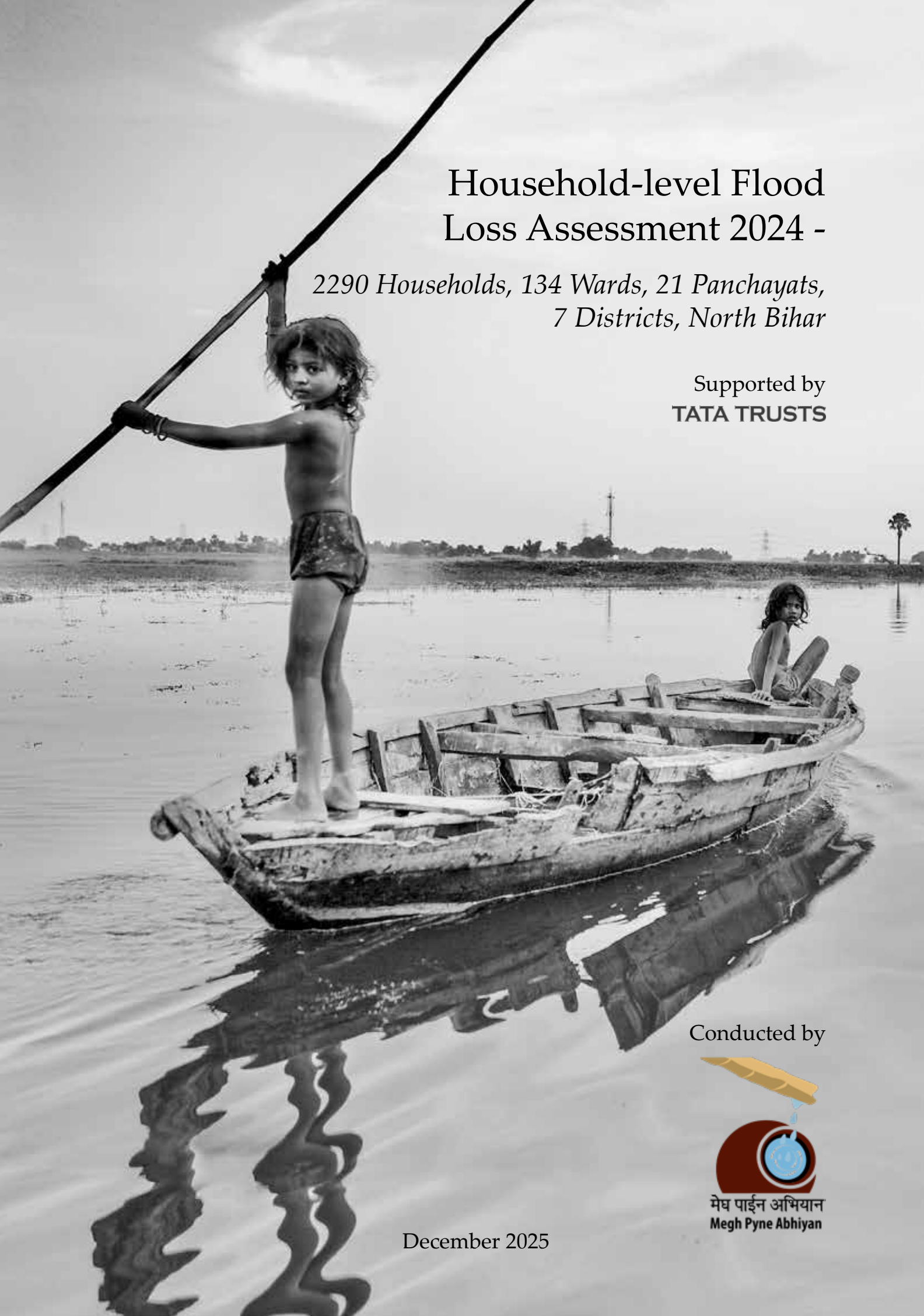

Household-level Flood Loss Assessment 2024 -

2290 Households, 134 Wards, 21 Panchayats, 7 Districts, North Bihar

Supported by
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Conducted by
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Organization – Megh Pyne Abhiyan is a Public Charitable Trust engaged in addressing water distress across East India. Its work focuses on enabling safe and secure drinking water systems and technologies, strengthening participatory groundwater management in both rural and urban settings, and fostering hygienic, context-specific sanitation practices. With particular emphasis on areas exposed to natural hazards and human-induced disasters, MPA is guided by the principles of collective accountability and action. The organisation remains committed to enhancing the resilience and adaptability of communities in East India.

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Executive Summary

The 2024 Bihar floods were one of the most devastating to strike the region in terms of geographical spread in recent decades, recording the third highest number of Districts (27 out of 38 Districts) affected since 2001 (Disaster Management Department, Government of Bihar, 2025). The Phase 2 floods (September 26-October 2, 2024), in particular, underscored the complex hydrological, social, and institutional realities of North Bihar's flood-prone landscape. This report presents a flood loss assessment covering 2,290 households across 134 Wards in 21 Panchayats of seven Districts affected by the Phase 2 floods. It combines quantitative rigor with participatory methods to capture the full spectrum of damages, losses, and lived experiences. The significance of this report lies in its role in addressing a critical gap in North Bihar's flood management framework. While State and District authorities routinely produce aggregated figures of damage and loss, these numbers obscure the immense variation in how different households, communities and geographies experience floods. By disaggregating impacts across flood typologies, social groups, and geographical contexts, and grounding the analysis in situated knowledge and lived experiences, this assessment offers a bottom-up perspective. This approach is crucial for shaping more equitable and effective policy responses. Moving beyond averages, it highlights the diverse realities of flooding and the pressing need for context-sensitive preparedness, response, recovery and resilience planning.

The 2024 Floods - A Compound and Unprecedented Event

The 2024 monsoon season in Bihar was characterized by highly irregular and extreme weather patterns. The early months saw prolonged rainfall deficits, leading to drought-like conditions in several Districts. However, from the second week of August until the end of September, an upstream surge in the Ganga caused river levels to rise, triggering widespread flooding across 13 Districts, of which seven were in South Bihar, and remaining six were in North Bihar. The Disaster Management Department (DMD), in its September 30, 2024 daily report cited by Sphere India, identified these events as Phase 1 of the 2024 Bihar floods.

Subsequently, between September 26 and 29, a sudden and intense late-season spell of heavy rainfall, triggered Phase 2 flooding (Shankar et al., 2025). This led to unprecedented inundation across the Gandak, Bagmati, Kosi, and Mahananda river basins simultaneously. As per Sphere India's September 30, 2024 report, the DMD specified 16 North Bihar Districts affected by Phase 2 of the 2024 floods.

The Phase 2 floods were far from a typical, linear flood event. They unfolded as a compound disaster, driven by embankment breaches, the merging of different rivers at different spatial locations, and drainage congestion. Together, these factors created complex and often unpredictable patterns of water flow. Such compound flooding exposed the shortcomings of conventional flood management approaches and highlighted the limitations of relying solely on embankments and reactive relief measures.

Purpose, Scope, and Objectives of the Assessment

In the wake of such an unprecedented disaster, there was a pressing need for detailed, disaggregated evidence to inform decision-making. Traditional reporting systems tend to focus on summary metrics and visible infrastructural damage, overlooking the diverse and often invisible forms of loss experienced by households and marginalized groups. Therefore, the household-level flood loss assessment was conceptualized and designed to address this gap by

- Generating granular, household-level data on flood losses across multiple domains, such as housing, land, livelihoods, water, sanitation, and hygiene (WASH), food security, health, and education

- Capturing the qualitative experiences and priorities of communities, using participatory methods that centred local voices
- Identifying how flood typology influenced damage patterns, vulnerabilities, and recovery pathways
- Providing a robust evidence base for equitable compensation, targeted interventions, and long-term resilience planning

The assessment was undertaken in 21 Panchayats across seven severely affected Districts - Pashchim Champaran, Sitamarhi, Darbhanga, Madhubani, Saharsa, Supaul, and Kishanganj. These sites were purposively selected to represent a wide diversity of flood conditions and typologies. Geographic Information System (GIS) tools were employed to spatially visualize the expanse and severity of floods. Within these Panchayats, 134 Wards were identified as the most affected, and 2,290 households were surveyed using structured questionnaires.[1] This quantitative data was complemented by reconnaissance visits (RVs)[2], participatory flood mapping (PFM),[3] focus group discussions (FGDs), key informant interviews (KIIs), GIS-based mapping, and direct field observations.

Flood Typologies – A Lens for Understanding Complexity

A cornerstone of this assessment is its grounding in flood typology, a framework developed by Megh Pyne Abhiyan (MPA) through years of field-based engagement. Unlike conventional approaches that treat all floods as homogenous, the typology approach recognizes that different kinds of floods have distinct causes, dynamics, and impacts, requiring equally differentiated responses. MPA's eight core typologies include

- Waterlogging outside the embankment (countryside)
- Riverine flooding within embankments
- Riverside riverine flooding within embankments combined with erosion
- Riverine flooding with incremental erosion in unembanked rivers
- Breach-induced riverine flooding in the countryside
- Flash flooding between embankments of the same river (riverside) with erosion and sedimentation
- Flash flooding in unconfined catchments adjacent to unembanked rivers
- Flooding and waterlogging between embankments of two different rivers

Among the eight typologies outlined, three were observed during the 2024 Phase 2 floods. In addition, this phase also brought forth four new flood typologies that had not been previously included in MPA's framework.

- Breach-induced riverine flooding in the countryside between the embankments of two rivers
- Breach-induced flooding and waterlogging between additional embankments in the countryside of same river
- Compound and hybrid flooding, where simultaneous overflow from unconfined rivers leads to multi-directional flows and severe erosion[4]
- Flash flooding in unconfined catchments adjacent to unembanked rivers with erosion

These emergent typologies underscore the diverse nature of flood hazards in the context of climate variability and infrastructural interventions. Moreover, they highlight the urgent need for policies and plans that are typology-sensitive.

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1 These 134 Wards were identified through rigorous processes, involving desk reviews of secondary sources, field-based interactions with Panchayati Raj Institution representatives, CSOs and resource persons, and reconnaissance visits.

2 Reconnaissance Visits (RVs) – Initial field visits to observe and assess flood-affected areas

3 Participatory Flood Mapping (PFM) – Flood map-based community discussions

4 Unconfined rivers should be understood as rivers without embankments.

Methodology – Rigor, Community Engagement, and Innovation

This assessment was built on a foundation of rigor and depth, combining multiple methodological layers to capture the realities of flood-affected communities. At its core, a household-level survey provided detailed quantitative insights into demographics, housing, livelihoods, losses, and coping strategies. Sampling was purposive yet systematic, covering 134 affected Wards with an average of 16 households surveyed per Ward, thereby ensuring robust and representative data.

To deepen and contextualize these findings, PFMs and FGDs were conducted in 10 of the 21 Panchayats across all seven Districts. These exercises placed communities at the centre of knowledge creation, allowing them to map flood dynamics, trace inundation pathways, highlight zones of historical erosion, and identify areas of chronic waterlogging. Their voices shaped the assessment, articulating priorities for recovery and resilience, and ensuring that situated knowledge informs every stage of analysis.

KIIs with Panchayati Raj Institution (PRI) representatives, District officials, and civil society actors provided a key dimension of insight, shedding light on governance structures, institutional bottlenecks, and systemic challenges.

Challenges were encountered while undertaking the survey. Active erosion and hazardous conditions limited access to some Wards, leaving gaps in coverage. Migration of household heads complicated data collection for the survey, as some respondents faced difficulties recalling asset values. In select instances, survey teams encountered resistance to the survey process. These obstacles were actively mitigated through the engagement of local enumerators, careful piloting of survey instruments, supervisor spot-checks, and triangulation across multiple data sources. While no survey is entirely free from bias, these measures reinforced the reliability and integrity of the findings.

Socio-Demographic – Profile of Affected Households

The characteristics of the surveyed households are summarized by the following key findings

- Gender and household head - Women comprised a slight majority of survey respondents at 51.9%, while men accounted for 48.1%. Around 80.1% of respondents identified themselves as the heads of their households. Overall, 65.4% households were male headed households (MHH), and only 34.6% were female headed households (FHH)
- Family composition - The average household size was 3.79, with an average of 1.74 earning members. Over one-third of households relied on a single source of income. As per the population structure 31.6% of family members were below the age of 15 and only 2.6% above 60 years. Students accounted for approximately 37% of household members
- Education - Educational deprivation was stark, with 56.6% of respondents reporting no formal schooling, while an additional 12.4% were literate without completing formal schooling. Only a minority had completed primary (16.4%), secondary (6.6%), or higher education (5.3%)
- Social group - The sample included 36.5% Backward Class 1 (BC1), 22.4% Backward Class 2 (BC2), 18.3% Scheduled Caste (SC), 13.1% General Category (GEN), 7.1% Economically Weaker Sections (EWS), and 2.6% Scheduled Tribe (ST)
- Housing and spatial exposure - Eighty seven per cent of the households lived in kucha structures, only 7.9% in pucca houses, and the remainder in semi- pucca dwellings. Spatially, 28% lived between two separate river embankments, 30% outside embankments, and the rest either near river without embankment, between different river systems or on embankment

Household Losses – Scale, Composition, and Dynamics

According to the Form IX released by the DMD on June 23, 2025, the 2024 floods altogether impacted 27 of the state's 38 Districts, affecting 56.38 lakh people across 36,632 villages. The scale of devastation was immense, with nearly 97% of agricultural land in the affected areas damaged, of which 70% was under cultivation. A total of 10,135 houses were destroyed or rendered uninhabitable, with 19 human fatalities and 53 animal deaths officially reported. The economic toll of crop damages were estimated at ₹306.19 crore (cr), while losses to houses and cattle sheds amounted to ₹20.87 cr. Under the two heads, 27 Districts experienced varying intensity of impact culminating in a total economic loss of ₹327.06 cr.

Form IX records 10,86,000 affected persons across the seven Districts included in the household-level flood loss assessment (Table). Using Cochran's formula, a representative sample for a population of this size would require approximately 384 respondents for a 95% confidence level. The survey, in fact, covered 8,685 individuals under 2290 households. This figure is more than twenty times the minimum required sample, indicating a robust and statistically reliable dataset.

Table – Information from Form IX (2024) and the household-level assessment

District	Number of affected Panchayats reported in Form IX (In numbers)	Number of affected Panchayats included in the household-level loss assessment (In numbers)	Number of affected persons reported in Form IX (In numbers)	Number of affected persons included in the household-level loss assessment (In numbers)
Pashchim Champaran	44	2	73000	699
Sitamarhi	31	6	310000	2501
Darbhanga	21	4	225000	918
Madhubani	5	1	35000	919
Saharsa	35	2	261000	1421
Supaul	36	1	131000	678
Kishanganj	36	5	51000	1549
Total	208	21	1086000	8685

The household-level flood loss assessment provides an estimate of the 2024 Phase 2 flood's economic impact on the 2,290 surveyed households. Losses were assessed across twenty categories and aggregated into seven broad themes - housing, personal and household assets, WASH, land, livestock, and agriculture. The total reported loss amounted to ₹126.3 cr, a figure that underscores the economic impact of the floods at the micro level. Land damage emerged as the largest contributor, accounting for 47.2% (₹55.4 cr) of total losses, followed by estimated house repair at 36.2% (₹42 cr). Losses to WASH facilities (2.2%, ₹2.8 cr) were nearly equivalent to livestock losses (2.4%, ₹3 cr), while agriculture and livestock together made up 10% of the total. Personal and household assets, such as kitchenware (1,606 households), groceries (1,521), and furniture (1,271), as well as WASH related (984) were more frequently reported than land damage (920 households), yet their share of monetary loss was much smaller. Overall, housing was the most frequently reported loss (1,990 households) and the second-largest component in monetary terms, underscoring its central role in flood impact, particularly for socially and economically vulnerable groups. The average loss per

household[5] was estimated at ₹5.51 lakh. However, the median[6] loss of ₹2.11 lakh offers a more reliable measure of central tendency, given the presence of high-value outliers. The interquartile range (Q1-Q3)[7] further indicates that household losses were largely concentrated between ₹1.17 lakh and ₹4.93 lakh, reflecting moderate dispersion in the overall distribution.

Flood typology also influenced loss patterns. Breach-induced typologies caused the largest aggregate losses, given their geographical extent. Approximately 58.7% of the total surveyed households encountered breach induced flooding. Flash flooding between embankments of the same river (riverside) with erosion and sedimentation, while affecting smaller populations, resulted in extraordinarily high per-household losses due to their suddenness and intensity. For 32 out of the 170 surveyed households that experienced this typology, the total losses exceeded ₹20 lakh per household. Within each typology, the per household economic impact varied both in terms of scale and composition of losses. For instance, while land loss accounted for roughly 33% of total losses in both flash floods across unconfined catchments near unembanked rivers and riverside riverine flooding with erosion, the remaining loss composition differed markedly. The former saw mainly housing losses, other categories constituting a far less prominent share. Whereas riverside riverine flooding led to multi-sectoral damages, spanning housing, agriculture, livestock, and personal and household assets.

If all flood-affected respondents located near embankments are grouped into two broad categories, outside and inside the embankments (the latter including both in riverine and flash flood zones), a clear pattern emerges. Respondents outside embankments (including those in spatial locations outside embankment, between two separate river embankments, and on embankments) accounted for losses of about ₹80.5 cr, while those inside embankments recorded around ₹13 cr. This pattern highlights how embankments often redistribute flood risk, creating new pockets of vulnerability rather than reducing overall exposure. The respondents near unembanked rivers and between different rivers accounted for losses of ₹26.2 cr and ₹6.3 cr respectively.

Assessment-based Vulnerability Paradox and Social Inequities

A key finding of the report is the assessment-based vulnerability paradox. Loss patterns revealed sharp disparities between asset-rich and asset-poor households. Typical losses for GEN households fell around ₹1.2-9.3 lakh (the widest central 50% range among all groups). They also recorded the highest average (₹9.8 lakh) and the second-highest median (₹2.5 lakh). These figures reflect higher asset ownership. BC1, BC2 and EWS households formed a middle tier. While some cases were severe, the majority of households in these categories clustered around the ₹2-2.6 lakh range (as indicated by their medians), and their upper quartile values remained around ₹4-5 lakh. In contrast, SC and ST households recorded the lowest central values, and their losses were more tightly clustered, indicating fewer assets at risk to begin with. These findings suggest that while monetary loss appears greater for asset rich households, even smaller losses can be far more devastating for marginalized families with limited assets, making recovery harder and longer.

Survival through Coping Strategies

The floods precipitated a problem with food availability and accessibility. Around 91% of households reported reducing the quantity of meals during floods, 83.67% consumed stored food grains, while 75% borrowed food from relatives or neighbours, underscoring the reliance on informal social safety nets. Approximately 82.18% of the total surveyed households were displaced. the role of migration gets highlighted as 68.43% of the households relied on remittances,

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5 Mean - The average loss per household

6 Median - The median loss is the middle value of all losses, where half the losses are higher and half are lower, making it resistant to being skewed by a few extremely large losses

7 The interquartile range of losses is the spread of the middle 50% of your losses, ignoring the highest 25% and lowest 25%, to show the core range of your typical losses

as a coping strategy. Distress sales were widespread - 35.07% mortgaged jewellery, 24.93% either mortgaged or sold livestock, 9.69% mortgaged land, and 4.02% sold land outright. These strategies provide temporary survival but erode households' productive capacities, locking them into long-term cycles of impoverishment and dependency.

The coping mechanisms adopted by marginalized groups were actually impediments to long-term recovery. Among ST households, 36% mortgaged land and 56% mortgaged livestock to survive. In contrast, the GEN households, despite experiencing higher absolute losses, reported less severe coping strategies displaying greater access to social networks and credit, thus enabling faster recovery.

Both FHH and MHH adopted similar coping strategies during floods, marked by food scarcity, borrowing, and reliance on stored supplies (96% FHH and 95% MHH) and remittances (72% each). However, FHH showed greater financial vulnerability, often resorting to selling or mortgaging jewellery (17% and 38% respectively, compared to 10% and 35% among MHH). Also, depending more on relatives for food (80% versus 74%). MHH, meanwhile, displayed a slightly higher inclination toward migration (49% versus 44%) and sale of productive assets like livestock (19% versus 16%). Despite experiencing relatively lower economic losses than MHH, the effort made by FHH to recover and rebuild after the floods remains equally intense, if not greater. This underscores the weight of the economic burden they shoulder, often managed through different and more constrained coping strategies.

Insurance mechanism was almost completely absent. Nearly 80% of households were unaware of or lacked access to any form of flood insurance, leaving affected families entirely dependent on borrowed money.

Mathematical Modelling to Asses Vulnerability

The outcomes of the household-level flood loss survey triggered the need to develop a comprehensive vulnerability assessment framework for translating the concept of multidimensional vulnerability into practical assessment tools. Developing such a framework is essential to quantify vulnerability in a nuanced and grounded manner, capturing not just the physical impacts of floods but also the social, economic, and institutional dimensions that shape people's ability to cope and recover.

Participatory Evidence and Community-Driven Solutions

PFMs and FGDs provided critical qualitative insights that go beyond quantitative data. Community perspectives shed light on the intangible challenges that persist during and after flooding, including the status of evacuation, shelter, rehabilitation and compensation arrangements, prolonged disruptions to children's education, the unavailability and inaccessibility of emergency health care, the disproportionate burdens faced by vulnerable groups including women, elderly, children and People with disabilities (PwDs). Communities demonstrated deep expertise in identifying the root causes of flooding. They also mapped historical erosion zones and areas of chronic waterlogging. This intervention could be a meaningful addition to administrative flood records if adopted by District administration. Communities articulated interventions, clustered across following thematic areas.

- Pre-positioned boats for ferrying people in flood prone areas
- Construction of elevated and flood-resilient, housing, educational, health infrastructure, and multipurpose shelters
- Provision of dedicated cattle shelters with provision for fodder, water and veterinary care to safeguard livestock
- Community-managed WASH infrastructure with elevated water sources and toilets
- Resilient storage systems and grain banks to prevent post-disaster food insecurity
- Promotion of flood-tolerant crops and diversified livelihoods

- Deployment of mobile health and veterinary services
- Gender-sensitive relief systems, including menstrual hygiene management and safe spaces for women
- Localized early warning systems and volunteer rescue teams
- Drainage and de-silting interventions for hydraulically trapped areas

The core message from these consultations was clear, communities need integrated, multi-sectoral solutions, rather than piecemeal technical fixes.

Government Efforts and Institutional Actions

Through KIIs and FGDs, the assessment noted that institutional responses to floods varied across Districts. In some areas, government departments displayed coordinated preparedness, and disaster management mechanisms were activated to address emerging impacts. Relief materials were mobilised, and recovery and compensation processes were initiated. However, consultations across the seven Districts also revealed recurring weaknesses. Early warnings were often too limited to enable timely action and rarely translated to actionable information that flood vulnerable communities could act upon to minimize losses. Relief services were inconsistent and frequently delayed, leaving many households to depend on community support. Institutional planning remained largely top-down, with PRI excluded from on-site decision-making. In several Districts, lack of coordination and slow fund disbursal compounded the situation. Several key informants observed that flood management in Bihar continues to prioritise structural interventions for protection, rather than risk-informed and ecologically sensitive measures for building resilience. This structure- and relief-centric approach often overshadows the struggles of flood-affected communities and masks the deepening economic and ecological challenges they face. Together, these findings suggest that while the state has institutional systems in place for flood response, their uneven implementation and limited local participation hinder effective governance. Strengthening coordination, devolving authority to Block and Panchayat levels, and valuing community knowledge can make flood management more responsive and grounded in local realities.

A Programmatic Blueprint: Preparedness, Response, Recovery, and Resilience

The report concludes with a comprehensive programmatic blueprint for action, structured around four interconnected stages, with few examples listed below

- Preparedness - Decentralized emergency operations centres, downscaled early warning systems, elevated multipurpose shelters, pre-positioned boats and relief supplies, and regular community drills
- Response - Rapid, inclusive action during floods, including pre-mapped evacuation routes, immediate deployment of flood typology-based boats, standardized modular relief kits, mobile health and veterinary services, gender-sensitive sanitation facilities, and real-time situational awareness through drones and GIS
- Recovery - Medium-term interventions such as owner-driven housing reconstruction (ODR) supported by resilience vouchers and concessional credit, rapid agricultural recovery through seed replacement and fodder banks, GIS-linked registries to track losses and reduce exclusion, and restoration of essential WASH infrastructure
- Resilience - Long-term systemic changes, including catchment restoration, participatory relocation where necessary, elevated and flood-resilient public infrastructure, community-led micro-insurance schemes, and innovative financial mechanisms such as resilience bonds

Conclusion - From Crisis to Transformation

The 2024 floods exposed the fragility of current systems, the inequities embedded in disaster impacts, and the urgent need for transformative, community-centered approaches. The data generated by this assessment, combining household surveys, participatory mapping, and GIS analysis, provides a foundation for action.

Moving forward, Bihar's flood management strategy must shift from reactive, infrastructure-heavy approaches to proactive, inclusive, and typology-sensitive planning. This means centering community knowledge, prioritizing vulnerability over absolute losses, and integrating social protection with structural interventions. If leveraged effectively, the findings of this report can help chart a path toward a future where floods, while inevitable, no longer translate into cycles of devastation and despair, but instead catalyze resilient and equitable development.

The result is far more than a dataset. It is a living archive of community knowledge, detailed, nuanced, and anchored in local agency. It is data with intention, evidence designed not merely to inform, but to drive transformative, equitable, and forward-looking decisions that can reshape Bihar's flood governance and strengthen the capacity of communities to navigate their future.

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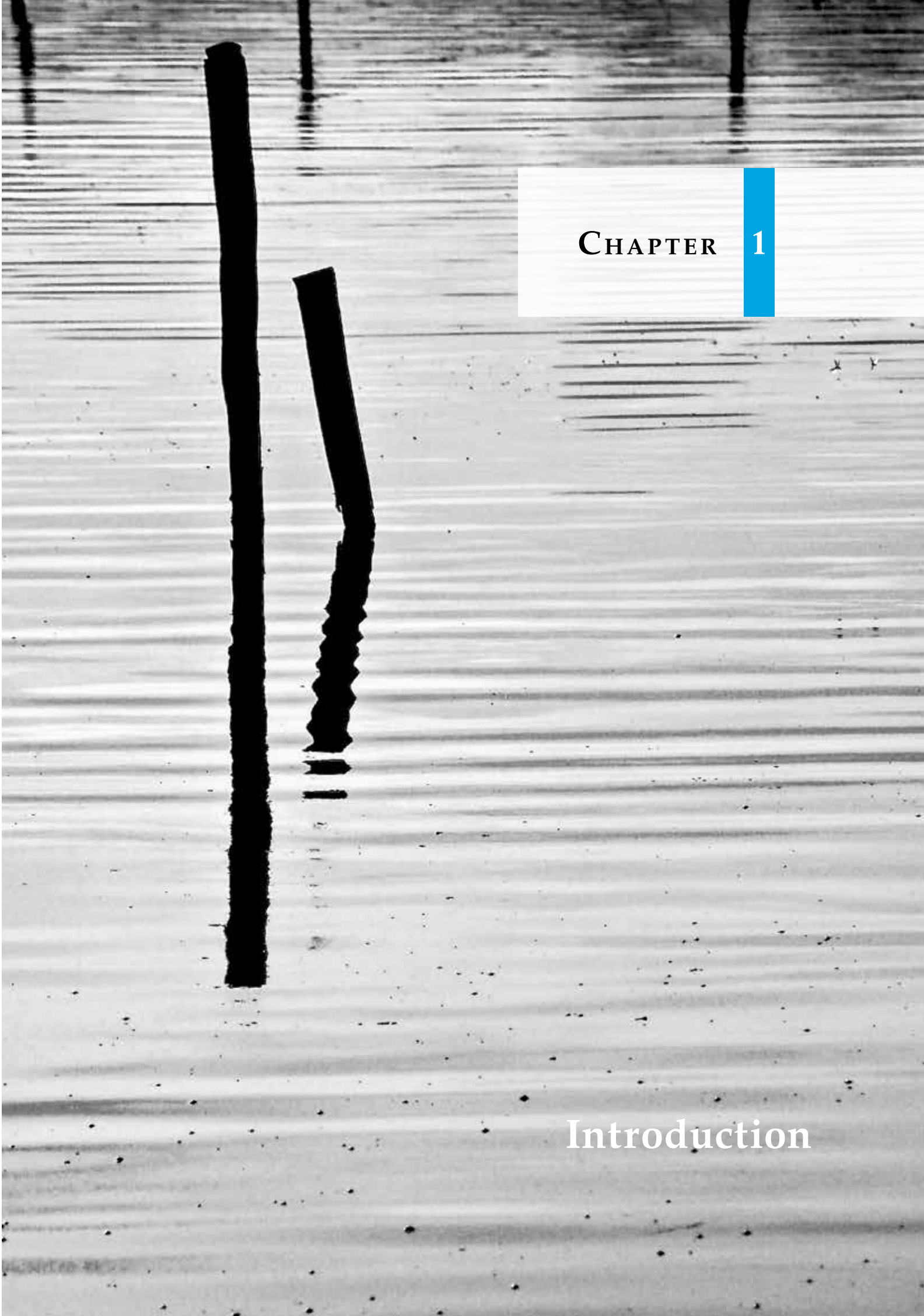
List of Abbreviations

AD	Agriculture Department
AFRD	Animal and Fisheries Resources Department
agl	Above ground level
AI	Artificial Intelligence
BC1	Backward Class 1
BC2	Backward Class 2
bgl	Below ground level
BMSICL	Bihar Medical Services and Infrastructure Corporation Limited
BSDMA	Bihar State Disaster Management Authority
CBO	Community-based Organization
CMRF	Chief Minister Relief Fund
cr	Crore
CSO	Civil Society Organisation
CSR	Corporate Social Responsibility
CwD	Children with Disabilities
DDMA	District Disaster Management Authorities
DMD	Disaster Management Department
DRR	Disaster Risk Reduction
ED	Education Department
EOC	Emergency Operations Centres
EWS	Economically Weaker Sections
FGD	Focus Group Discussion
FHH	Female-headed Household
FMISC	Flood Management Improvement Support Centre
ft	Feet
GEN	General Category
GI	Galvanized Iron
GIS	Geographic Information System
GOB	Government of Bihar
GPS	Geographic Positioning System
GR	Gratuitous Relief
HD	Health Department
hrs	Hours
IPCC	Intergovernmental Panel on Climate Change
IQR	Interquartile Range
IVRS	Interactive Voice Response System

KII	Key Informant Interview
KPVP	Kosi Peedit Vikas Pradhikaran
LSBA	Lohiya Swachh Bihar Abhiyan
MGNREGA	Mahatma Gandhi National Rural Employment Guarantee Act
MHH	Male-headed Household
MPA	Megh Pyne Abhiyan
NDMA	National Disaster Management Authority
NDRF	National Disaster Response Force
NHM	National Health Mission
NRSC	National Remote Sensing Centre
NWFC	National Weather Forecasting
ODR	Owner-driven Reconstruction
PD	Pakhnaha-Dumariya
PDD	Planning and Development Department
PDS	Public Distribution System
PFM	Participatory Flood Mapping
PHC	Primary Health Centre
PHED	Public Health Engineering Department
PM-ABHIM	Pradhan Mantri - Ayushman Bharat Health Infrastructure Mission
PMAY	Pradhan Mantri Awas Yojana
PMFBY	to Pradhan Mantri Fasal Bima Yojana
PRD	Panchayati Raj Department
PRI	Panchayati Raj Institution
PwD	People with Disabilities
RC	Reinforced Concrete
RDD	Rural Development Department
RLRD	Revenue and Land Reform Department
RV	Reconnaissance Visit
RWD	Rural Works Department
SBMG	Swachh Bharat Mission (Gramin
SC	Scheduled Caste
SDMP	School Disaster Management Plan
SDRF	State Disaster Response Force
SHG	Self-help Group
SMS	Short Message Service
SOP	Standard Operating Procedure
SSB	Sahastra Seema Bal
ST	Scheduled Tribe



CHAPTER 1

Introduction

1. Background and Context of the 2024 Floods in North Bihar

Situated in the alluvial floodplains of several major Himalayan rivers, Bihar accounts for 17% of India's flood-prone area and over one-fifth of its flood-affected population. The northern part of the state remains particularly vulnerable, with one-third of its inhabitants living under the constant threat of recurrent flooding. Most major river systems in this region, including the Ganga, Gandak, Bagmati, Kosi, and Mahananda, originate in the Himalayas, majorly in Nepal and Tibet, and carry high volumes of water and sediment during the monsoon (National Remote Sensing Centre [NRSC], Indian Space Research Organisation, 2020).

Bihar, India's most densely populated state with the projected population density of 1,307 persons per square kilometres (Niti Aayog, 2025), experiences flooding annually. This relentless cycle of inundation routinely destroys houses, damages public infrastructure, decimates crops, and claims both human and animal lives. In the last 25 years, an average of 88% of the land affected by the floods has been agricultural, and 95% of the houses damaged have either been kucha houses or huts (Disaster Management Department, 2000-2024). Decades of flooding result not only in the periodic destruction of tangible assets and infrastructure but also entrench long-term socio-economic vulnerabilities.

The 2024 monsoon triggered flood events in North Bihar. Though characteristic of the state's vulnerability, these episodes were anomalous in their timing and intensity. At first, the early months of monsoon deprived the agrarian state, particularly South Bihar, of adequate rainfall (National Weather Forecasting Centre [NWFC], India Meteorological Department, 2024). August, however, brought a sudden surge of heavy precipitation in Nepal, North Bihar, and neighbouring states, causing water levels to rise sharply across major rivers, notably the Punpun, Ganga, Gandak, Bagmati and Kosi. By mid-September, the resulting floods had impacted over 400 Panchayats across 13 Districts, including Bhojpur, Saran, Patna, Vaishali, Khagaria, and Bhagalpur. Families were forced to abandon their homes in search of safety as the region entered

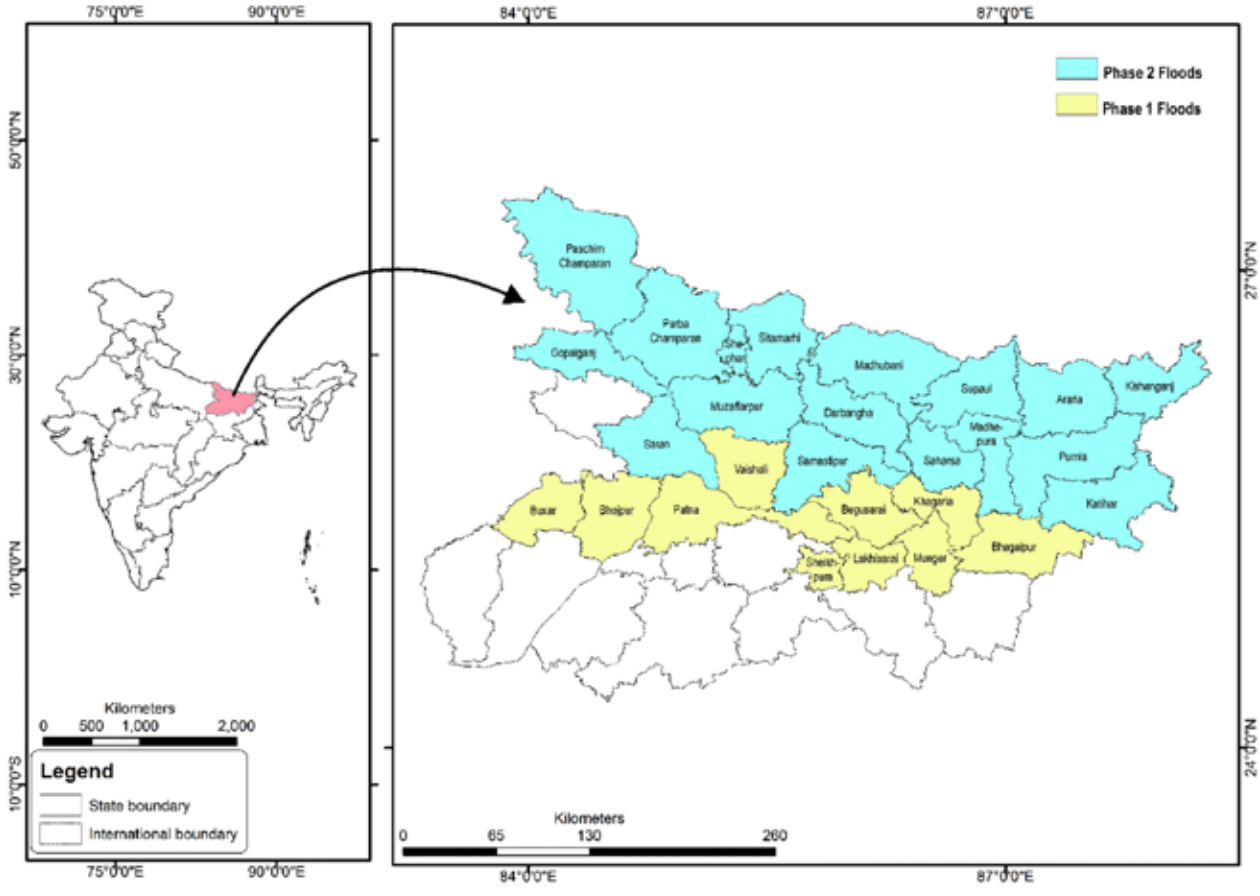
A woman walks with a young girl along the breach site of the River Kosi's western embankment at Narkatiya Bhandara Panchayat, Darbhanga district

a familiar cycle of displacement and desolation (Disaster Management Department, Government of Bihar, 2024; Khan, 2024; Morung Express, 2024; Khan, 2024b; Sphere India, 2024).

While response efforts were still under way, what is now termed Phase 2 of the 2024 Bihar floods began, drawing even more Districts into crisis. July and August are generally the rainiest months for Bihar. Rainfall gradually subsides towards September as the Southwest Monsoon begins its retreat from the state in early October (India Meteorological Department, 2011). Yet in late September 2024, a rare combination of large-scale synoptic systems created exceptional atmospheric instability, triggering a four-day episode of relentless rainfall.

On September 24, a low-pressure area developed over the Bay of Bengal, serving as the primary source of moisture. Its interaction with cyclonic circulations and an unfavorably aligned monsoon trough created highly conducive conditions for intense rainfall over North Bihar and Nepal's Terai region. Between September 26 and 29, the rainstorm advanced westward across the state. Additional factors, including the oscillation of the Tibetan High and the orographic influence of the Himalayas, further enhanced moisture convergence and uplift, leading to peak rainfall on September 27 and 28. Districts such as Gopalganj, Pashchim (West) and Purbi (East) Champaran, Sitamarhi, Darbhanga, Supaul, Araria, Purnea, and Kishanganj experienced the heaviest downpours(Shankar et al., 2025). Consequently, major rivers, including the Gandak, Burhi Gandak, Bagmati, Adhwara, Kamla Balan, Kosi, Mechi, Mahananda and several small rivers, rose far above danger levels, triggering widespread flooding. By October 2, the resulting inundation had already marked the Phase 2 floods of 2024 as one of the most severe in recent decades (UNICEF, 2024; The New Indian Express, 2024; India Today, 2024; Khan, 2024c). Overall, the 2024 floods had affected almost all of Bihar's flood-prone regions, even the ones classified "low" on the Flood Hazard Index (NRSC, 2020).

Map 1 - Flood affected District (Phase 1 and 2) in Bihar

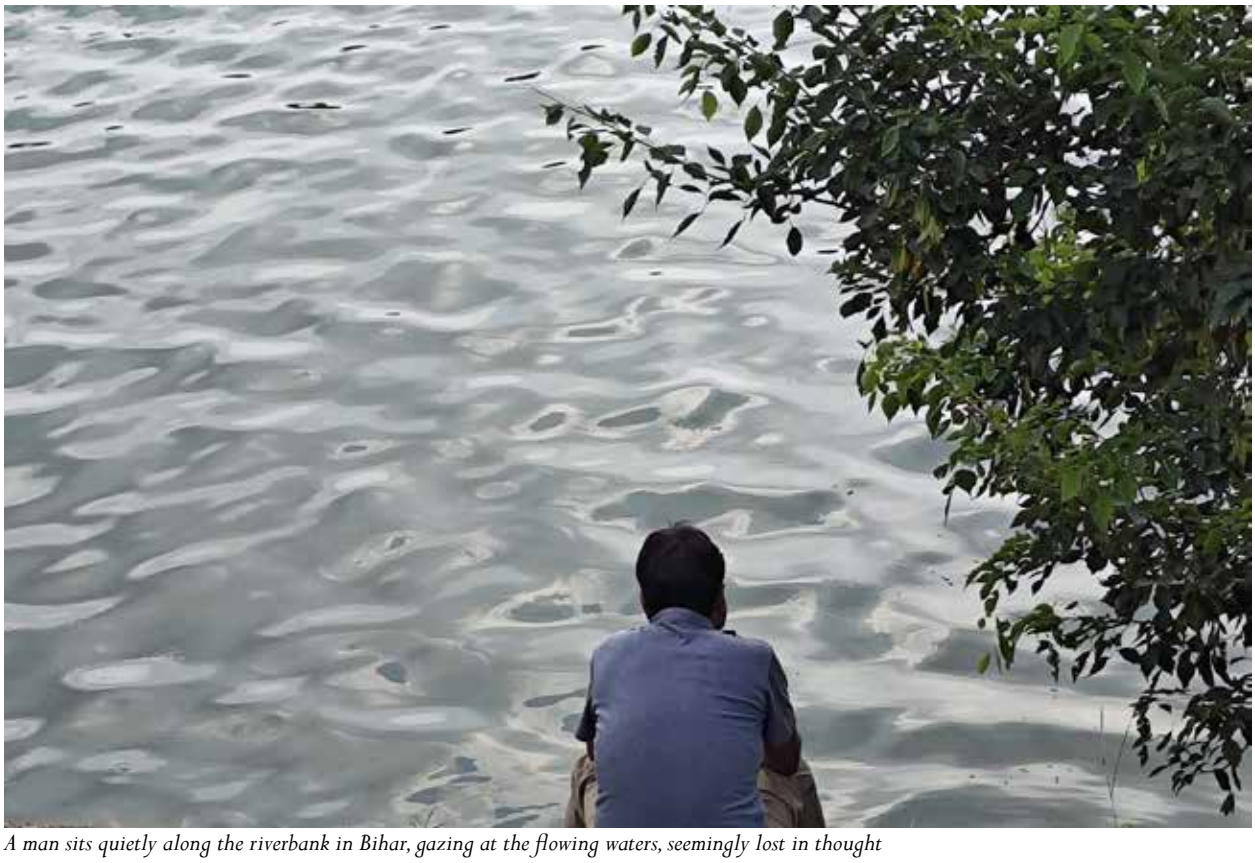


Note - Adapted from India Humanitarian Situation Report No. 2 (Bihar Floods), 03-08 Oct 2024 (2024), UNICEF

According to the Form IX released by the Disaster Management Department (DMD) of the Government of Bihar (GoB) on June 23, 2025, the 2024 floods impacted 27 of the state's 38 Districts. Over 56 lakh people across 36,632 villages, 1,038 Panchayats and 164 Blocks were affected. In addition, the total number of animals affected were 5.7 lakh in 18 Districts. Approximately 3.3 lakh hectares of land were damaged, nearly 70% of which was agricultural. crop losses were valued at around ₹306 cr. Of the 10,135 houses reported damaged, 67.5% were huts that had been fully destroyed. Damage to public infrastructure was estimated at ₹1185 crore (cr) and the disaster resulted in 19 human and 53 animal fatalities. Notably, there are reports that suggest the number of human lives lost due to the floods may be higher than officially stated (Sphere India, 2024).

Bihar's flood-prone areas have actually increased over the years, despite extensive construction of embankments and the implementation of other structural flood-control measures. In fact, infrastructural gaps, such as embankment breaches, waterlogging due to encroachment of natural drainage channels and inadequate drainage systems, are increasingly being cited as primary causes of recurring floods. (NRSC, 2020). Moreover, the impacts of floods in Bihar cannot be viewed in isolation, as standalone events; one must take into account the cumulative and generational consequences of the repeated despoliation of homes, livelihoods and futures.

Unlike typical seasonal floods, the Phase 2 floods of 2024 represented a compound hazard, transboundary hydrology interacting with structural embankment failures and climate-exacerbated rainfall.



A man sits quietly along the riverbank in Bihar, gazing at the flowing waters, seemingly lost in thought

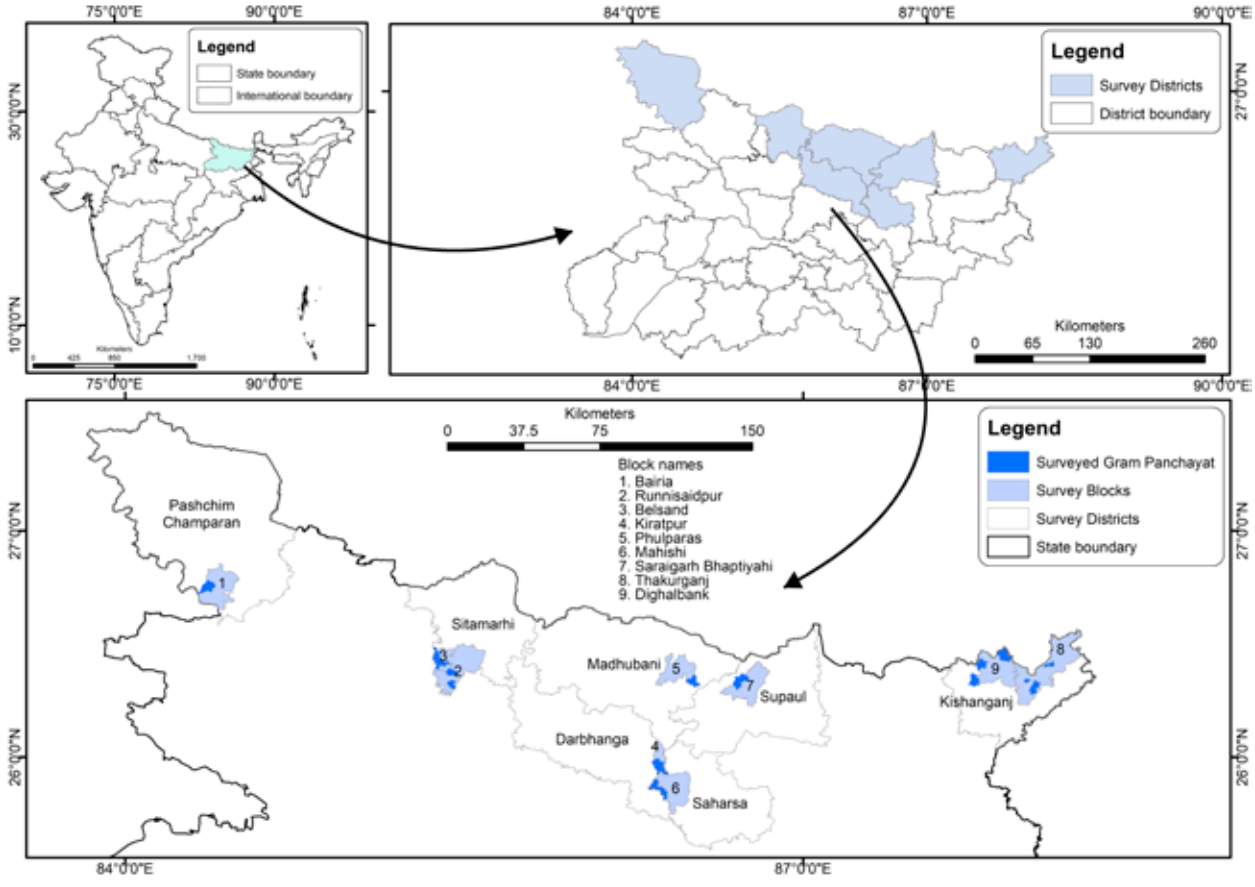
Given the scale and complexity of the 2024 flood events, there was a pressing need to recalibrate the understanding of floods in North Bihar, particularly in the context of a changing climate, the increasing unpredictability of flood timing, and the limitations of relying on generic assessments. It became critical to adopt a lens that recognized local specificities

and variations in floods and their impact. In this context, a household-level flood loss assessment was essential to capture the depth and diversity of flood-induced disruptions. The outcome of the assessment will serve as a key tool for understanding response strategies, shaping both structural and non-structural mitigation measures, and guiding resettlement and resilience efforts, all grounded in the lived realities of affected communities.

2. Purpose and Scope of the Household-level Flood Loss Assessment

The household-level flood loss assessment focused on affected populations in seven northern Districts of Bihar - Pashchim Champaran, Sitamarhi, Darbhanga, Madhubani, Saharsa, Supaul, and Kishanganj, in the aftermath of the Phase 2 floods of 2024. These Districts, spread across the Gandak, Bagmati, Bhutahi Balan, Kosi, Kankai, Mechi, and Mahananda river basins, were selected through a rigorous process to capture flood impacts across North Bihar's diverse hydro-geomorphological settings and flood typologies.

Map 2 - Geographic distribution of Blocks covering the surveyed Panchayats



This evidence-based participatory assessment aimed to generate a deeper understanding of the multifaceted impacts of flooding across the region's flood-affected geographies from the eyes of the communities. Accordingly, the assessment placed particular emphasis on capturing the socio-economic and environmental losses experienced by the affected population situated in varying flood typologies. This includes losses related not only to housing and assets but also to livelihoods, food security, displacement, access to drinking water, sanitation, health and education services, and environmental degradation, including erosion and siltation.

One of the core objectives was to understand how the type and severity of losses differed across different flood typologies in the floodplain. In addition to looking at overall loses, the assessment focused on how different communities

experienced, coped with, and responded to floods. In parallel, the assessment identified and documented recovery practices and resilience strategies as articulated by the affected communities. This included an exploration of the local coping mechanisms, existing administrative response frameworks and community suggested ways forward.

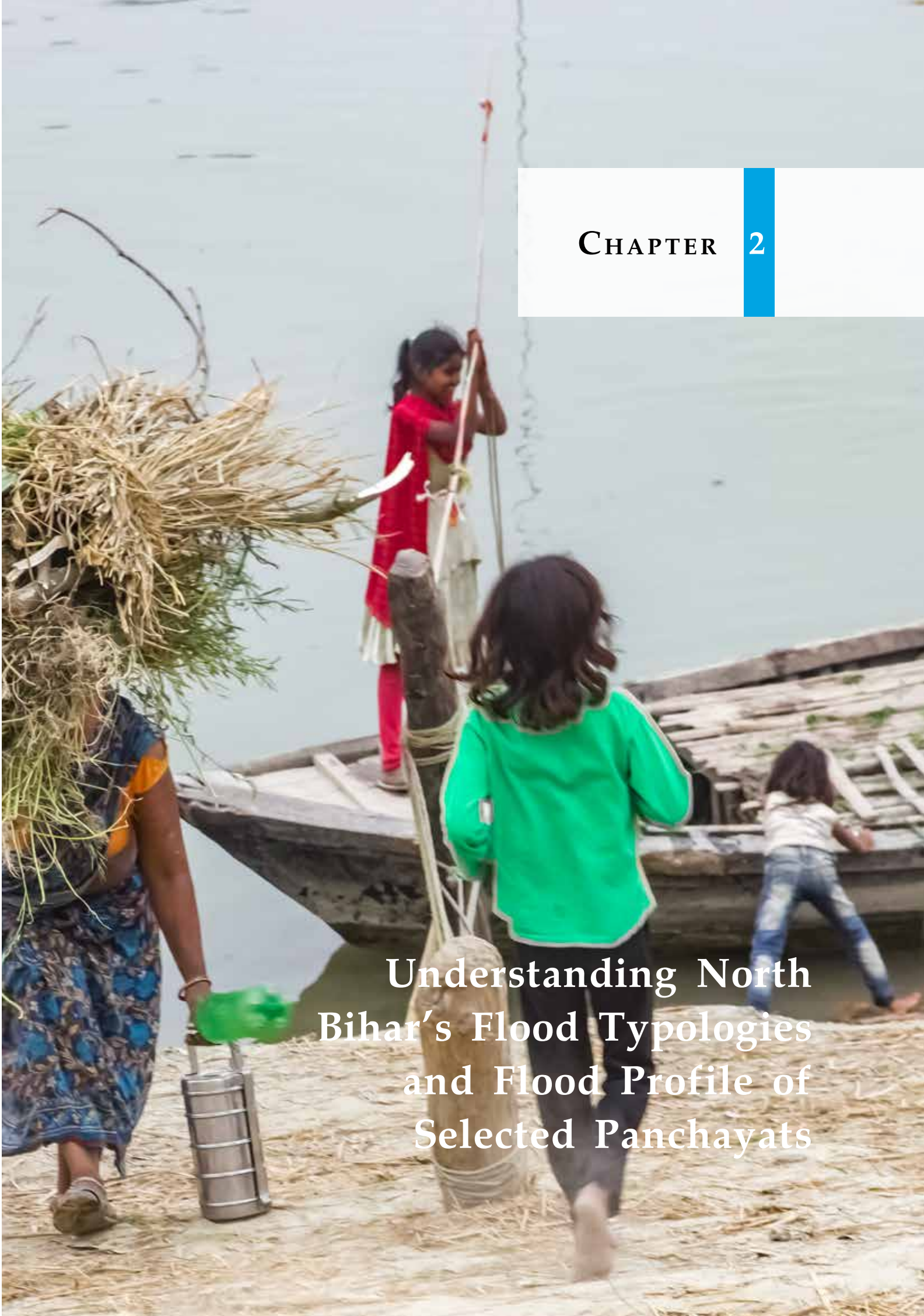
Ultimately, the assessment was geared towards producing actionable insights that can inform government, Civil Society Organizations (CSOs) and innovators in designing and implementing preparedness, response, recovery, and resilience interventions.

3. Key Stakeholders Involved

The household-level flood loss assessment drew upon the perspectives, experiences, and inputs of a wide range of stakeholders who were directly or indirectly encountered the Phase 2 floods of 2024. These stakeholders were engaged at different stages to ensure the assessment drew on both institutional knowledge and lived realities across levels of governance and society.

At the core of the assessment were flood-affected households, whose responses offered vital insights into the nature, extent, and consequences of the floods at the micro level. Elected representatives of Panchayati Raj Institutions (PRIs), including Former Pramukh, Mukhiyas, Sarpanches, Panchayat Samiti and Ward Members, offered perspectives on community-level impacts, administrative responses, and challenges encountered. District-level officials, in turn, highlighted the overall severity of the floods, institutional response strategies, and logistical constraints in relief delivery. Civil society members and social activists highlighted service delivery gaps and drew attention to both long-standing and emerging community needs. Consultations were held with women, adolescents, the elderly, persons with disabilities (PwDs), and other marginalized groups, whose perspectives highlighted often-overlooked vulnerabilities and experiences of the flood. Together, these stakeholder engagements provided a comprehensive, locally informed, and socially inclusive picture of flood impacts and recovery needs, while their contributions greatly enhanced the credibility of the assessment.

Consultations with elected Panchayati Raj Institution (PRI) members underway at Jaffarpur Panchayat, Sitamarhi District



CHAPTER 2

Understanding North Bihar's Flood Typologies and Flood Profile of Selected Panchayats

1. Flood Typologies

North Bihar's hydrogeomorphology is intricately defined by a network of perennial and non-perennial rivers, with a significant proportion of the fluvial systems originating in the Nepal Himalayas. These transboundary rivers are characterised by high sediment yields, which are deposited across the state's alluvial plains, contributing to rapid aggradation, shifting river courses, and increased flood vulnerability. The regional precipitation regime is highly imbalanced, with over 80% of the annual rainfall occurring during the three monsoon months (June to September). This results in dramatic hydrological responses, with river discharge volumes increasing up to fiftyfold, often breaching channel capacities and triggering widespread inundation (Shankar et al., 2025).

In India, agencies at the national and state level, such as the National Disaster Management Authority (NDMA) or the Flood Management Improvement Support Centre (FMISC), GoB have identified different types of floods, based on factors such as cause, intensity, duration and frequency.

In its guidelines on flood management, for instance, the NDMA describes, without explicitly stating so, the different types of floods faced by different parts of the country - flooding and erosion in islands, flash floods in the hilly terrains, drainage congestion and water-logging, river erosion, urban flooding, snow-melt and glacial outbursts, floods caused by cyclones, and cloudbursts (National Disaster Management Authority, 2008). Broadly, this seems a classification that has come from the different causes of floods.

The FMISC has classified floods into four distinct typologies based on hydrodynamic behaviour, temporal characteristics, and spatial persistence (Flood Management Improvement Support Centre [FMISC], 2013).

- Class I: Flash Floods - Resulting from intense upstream precipitation in Nepal, these floods exhibit extremely short lead times (approximately 8 hours), with rapid onset and equally swift recession, posing significant challenges for early warning dissemination and response coordination
- Class II: Riverine Floods - These are typified by a lead time of around 24 hours and extended flood retention, with

The shifting sandy landscape within the Kosi River embankments in Supaul District, where sparse riverine grasses and darkening monsoon skies reflect the river's ever-changing and fragile landscape

inundation persisting for a week or longer. They are more predictable but have broader spatial coverage and deeper socio-economic impacts

- Class III: Drainage Congestion Events - Typically occurring at fluvial confluences or areas with compromised natural drainage, these floods have lead times exceeding 24 hours and often result in chronic water stagnation, persisting throughout the monsoon season (up to 90 days), adversely affecting agricultural productivity and habitability
- Class IV: Permanently Waterlogged Zones - These are hydrologically depressed regions where surface water fails to recede year-round, with minimal reduction observed only during late winter (February). Such areas are prone to sustained ecosystem degradation and long-term livelihood disruption

FMISC, also applied an additional classification framework wherein each flood typology is delineated exclusively based on the spatial extent of inundation. This intensity-based schema stratifies flood-affected areas into four categories - Not Affected (inundation <10% of area inundated), Low Flood (11-30%), Medium Flood (31-60%), and High Flood (inundation >60%). This methodology offers a spatially explicit and quantifiable lens for analysing flood coverage (FMISC, 2013).

Despite the existence of formal classification systems, floods and their impacts in Bihar are often approached through a homogenised lens, overlooking the spatial, temporal, and hydrological complexities that define flood realities on the ground. Floods resulting from extreme weather events differ considerably from recurrent inundations in chronically affected regions. Even within these flood-prone geographies, variations in topography, infrastructure, hydrogeomorphology, groundwater behaviour, settlement proximity, and shifting rainfall regimes, produce distinct flood expressions.

Thus, through extensive field engagement and interdisciplinary inquiry, Megh Pyne Abhiyan (MPA) has been working since 2011 to evolve a more nuanced and contextually grounded framework of flood typologies in North Bihar. Moving beyond generic classifications, the framework reflects socio-hydrological and geomorphic specificities of North Bihar's alluvial floodplains.

2. Evolving a Granular Understanding of Flood Typologies in North Bihar

MPA's classification delineates eight typologies that dominate North Bihar's flood-prone alluvial landscape. These are not rigid categories, but rather representative models that reflect recurring patterns and site-specific realities. Together, they provide a structured lens to understand how different types of floods affect exposure levels, preparedness timelines, and the nature of damage across regions.

This typology framework brings clarity to how structural and non-structural variables influence flood hazard outcomes. It also emphasizes how people's lived experiences with floods, including their ability to anticipate, respond to, and recover from them, are conditioned by these physical and infrastructural settings. Each flood typology corresponds to a unique hazard profile, shaped by embankment presence or absence, the velocity and duration of inundation, and the scale of erosion and waterlogging involved. Moreover, these types carry distinct implications for risk reduction strategies, from engineering interventions to decentralised preparedness.

The following flood typologies capture the diverse flood realities in North Bihar and serve as a foundation for designing more effective, locally-appropriate responses.

2.1. Typology 1 - Waterlogging Outside the Embankment (Countryside)

This flood typology pertains to water-logged regions outside the embankments, commonly found in low-lying countryside areas. These zones are chronically prone to predictable and prolonged water stagnation, not due to river

Life stands still as homes and farmlands lie drowned in stagnant waters outside the Kosi embankment in Supaul District, revealing the enduring burden of countryside waterlogging

overtopping or breaches, but as a result of inadequate drainage, stagnation of rainfall runoff, non-functional or absent sluice systems and seepage from the embanked river. Water accumulation in these areas occurs gradually, with a slow hydraulic rise that allows communities a window to seek temporary refuge or make necessary adjustments. However, the persistence of standing water, often lasting weeks, months, or even year-round, severely restricts mobility, disrupts daily life, and hampers access to essential services.

Agricultural activities bear the brunt of these conditions. Kharif cropping is regularly affected, and even Rabi cultivation is compromised due to delayed sowing, reduced soil bearing capacity, and overall water saturation. Prolonged submergence also weakens infrastructure, undermining houses, sanitation facilities, and drinking water systems. While such inundation can aid groundwater recharge, particularly in unconfined shallow aquifers, it simultaneously raises concerns of contamination. Limited sanitation infrastructure and submerged on-site systems contribute to the infiltration of pathogens, heightening the risk of waterborne diseases.

This typology is emblematic of chronic flood stress, marked not by sudden disaster but by enduring environmental strain, economic stagnation, and persistent vulnerability.

2.2. Typology 2 - Riverine Flooding Within Embankments

The second flood typology concerns riverine flooding within the embankments, typically on the riverside of a single river system. These areas are subject to lateral confinement, where floodwaters are restricted between embankments, resulting in rapid stage rise when upstream discharges exceed the design capacity of the channel. This typology represents a classic case of constrained flow in embanked river corridors, where even moderate increases in discharge can lead to significant inundation due to limited floodplain dispersion. The primary hazard in these zones is a sudden and steep hydraulic rise.

An overwhelming expanse of floodwater stretches between the Kosi's embankments in Supaul District, rendering the diarascape provisional and survival precarious

While upstream discharge monitoring and forecast models provide an opportunity for early preparedness and evacuation, how discharge levels translate into actual inundation at the habitation level is difficult to visualize for communities residing within embankments. Therefore, residents are often compelled to make rapid decisions, whether to relocate movable assets, seek vertical evacuation within their houses, or move toward relatively safer locations. Floodwaters in this typology can attain considerable height, often exceeding the plinth level of masonry houses, leading to the submergence of the structures. The potential for structural damage is considerable, especially in settlements located at lower elevations within the embanked zone. Despite their seasonal and recurring nature, these floods impose considerable hardship on affected populations. Both temporary and, in some cases, permanent displacement are common, with families often forced to take shelter along elevated linear features such as roads and embankments.

While water levels eventually recede, the duration of inundation may extend over several days or weeks, causing extended disruption to livelihoods. Agricultural lands within these embanked riverine belts face recurrent damage. Standing crops are often lost to sudden inundation, and sowing cycles are disrupted. Moreover, livestock and stored agricultural inputs are at constant risk during peak flows.

In such contexts, the combination of limited response time and prolonged exposure adds to the cumulative vulnerability of residents. Water quality issues further compound the situation. Although shallow aquifers may undergo natural recharge due to sustained flood presence, they remain susceptible to contamination from surface pollutants, particularly where sanitation infrastructure is poor or submerged. The absence of protected drinking water sources during flood periods increases dependency on unsafe water, raising the risk of disease outbreaks.

This typology highlights acute flood exposure in confined river corridors, characterized by rapid onset, limited preparation time, and severe infrastructural and socio-economic impacts within embankments.

Steep, freshly eroded riverbanks along the Bagmati reveal the combined forces of riverine flooding and erosion within the embankments, steadily reshaping land and livelihoods

2.3. Typology 3 - Riverside Riverine Flooding Within Embankments Combined with Erosion

The third flood typology describes the concurrent occurrence of embanked riverine flooding and river erosion. Such vulnerable zones are exposed to dual hazards, the inundation associated with seasonal or peak discharges and the lateral scouring of riverbanks. While the magnitude and timing of flood peaks can generally be forecast through upstream gauge data, the onset and severity of river erosion processes remain less predictable. River erosion can initiate without warning, during both high- and low-flow events. Erosion often results in the direct loss of valuable riparian land, including agricultural land, homesteads, and public infrastructure.

For households located in these vulnerable zones, displacement becomes a cyclical phenomenon. Entire settlements are forced to shift seasonally or even permanently, without any formal support through official resettlement mechanism. The lack of secure tenure, long-term relocation plan, and implementation strategy compounds social and economic vulnerability. As erosion gradually encroaches upon settlement margins, families are pushed into increasingly marginal spaces, with each year intensifying the risk of permanent displacement.

This typology represents a high-risk scenario where hydrodynamic forces act not only vertically through inundation but also laterally through bank erosion.

2.4. Typology 4 - Riverine Flooding with Incremental Erosion in Unembanked Rivers

This flood typology is observed in areas adjacent to rivers that are not confined by embankments, allowing the channel to migrate laterally across its floodplain over time. In such settings, riverine flooding occurs seasonally as a natural hydrological process. While the timing and extent of inundation are generally predictable based on discharge and upstream rainfall events, the associated hazard of bank erosion is persistent and often less predictable in terms of

location and severity. In unembanked rivers, the absence of physical containment permits the river to follow its natural fluvial dynamics.

High flows, particularly during the monsoon or flood season, generate shear forces that exceed the resisting capacity of unconsolidated banks, leading to toe scour and progressive mass failure. This process of lateral erosion occurs incrementally and as a sudden breach as well, manifesting in the steady loss of land along the outer banks of meander bends or near high-energy zones within the channel. The long-term impact of this typology is a cumulative reduction in land availability, where agricultural fields, human settlements, and other land-based assets are eroded. Social and economic vulnerability is heightened in this setting due to repeated displacement, the lack of secure boundaries, and the erosion of livelihood systems that depend on stable land access.

This typology is characterised by its chronic nature. Flooding occurs seasonally and predictably, but its impacts are magnified by the continuous attrition of riverbanks.

2.5. Typology 5 - Breach-Induced Riverine Flooding in the Countryside

This typology represents a high-intensity flood scenario that arises following the structural failure of an embankment. Once a breach occurs, due to toe erosion, overtopping, or structural fatigue, the stored hydraulic head within the embanked river channel is rapidly released into the adjacent countryside. This results in the sudden transformation of a confined river flow into an uncontrolled overland surge with high kinetic energy and destructive potential. Given the localised nature of the breach and the variability of flow paths through the surrounding terrain, the onset of flooding becomes extremely rapid and largely unpredictable in spatial terms. The local population has very limited response time, often just minutes to a couple of hours, which severely restricts their ability to evacuate, protect assets, or implement temporary safeguards.

Enduring scars of riverine flooding following the breach of Bagmati's embankment in Tilak Tajpur Panchayat's countryside, Sitamarhi District

The initial surge is typically characterised by high flow velocities and steep hydraulic gradients, which generate substantial sediment transport capacity. As the floodwater spreads across agricultural fields and rural settlements, it causes damage

Flash floods confined between embankments scour the banks and bury the riverside with sediment in Ramnagar Panchayat, Madhubani District

to standing crops and infrastructure, while simultaneously depositing coarse and fine sediments. These silt and sand layers can smother soil surfaces, disrupt standing crops, and necessitate post-event land reclamation involving de-silting and soil restoration measures.

This flood typology is marked by rapid onset, strong flow energy, and significant geomorphic disturbance, affecting agricultural activities, rural infrastructure, and access to basic services.

2.6. Typology 6 - Flash Flooding Between Embankments of the Same River (Riverside) with Erosion and Sedimentation

This typology refers to flash floods within the river's embanked corridor, specifically between twin embankments. They are usually triggered by intense, short-duration rainfall or simultaneous peak flows from upstream catchments. The embanked channel restricts lateral water spread. As a result, floodwaters rise sharply, often within minutes to a few hours. The water moves rapidly downstream and exerts heavy pressure on the embankments. The narrow floodplain leaves little scope for dispersal. Warning windows are usually less than three hours. This makes evacuation and protective measures difficult, especially at night or during concurrent rainfall.

In addition to the immediate hydrological hazards, this typology has contributed to significant long-term transformation of land use and habitation patterns within the embanked river corridor. Historically settled or cultivated areas between embankments have been progressively altered due to recurrent flash floods, leading to either their functional abandonment or conversion into high-risk zones. Multiple flash flood events within a single monsoon season, or within the same calendar year, exert cumulative pressure on the land system.

Agricultural plots suffer repeated topsoil and bank stripping due to erosion, crop damage, and sediment deposition, degrading their fertility and productivity. In areas with limited drainage or natural gradient, residual floodwaters may stagnate between events, exacerbating land degradation and limiting re-use even after floodwaters recede.

This typology underlines the limitations of relying solely on embankment confinement in catchments with flash flood characteristics.

Flash flooding along the unembanked Mechi River inundates Dallegaon Panchayat, Kishanganj District

2.7. Typology 7: Flash Flooding in Unconfined Catchments Adjacent to Unembanked Rivers

This flood typology occurs in catchments along foothill rivers, ephemeral streams, and seasonal rivulets, typically found in transitional zones between mountainous terrain and alluvial plains. These unembanked systems allow rapid downstream movement of floodwaters triggered by heavy upstream rainfall, regardless of the season. The hydrological response is very swift, with peak flows forming and reaching downstream locations within hours.

Flash floods in these unconfined systems are marked by high-velocity flows, and elevated sediment loads. Unit discharges are often sufficient to strip topsoil, transport coarse debris, and destruction of private and public infrastructure etc. Village access routes are commonly severed during these events.

In this typology, floodwaters typically do not stagnate unless obstructed by structural barriers or other impediments. Instead, they drain rapidly downstream once the flood peak subsides. This transient inundation poses administrative challenges, as current flood classification guidelines by the GoB recognise a habitation as flood-affected only if standing water remains in the household courtyard for a continuous period of 48 hours.

This typology causes severe disruption, property loss, prolonged inaccessibility to basic services, and agricultural damage but often falls outside the criteria for formal flood declaration and compensation. Such gaps lead to underreporting of damage and exclude affected communities from relief and recovery efforts. Additionally, repeated flash flood events within a single monsoon season or calendar year can have cumulative impacts.

2.8. Typology 8: Flooding and Waterlogging Between Embankments of Two River Systems

This typology represents a hydrologically complex and high-risk flood condition that occurs in the interfluvial zones situated between the embankments of two separate river systems. These areas are typically low-lying and hydraulically enclosed, and are thus subject to a combination of flood drivers including, intense rainfall-induced surface runoff, and chronic drainage congestion. The defining characteristic of this typology is the convergence of water into a physically confined space with limited or impeded drainage capacity.

Flooding and waterlogging in this typology arise from multiple factors. The interfluvial area is typically marked by the presence of small, often unnamed rivers, local drainage channels, seasonal streams, and old distributaries, that carry upstream and local flows. These channels frequently cause localized inundation and stagnant water due to the under-functioning of human-made sluice gates. In addition, rising river levels on both sides of the embankments render sluice gates ineffective. This results in prolonged waterlogging and upstream surface inundation within the confined corridor. Such complex conditions are rarely integrated into formal flood management narratives, yet they play a critical role in shaping local inundation dynamics.

Whether slow-onset or sudden, flooding in this typology leads to prolonged stagnation of water, which has cascading impacts on infrastructure, public health, and livelihoods. Submerged roads lose load-bearing capacity, houses, particularly those constructed with non-durable materials, suffer structural damage, and public facilities are rendered inoperative. Agricultural activity is repeatedly disrupted, not only due to waterlogging but also due to siltation of cropland.

This typology presents unique classification challenges, as it illustrates a hybrid flood regime, comprising of flooding and waterlogging under constrained drainage conditions.

MPA's typological framework provides a critical lens to understand the varied impacts of floods across Bihar. By highlighting the importance of local flood behaviour, it guides the design of preparedness, response, recovery, and resilience systems. Embedding these typologies within flood governance enables responses that are not only more effective but also more equitable, as they reflect the lived realities of affected communities. Grounding flood assessment in such typologies sharpens the accuracy of exposure analysis and strengthens equity-oriented planning and resource allocation across Bihar's diverse flood-prone geographies.

3. Typological Overview of Flood Across the Twenty-One Study Panchayats

This section summarises the flooding characteristics across the 21 study Panchayats, including their causes, onset, duration and associated typologies.

3.1. Pashchim Champaran - Dakshini Patjirwa and Suryapur Panchayats, Bairiya Block

The flooding in the two Panchayats was triggered by a breach in the Pakhnaha-Dumariya (PD) Ring Bandh, which occurred on September 29, 2024, at 2300 hours (hrs). The nature of flooding observed here represents an emergent typology. The affected habitations were located in the countryside, positioned between two structural embankments, namely, the PD Ring Bandh and the Champaran Bandh, of the same river system, and not situated directly within its main fluvial corridor. However, the surveyed households considered their location as inside the embankment. This configuration led to a unique pattern of inundation, as floodwaters entered and stagnated within the intra-embankment zone. In these two Panchayats, inundation lasted for 15 to 20 days, with water levels varying across different Wards, highlighting the influence of micro-topographical variations and local drainage differentials within the flood-affected area (PRI representatives, Dakshini Patjirwa and Suryapur Panchayats, personal communication, 2025).

3.2. Sitamarhi - Tilak Tajpur and Mahesha Farakpur Panchayats, Runisaidpur Block

The flood typology in Tilak Tajpur and Mahesha Farakpur Panchayats, was a breach-induced riverine flooding in the countryside. The flooding was precipitated by a breach on the right bank of the Bagmati River on September 29, 2024 at approximately 2130 hrs along Tilak Tajpur Panchayat. The breach resulted in the inundation of countryside settlements within the Panchayat. Inundation in these areas persisted for approximately 15 days, leading to sustained disruption of habitation and services. Following the breach, floodwaters advanced southward, subsequently inundating the entire Mahesha Farakpur Panchayat by 0400 hrs on September 30, 2024. The duration of inundation in the Panchayat

was recorded at 10 days, affecting the majority of administrative Wards. The variations in local elevation and drainage capacity contributed to differential floodwater levels and recession times (PRI representatives, Tilak Tajpur and Mahesha Farakpur Panchayats, personal communication, 2025).

3.3. Sitamarhi - Chandauli Panchayat, Belsand Block

The flood typology observed in Chandauli Panchayat was a riverine flood in the countryside, induced by a breach in the Suraksha Bandh (Guide Bandh) along the Manushyamara River. The breach occurred at Dumariya Ghat at approximately 2000 hrs on September 29, 2024, resulting in the immediate onset of inundation across the Panchayat. Floodwaters remained for 7 to 10 days, with their extent and depth shaped by the area's local terrain features and drainage patterns (PRI representatives, Chandauli Panchayat, personal communication, 2025).

3.4. Sitamarhi - Kansar Panchayat, Belsand Block

In the Panchayat, inundation was triggered by a breach on the left embankment of the Bagmati River at Madhkol (Jaffarpur Panchayat), and the inundation started at approximately 1730 hrs on September 29, 2024. The resulting floodwaters remained in the Panchayat for about seven days. While the flood typology qualified as a breach-induced riverine flooding in the countryside, the geographical positioning of Kansar, surrounded by the Bagmati embankment and the Ring Bandh along the Manushyamara River, added complexity to its classification. (PRI representatives, Kansar Panchayat, personal communication, 2025).

3.5. Sitamarhi - Jaffarpur Panchayat, Belsand Block

The flood event in Jaffarpur Panchayat was classified as a riverine flood in the countryside, resulting from a breach in the left embankment of the Bagmati River. The breach occurred opposite Ward 3 of Madhkol revenue village at approximately 1100 hrs on September 29, 2024, triggering immediate inundation across the Panchayat. Floodwaters persisted for approximately 15 days, causing prolonged disruption to habitation and local services. The extent and depth of inundation shaped by the local topography and drainage conditions (PRI representatives, Jaffarpur Panchayat, personal communication, 2025).

3.6. Sitamarhi - Sauli Rupauli Panchayat, Belsand Block

The flood typology in Sauli Rupauli Panchayat was identified as a riverine flood in the countryside, primarily triggered by a breach in the left embankment of the Bagmati River. The breach occurred at Madhkol in Jaffarpur Panchayat, near the boundary between Jaffarpur and Sauli Rupauli Panchayats. Inundation persisted for nearly 20 days, causing widespread disruption to daily life, extensive damage to residential areas, and significant impact on local infrastructure. The severity of the flooding was amplified by the Panchayat's proximity to the breach site and the limited capacity of its drainage system (PRI representatives, Sauli Rupauli Panchayat, personal communication, 2025).

3.7. Darbhanga - Narkatiya Bhandara, Kiratpur Block

On September 30, 2024, at approximately 0040 hrs, a breach occurred along the western embankment of the Kosi River at Bhubhol in Narkatiya Bhandara Panchayat. The breach led to rapid inundation of multiple Wards situated in the interfluvial zone between the embanked channels of the Kosi and Kamla Balan rivers. The inundation persisted for 25 days. All Wards located within this embanked corridor, were significantly affected. This flood event is best classified as a breach-induced flood, resulting from inter-basin hydrological interactions and further intensified by severe drainage congestion. The Panchayat's geographical position between two embanked river systems played a critical role in amplifying both the extent and complexity of the flooding (PRI representatives, Narkatiya Bhandara Panchayat, personal communication, 2025).

3.8. Darbhanga - Kubol Dhanga Panchayat, Kiratpur Block

Kubol Dhanga lies between the embankments of Kamla Balan and Kosi Rivers. The breach that occurred in Narkatiya Bhandara Panchayat, resulted in an influx of floodwaters that led to complete submergence of Kubol Dhanga Panchayat by 0130 hrs the same day. Inundation persisted for a duration of 20 days. This flood event is best characterised as a breach-induced flood, driven by inter-basin hydrological dynamics and compounded by significant drainage congestion. The Panchayat's low-lying topography and close proximity to the breach site significantly exacerbated the flooding impact (PRI representatives, Kubol Dhanga Panchayat, personal communication, 2025).

3.9. Darbhanga -Jamalpur Panchayat, Kiratpur Block

Jamalpur Panchayat is bounded by the embankments of Kamla Balan and Kosi Rivers. This Panchayat too was impacted by the breach at Narkatiya Bhandara Panchayat. Floodwaters rapidly entered Jamalpur Panchayat, leading to complete inundation by approximately 0200 hrs the same day. The flooding persisted for nearly a week, significantly impacting daily life and mobility. Given the influence of drainage congestion, the flood typology is best categorised as a breach-induced flood, shaped by inter-basin hydrological dynamics and restricted outflows (PRI representatives, Jamalpur Panchayat, personal communication, 2025).

3.10. Darbhanga - Khaisa Jamalpur Panchayat, Kiratpur Block

Khaisa Jamalpur is situated between the embankments of Kamla Balan and the Kosi Rivers. The cause of flooding in this Panchayat, was the same as Narkatiya Bhandara, Kubol Dhanga, and Jamalpur Panchayats. The breach resulted in the complete inundation of the Panchayat by 0400 hrs on September 30, 2024. The floodwaters persisted for approximately 15 days. This flood typology is best classified as a breach-induced flood, characterized by inter-basin influence and acute drainage congestion, attributable to the Panchayat's location within the confined corridors of two embanked river systems (PRI representatives, Khaisa Jamalpur Panchayat, personal communication, 2025).

3.11. Madhubani - Ramnagar Panchayat, Phulparas Block

The hydrological complexity of the Panchayat arises from the presence of three river systems, the main embanked channel of the Bhutahi Balan River, which flows along the western boundary of the Panchayat, its old course, located outside the eastern embankment, And Bihul River, which traverses along the eastern boundary of the Panchayat. These rivers collectively contribute to compound flooding, affecting both embanked and non-embanked sections of the Panchayat. The uncoordinated flows from these three channels, especially under intense precipitation or upstream discharge conditions, increase the susceptibility to flash floods. This flood typology is best classified as flash flooding within the embankments of same river with erosion and sedimentation.

The Panchayat faced two consecutive flash flood events linked to the embanked stretch of the Bhutahi Balan River. The first occurred on October 1, 2024, around 1200 hrs, and the second followed on October 2, 2024, at approximately 0800 hrs. Together, these surges led to the swift inundation of agricultural fields and low-lying settlements located within the embankments, where floodwaters remained trapped for nearly two days. Simultaneously, between September 29 and October 2, the other two channels of the river caused flooding outside the eastern embankment of the Bhutahi Balan, further intensifying the situation.

3.12. Saharsa - Manovar Panchayat Ghonghepur Panchayats, Mahishi Block

The breach at Narkatiya Bhandara Panchayat, led to the inundation of low-lying areas positioned between the embankments of the Kosi and Kamla Balan rivers in the District. Both Manovar and Ghonghepur Panchayats were inundated on the same day by 1000 hrs and 1400 hrs respectively. The flood is most accurately typologized as a breach-induced flood,

driven by inter-basin hydrological dynamics and aggravated by poor drainage conditions. The Panchayats' location between two major embanked river systems was a key contributing factor in escalating both the intensity and spatial spread of the inundation (PRI representatives, Manovar and Ghonghepur Panchayats, personal communication, 2025).

3.13. Supaul - Dholi Panchayat, Saraigarh Bhaptiyahi Block

The flood typology in Dholi is characterised as a riverside riverine flood, combined with active river erosion. The flood was triggered by intense precipitation across the upper Kosi catchment, which recorded its highest Average Aerial Precipitation on September 27, 2024. Concurrently, 6.61 lakh cusecs of water, the highest recorded discharge since 1968, was released from the Birpur Barrage on the Kosi River. This substantial release caused a rapid increase in water levels within the embankments downstream, intensifying flood pressures in the riverside areas of Dholi Panchayat. The floodwaters entered the Panchayat at approximately 2000 hrs and persisted for around 18 hours. The water column during peak inundation was estimated at approximately 5 feet (ft), affecting both habitations and agricultural land along the riverside. Several Wards experienced severe erosion and subsequent displacement, even within the protected embankment zone (PRI representatives, Dholi Panchayat, personal communication, 2025).

3.14. Kishanganj - Dhantola Panchayat, Dighalbank Block

The severe flooding in Dhantola Panchayat on September 27, 2024 caused by the overflow of the Budhi Kankai River (Garban Danga) can be typologized as a flash flood in an unembanked river accompanied by river erosion. Floodwaters entered the Panchayat in the early hours, with full-scale inundation reported by approximately 0700 hrs, that persisted for two days. This flooding coincided with extreme rainfall recorded across the Kishanganj District. The intensity and concentration of this rainfall, along with runoff from upstream areas, led to a sudden surge in river discharge, overwhelming local drainage systems. The flooding underscores Dhantola's vulnerability to high-intensity, short-duration rainfall events (PRI representatives, Dhantola Panchayat, personal communication, 2025).

3.15. Kishanganj - Lohagada Panchayat, Dighalbank Block

On September 27, 2024, the Kankai River triggered a flash flood in Lohagada Panchayat, resulting in complete inundation by approximately 2000 hrs. The floodwaters remained stationary for 4 to 5 days, causing extensive disruption to local habitation, agriculture, and infrastructure. The flood typology observed in this case was a flash flood in an unembanked river accompanied by river erosion. The flood event was driven by extreme rainfall across the region. This intense, short-duration rainfall contributed to sudden runoff, overwhelming the river systems. In addition to the Kankai River, the Panchayat is also traversed by two monsoon-fed tributaries, Sikandra River and Kisni River. These rivers flow only during the monsoon season, and are highly responsive to intense upstream rainfall events. During periods of heavy precipitation, both rivers experience rapid swelling and overbank flow, which, although localized, significantly amplifies flood volumes and contributes to flash flooding. Together, these three rivers form a compound flood hazard system in Lohagada Panchayat (PRI representatives, Lohagada Panchayat, personal communication, 2025).

3.16. Kishanganj - Patttharghatti Panchayat - Dighalbank Block

On September 27, 2024, the Panchayat experienced a severe flash flood event that resulted in its complete inundation by around 2100 hrs. The floodwaters remained for approximately two days, significantly impacting the habitation. The flood typology in Pattharghatti is characterised as flash flooding accompanied by active river erosion. The flooding was caused by a combination of river systems, including the old and new channels of the Kankai River and the Kisni River. These rivers, responded rapidly to hydrological stress during the event. with high levels of inundation and areas of active erosion. The primary drivers of the flood were high discharge from upstream catchments, including transboundary inflows from Nepal, compounded by intense rainfall within the District on the same day. The region's

topographical vulnerability aggravated the impact, contributing to the severity and persistence of flooding in the area (PRI representatives, Pattharghhati Panchayat, personal communication, 2025).

3.17. Kishanganj - Barchoundi Panchayat - Thakurganj Block

On September 28, 2024, Barchoundi Panchayat experienced a combined riverine and flash flood event resulting from the concurrent overflow of the Mahananda, Mechi, and Jamuna Rivers. The Mahananda River, flows along the eastern part of the Panchayat, Mechi River flows through the middle of the Panchayat, and the Jamuna River, along the western boundary. The Panchayat was fully inundated by approximately 1900 hrs, and floodwaters persisted for a duration of three days, impacting habitation and agricultural land. The flood typology observed in the Panchayat was compound and hybrid flooding accompanied by active river erosion.

These rivers responded rapidly to elevated discharge volumes originating from upstream catchments. The situation was further aggravated by intense rainfall recorded across Kishanganj District on the same day, contributing to a sudden surge in river levels and widespread inundation. The convergence of multiple river systems, combined with high-intensity rainfall and unregulated river courses, heightened the flood vulnerability of Barchoundi Panchayat during this event (PRI representatives, Barchoundi Panchayat, personal communication, 2025).

3.18. Kishanganj - Dallegaon Panchayat - Thakurganj Block

On September 28, 2024, Dallegoan Panchayat in Thakurganj Block experienced a major riverine flood event triggered by the Mechi River, which flows directly through the Panchayat and effectively divides it into two halves. By approximately 0800 hrs, the entire Panchayat was inundated, and floodwaters remained for a duration of two days. The flood typology was characterised as compound and hybrid flooding accompanied by active riverbank erosion. Flooding caused considerable disruption to habitation, infrastructure, and agricultural land. The inundation occurred simultaneously from multiple directions. On the western side, floodwaters from the Mechi River entered the Panchayat, eventually merging with the Dono River, which flows along the western periphery of the Panchayat. The combined flow of the Mechi and Dono Rivers contributed to the inundation of habitations on the western side. Concurrently, water from the eastern side of the Mechi River breached the India connecting road to Nepal, allowing floodwaters to spread further into adjoining habitations behind the Sahastra Seema Bal (SSB) camp, to spread to other habitations in the eastern side of the Panchayat. This complex and multi-directional pattern of inundation highlights the dynamic hydrological behaviour of the Mechi River system during high-intensity rainfall and transboundary discharge events (PRI representatives, Dallegoan Panchayat, personal communication, 2025).

4. Concluding Reflections on Flood Typologies of 21 Panchayats

The typological mapping of flood events across twenty-one Panchayats in Bihar as part of the 2024 household-level flood loss assessment reaffirms the complexity of the state's flood landscape. It demonstrates that floods in Bihar manifest not through a single dominant mechanism, but across a diverse continuum of hydrological behaviours shaped by river systems, embankment infrastructure, local topography, and rainfall intensity (both upstream and at the local level). The classification of these events, aligned with the flood typology framework developed by MPA, offers crucial insights into how location-specific factors produce varied flood risks, impacts, and response challenges. During the assessment of the 2024 Phase 2 floods, four new flood typologies were identified in Pashchim Champaran, Darbhanga, Saharsa, and Kishanganj, bringing the total documented by MPA since 2012 to twelve.

Table 1 - Details of typologies of floods in North Bihar

Index	Typologies of floods	Who are exposed	Character of the hazards	Study Panchayats affected in 2024
1	Waterlogging outside the embankment (countryside)	Adjacent to the embankments (countryside)	Hazards predictable, sufficient time to seek refuge	-
2	Riverine flooding within embankments	Between embankments of same river (riverside)	Hazards predictable, insufficient time to seek refuge	-
3	Riverside riverine flooding within embankments combined with erosion	Adjacent to the embankments (riverside)	Hazards unpredictable, with limited possibilities of safeguards	Dholi
4	Riverine flooding with incremental erosion in unembanked rivers	Adjacent to river (no embankment)	Floods predictable, erosion frequent, with limited possibilities of safeguards	-
5	Breach-induced riverine flooding in the countryside	Countryside (post the breach of the embankment)	Floods unpredictable, with extremely limited time for safeguards	Tilak Tajpur, Mahesha Farakpur, Chandauli, Jaffarpur, Sauli Rupauli, and Kansar
6	Flash flooding between embankments of the same river (riverside) with erosion and sedimentation	Between embankments of same river (riverside)	Foreseeable, with short time frame for safeguards	Ramnagar
7	Flash flooding in unconfined catchments adjacent to unembanked rivers	Adjacent to river (no embankment)	Foreseeable, with short time frame for safeguards	-
8	Flooding and waterlogging between embankments of two different rivers	Between embankments of two rivers	Foreseeable, moderate time frame for safeguards	-
9	Breach-induced riverine flooding in the countryside between the embankments of two rivers	Between embankments of two rivers	Floods unpredictable, with extremely limited time for safeguards	Narkatiya Bhandara, Kubol Dhanga, Jamalpur, Khaisa Jamalpur, Manovar and Ghonghepur

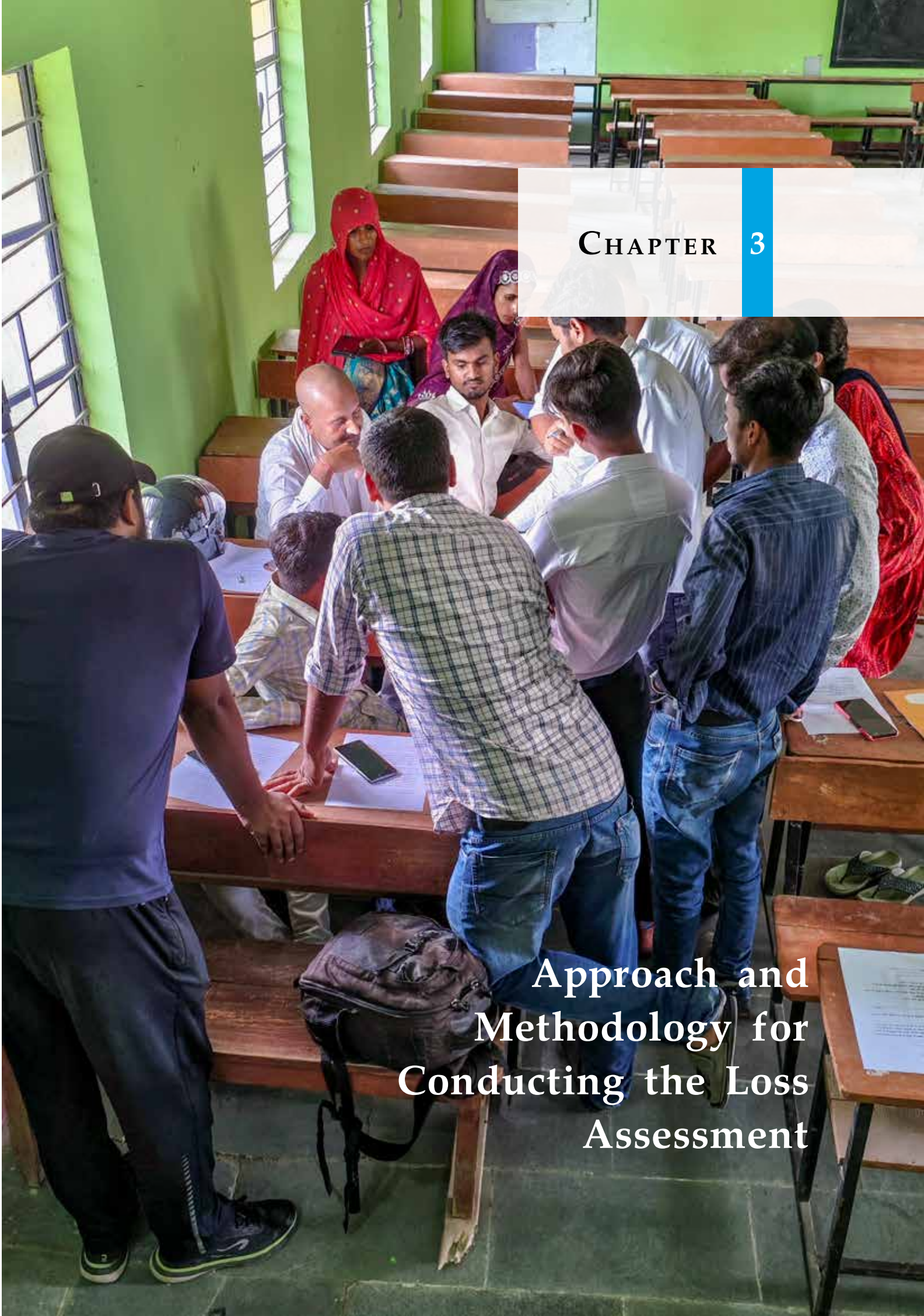
Index	Typologies of floods	Who are exposed	Character of the hazards	Study Panchayats affected in 2024
10	Breach-induced flooding and waterlogging between additional embankments in the countryside of same river	Between additional embankments of same river in the countryside	Floods unpredictable, with extremely limited time for safeguards	Dakshini Patjirwa and Suryapur
11	Compound and hybrid flooding	Adjacent to unembanked rivers resulting in combined riverine and flash flooding	Foreseeable, with short time frame for safeguards	Barchoundi and Dallegoan
12	Flash flooding in unconfined catchments adjacent to unembanked rivers with erosion	Adjacent to unembanked rivers resulting in flash flooding with erosion	Foreseeable, with short time frame for safeguards	Dhantola, Lohagada and Pattharghatti

Embankments do not eliminate flood risk, they often shift or redistribute it. This was evident in several 2024 flood events where breach-induced flooding, and drainage congestion were recurring consequences, particularly in Districts such as Pashchim Champaran, Sitamarhi, Darbhanga, and Saharsa. In these regions, embankments not only failed to contain floodwaters but, in many cases, amplified the hazard by preventing natural drainage or diverting water into previously unaffected zones.

Flash floods in unregulated river systems, especially in Kishanganj is becoming increasingly frequent and severe. These floods, driven by intense rainfall and sudden catchment discharge, often provide little to no lead time for local populations to respond. Their erosive power and velocity also pose a heightened risk to habitation, agriculture, and infrastructure.

Composite and compound floods, characterized by interactions between rivers and unacknowledged natural channels, present some of the most complex flood scenarios. These events demand more advanced hydrological engagement and granular risk mapping to understand how multiple systems interact during floods. They also highlight the critical need to account for smaller watercourses like the small trans-boundary rivers across the India-Nepal border at Kishanganj. Roles of such rivers are often overlooked in formal river basin discourses despite being vital to understanding the local inundation patterns.

The typology-based framework developed by MPA and applied across these study Panchayats offers a robust, field-grounded method for interpreting Bihar's diverse flood dynamics. By shifting the lens from generic hazard categories to detailed, location-specific flood typologies, the framework equips planners, engineers, and communities to move beyond one-size-fits-all strategies. It enables the design of more responsive, adaptive, and locally relevant flood management interventions that reflect the varied hydrological, infrastructural, and social realities of flood-prone regions across Bihar. In sum, the 2024 flood typologies illustrate that Bihar's flood risk landscape is dynamic, multi-sourced, and increasingly shaped by infrastructure interactions. A granular, typology-informed perspective is essential for building long-term flood resilience across the region.



CHAPTER 3

Approach and Methodology for Conducting the Loss Assessment

1. Approach and Framework

The methodology for this assessment was anchored in a mixed-methods approach, combining both quantitative and qualitative approaches to ensure depth, breadth, and contextual accuracy. The quantitative component focused on household-level data collection using structured questionnaires, which enabled a systematic analysis of losses. Complementing this, the qualitative component sought to surface the situated knowledge, lived experiences, perceptions, and coping strategies of affected populations through, reconnaissance visits (RVs), participatory flood mapping (PFMs), focus group discussions (FGDs), and key informant interviews (KIIs). This framework was instrumental in capturing the multi-dimensional household-level impacts of the 2024 Phase 2 floods across 21 Panchayats in seven study Districts of North Bihar. Alongside, a Geographic Information System (GIS)-based satellite flood mapping tool was employed across Bihar to assess the September–October 2024 flooding.

The assessment was informed by a socio-hydrological lens, recognising that flood impacts are not merely a result of hydrometeorological events, but are shaped by settlement patterns, administrative responses, embankment configurations, and social vulnerabilities. This framework allowed the study to go beyond documenting damages and also focus on differential exposure, pre-existing vulnerabilities, and recovery capacities across typologically distinct flood geographies.

2. Field-based Processes Followed

A sequence of processes was conceptualized and executed to operationalize this integrated methodological design,

2.1. Selection of the Study Area

- Districts - A preliminary desk review of news reports, government and civil society publications, and visual media provided an overview of the geographical spread and severity of the 2024 flood events. Based on this, six Districts were shortlisted - Pashchim Champaran, Sitamarhi, Darbhanga, Madhubani, Saharsa, and Kishanganj. Following

Engaging with Panchayat representatives to validate flood impacts, capturing local knowledge and lived experiences at the grassroots level

consultations with field-level experts and CSOs, Supaul District was also included. The final selection of seven Districts reflected a balance between widely reported and relatively under-reported flood-affected areas, with all selected Districts experiencing significant impact during the second phase of flooding

- Blocks and Panchayats - Within the seven Districts, Blocks were chosen based on the reported severity of floods, diversity of flood typologies, and feasibility of field operations. Elected Ward members were contacted via the Panchayat Nischay Soft portal and they further facilitated consultations with other PRI representatives (Mukhiya and Sarpanch). Thus, discussions with all contacted PRI representatives helped to validate flood impacts at the Panchayat level. Their inputs, along with RVs and CSO consultations, guided the selection of 21 Panchayats across nine Blocks. The selection was validated by the use of GIS tools, which helped visualize and verify flooding in the study Panchayats
- Wards - Within each selected Panchayat, the most affected Wards based on inundation levels, reported damages, and overall flood-induced losses were identified by the respective PRI representatives. This is how the 134 Wards were selected for the assessment
- Households - The survey was rolled out in the most affected Wards of each selected Panchayat. To maintain consistency in sample size across Wards, the number of households to be surveyed was determined in proportion to the total target of households to be assessed and the total number of Wards identified in 21 Panchayats. As a result, the approximate sample size per Ward was established as 16. For the execution of the survey within each Ward, households were then selected through systematic random sampling. Ward-level population data was collected during RVs, and a sampling interval was calculated by dividing the total household count by the required sample size. After randomly identifying the first household, every subsequent household was chosen based on this interval, ensuring unbiased representation. A total of 2,290 household surveys were conducted

2.2. Design and Deployment of Survey

- The household survey was designed as a structured questionnaire to capture multi-dimensional data on flood-induced losses. It covered key domains including - Demographic and socio-economic profile of affected households; Housing and shelter conditions; Livelihood disruption and economic losses; Access to basic services; And coping strategies and recovery pathways. These indicators enabled a socially disaggregated and spatially grounded assessment of loss and vulnerability, ensuring that variations by socio-economic status, geography, and flood typology were reflected in the data
- For digital administration, mWater was selected as the data collection platform. Its offline functionality, user-friendly interface, and secure data protocols were particularly suited to field conditions. The use of digital data collection also enabled real-time monitoring, systematic validation, and secure storage of responses, ensuring the reliability of the dataset
- Data collection was undertaken by locally identified individuals from within or around the selected Panchayats. These enumerators were trained by the core assessment team through on-site capacity-building sessions at each location. Training focused on ethical protocols, survey methodology, and the technical use of mWater
- Following training, a pilot phase was conducted in Dakshini Patjirwa Panchayat of Bairiya Block in Pashchim Champaran. This field testing ensured that enumerators were comfortable with digital administration, while also helping the team refine specific sections of the survey tool. Feedback from enumerators and respondents was incorporated to improve the clarity, sequencing, and relevance of questions

Enumerators from Dakshini Patjirwa and Suryapur Panchayats in Pashchim Champaran District during a training session for the household-level flood loss survey

2.3. Engaging Community and Key Informants through Participatory Consultations

- PFMs and FGDs were conducted in 10 Panchayats, across all the seven Districts to capture the broader Panchayat-level implications and experiences of flooding, extending beyond what a household survey alone could reveal. The selected Panchayats represented a diversity of flood-prone landscapes and socio-economic conditions. This purposive selection allowed the study to capture the heterogeneity of flood typologies and response capacities, while remaining grounded in the shared lived experiences of communities affected by the 2024 Phase 2 floods in the selected Panchayats. The PFMs and FGDs were conducted with a mix of different demographic and occupational groups, including women, adolescents, small and marginal farmers, landless labourers, and PwDs. These groupings allowed for a more disaggregated understanding of vulnerabilities, coping mechanisms, and perceived gaps in access to basic services and administrative responses. The discussions focused on flood flow path, inundation patterns, experiences of displacement, damage to community infrastructure, disruption of services such as health, education, water and sanitation, and the status of community-level preparedness and risk-sharing systems. Together, the PFMs, FGDs and household surveys created a layered, multi-scalar view of flood impacts, enabling the assessment to better trace how different typologies of flooding affected not just households individually but communities collectively
- In addition to household surveys and FGDs, semi-structured KIIs were held with elected PRI representatives, District officials, and members of CSOs. These interviews explored institutional response mechanisms during and after the 2024 Phase 2 floods, highlighting administrative challenges, coordination issues, and constraints in delivering timely relief. They also provided insights into the effectiveness of existing mitigation infrastructure, limitations in early warning dissemination, and the role of decentralized governance in supporting recovery and resilience. By integrating these perspectives, the assessment was able to connect the impacts with the broader institutional and policy landscape, offering a more expansive understanding of flood response and long-term adaptation needs

2.4. Vulnerability Assessment Framework

- Based on the household-level 2024 flood loss assessment in North Bihar, a framework was developed to operationalize the multidimensional concept of vulnerability into a practical assessment tool. Grounded in empirical evidence from 2,290 household surveys, it integrates flood typologies, socio-demographics, housing characteristics, loss patterns, and institutional access. This evidence-based, multidimensional framework underpins recommendations for vulnerability-weighted relief and targeted resilience interventions.

Table 2 - Strengths of the framework

Strength category	Key feature and detail
Evidence-based and data-driven	Built on empirical data from a large-scale household survey
Comprehensive and multidimensional	Incorporates four distinct dimensions – exposure, sensitivity, adaptive capacity, and coping capacity, moving beyond single-metric assessments
Granular and specific	Breaks down each dimension into specific, measurable indicators (e.g., exposure is calculated from location, housing materials, and flood duration)
Clear and transparent scoring	Provides a replicable scoring method with explicit weights for each component, reducing subjectivity
Recognizes social inequity	Explicitly incorporates systemic factors like a social group indicator and a gender multiplier for female-headed households to address inequities

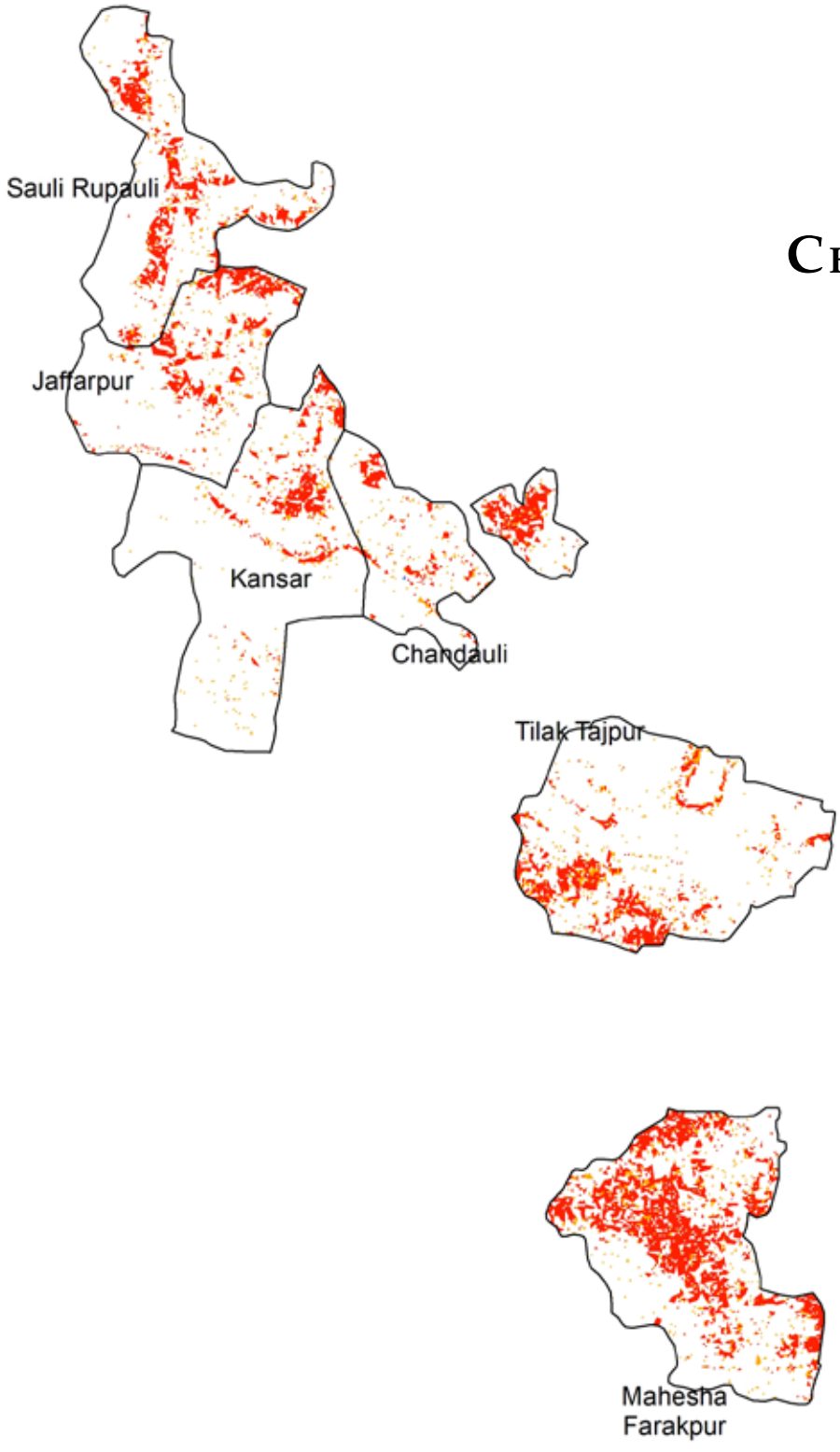
3. Limitations

While the study was anchored in a rigorous methodology and implemented by locally trained enumerators using digital tools, certain limitations arose during the execution of the fieldwork.

- In two locations, active river erosion displaced households and created multiple river channels that obstructed direct access. As a result, survey teams could not reach all affected sites, leading to partial gaps in spatial coverage for some erosion-prone Wards
- Many respondents were hesitant to share detailed information. This reluctance was rooted in limited prior exposure to structured surveys and trust deficit. Several respondents mentioned that no such assessment initiative had ever taken place in their area before, which made it difficult for them to relate the purpose of the survey to any forward-looking or meaningful outcomes. While employing local enumerators helped build confidence, in certain cases reluctance persisted, occasionally requiring changes in surveyed households
- Respondents' recall and reluctance to disclose earnings created challenges in capturing consistent household income data, particularly where multiple or informal income streams were involved. Despite detailed probing and cross-verification by the team, some inconsistencies persisted, often resulting in understated figures
- In some Wards, community leaders resisted random sampling, insisting that all households be surveyed, which was beyond the study's scope and caused delays in survey execution

- In one Panchayat, unrelated prior incidents created heightened mistrust, leading villagers to initially prohibit surveys. And only after sustained dialogue and assurances was cooperation secured
- In households where the head had migrated, collecting accurate data on income and family contributions, was difficult due to the absence of the primary decision-maker. With patient probing, however, many respondents were eventually able to provide required information
- Enumerators were trained to record responses without influence, ensuring answers reflected respondents' perspectives. However, occasional lapses, such as limited patience and not capturing responses verbatim, were observed, which the core assessment team addressed through continuous oversight

The integration of qualitative and quantitative methods, the inclusion of diverse stakeholder voices, and the triangulation of primary data with spatial and administrative records ensured the overall reliability and depth of the findings.



CHAPTER 4

Flood Mapping through Geographic Information System

1. Sentinel-1 Flood Mapping Implementation in Google Earth Engine

This chapter describes a satellite-based flood mapping system deployed across Bihar state to assess the September-October 2024 monsoon flooding. The analysis examined 19 Panchayats across six Districts - Pashchim Champaran, Sitamarhi, Darbhanga, Saharsa, Supaul, and Kishanganj, producing rapid, quantitative measurements of flooded area. This demonstrates a practical, cost-effective approach that decision-makers can deploy during disaster events without specialized expertise or significant financial investment.

2. Technical Methodology

Sentinel-1 radar enables uninterrupted flood monitoring during the monsoon, as its microwave signals penetrate cloud cover that renders optical satellites unusable. With a 12-day revisit cycle, far quicker than older 24-46-day systems, it captures active flooding before waters recede. Baselines were established using dry-season radar signatures from April-May 2024, calculating pixel-wise mean backscatter and natural variability to ensure only true anomalies indicate flooding. During flood events, each image was compared to this baseline, since water absorbs radar energy and lowers backscatter, significant negative deviations signalled inundation. Dual-polarization checks strengthened detection, both confirming high-confidence floods over submerged fields, roads, and settlements, while single-polarization flags indicated low-confidence areas such as waterlogged soil or receding edges needing verification. Integrating ascending and descending orbits provided full spatial coverage of peak inundation across 19 Panchayats in Bihar, and topographic masking using Shuttle Radar Topography Mission data removed false signals from steep terrain while preserving sensitivity to genuine lowland flooding. (Tripathy et al., 2022)

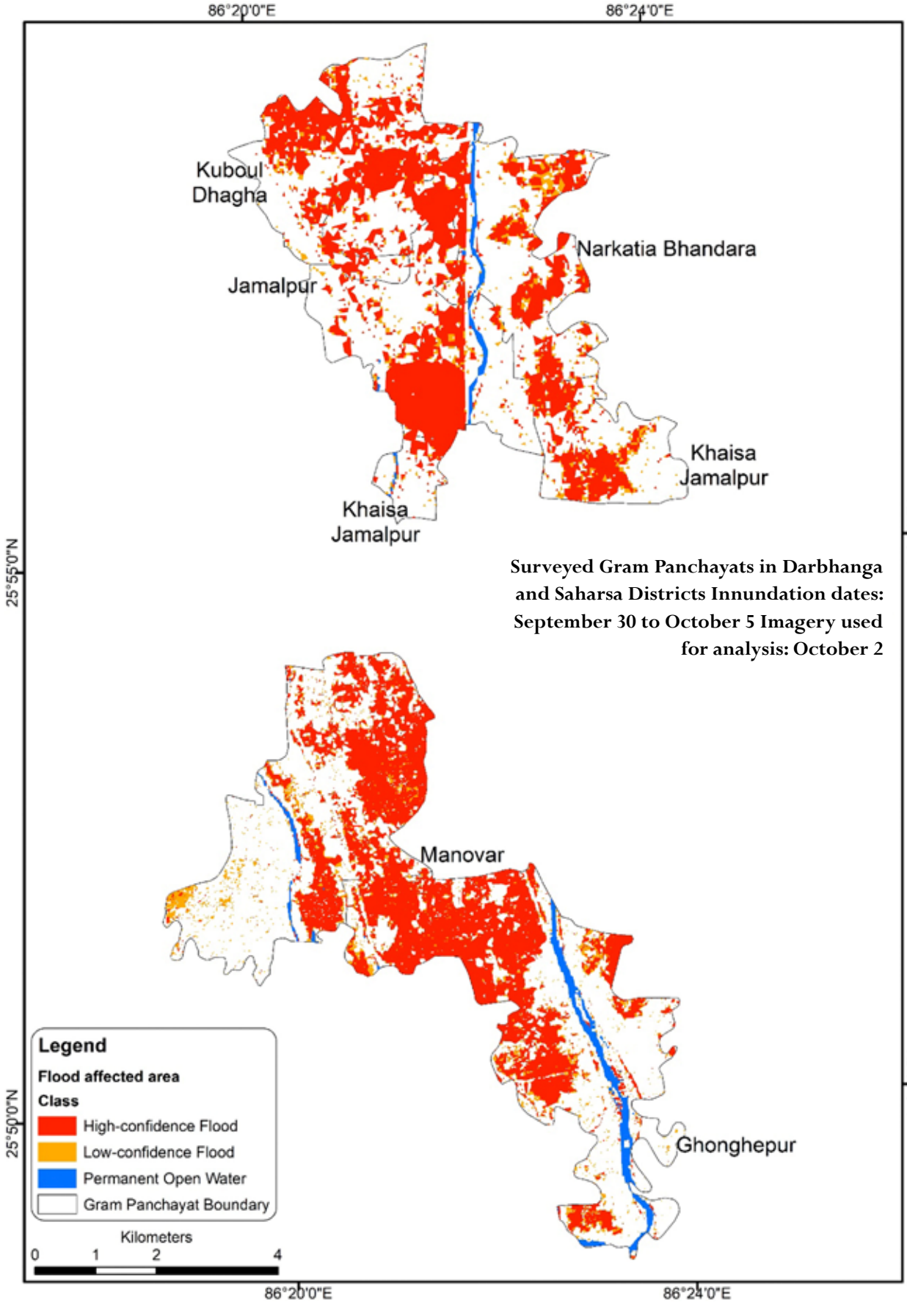
3. Data Processing and Results

Resulting flood maps used colour coding for high and low confidence pixels, enabling rapid visual assessment. Maps were verified through satellite imagery comparison, then exported as GIS shapefiles for area analysis and emergency management integration. This satellite approach delivers usable flood maps in 6-24 hours, and remains replicable globally. High-confidence zones guide immediate rescue and damage assessment; low-confidence areas identify extended recovery needs and monitoring requirements.

4. Results of Flood Mapping Analysis

Due to scope and spatial constraints, a single representative map is displayed. However, detailed inundation measurements for all 19 Panchayats are presented in Table 3, and the following text synthesizes key spatial and hydrological patterns. Map 2 presents the flood mapping results for the six Panchayats in Darbhanga and Saharsa Districts.

Map 3 - Flood mapping of Panchayats in Darbhanga and Saharsa Districts



5. Overview of Observed Patterns across nineteen Panchayats in six Districts

Across all 19 Panchayats, high-confidence flood areas ranged from 2% to 26%, while low-confidence areas ranged from 2% to 13%. The analysis revealed distinct spatial and hydrological patterns, though it is critical to recognize that observed variations are substantially influenced by satellite acquisition timing relative to flood peaks. Panchayats captured near peak inundation show higher high-confidence percentages, while those documented during recession phases show higher low-confidence percentages, independent of actual severity or terrain characteristics. With this caveat, several hydrological patterns emerge:

Table 3 - Summary of the results from the analysis

District	Panchayats	Inundation Period	Sentinel-1 Coverage	Panchayats per District	Status
Pashchim Champaran	Dakshini Patjirwa	September 30-October 5	-	1	Not analysed (boundary data unavailable)
Pashchim Champaran	Suryapur	September 30-October 5	October 2	1	Analysed
Sitamarhi	Tilak Tajpur, Mahesha Farakpur, Chandauli, Kansar, Jaffarpur, Sauli Rupauli	September 30-October 5	October 2	6	Analysed
Darbhanga	Narkatiya Bhandara, Kubol Dhanga, Jamalpur, Khaisa Jamalpur	September 30-October 5	October 6	4	Analysed
Madhubani	Ramnagar	October 1-October 2	-	1	Not analysed (no imagery)
Saharsa	Manovar, Ghonghepur	October 1-October 5	October 6	2	Analysed
Supaul	Dholi	September 27-September 29	September 27	1	Analysed
Kishanganj	Dhantola, Lohagada, Pattharghatti, Barchoundi, Dallegaon	September 27-October 1	October 1	5	Analysed

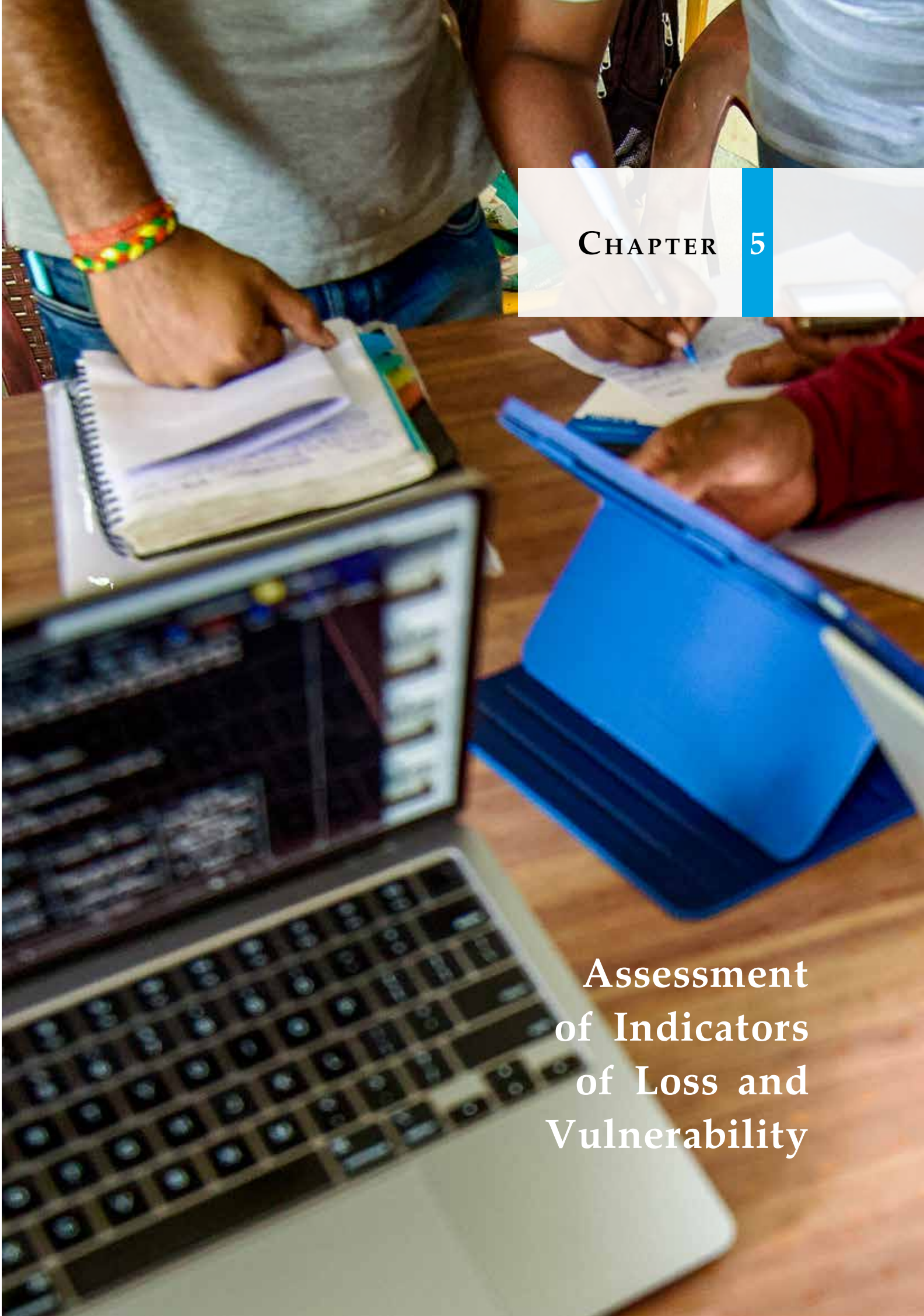
6. Hydrological Patterns Across the Study Region

- Discrete High-Standing Water Zones – Some areas exhibited relatively discrete flood boundaries with low-confidence areas typically ranging from 2-4%, suggesting sharp inundation margins with limited waterlogging extending beyond standing water. These patterns are characteristic of regions with well-defined drainage features or embankment systems that constrain water spread
  - Mahesha Farakpur (26% high, 4% low)
  - Chandauli (11% high, 3% low)
  - Sauli Rupauli (11% high, 2% low)
  - Tilak Tajpur (9% high, 3% low)
  - Kansar (6% high, 2% low)
  - Jaffarpur (7% high, 2% low)
- Extended Water logging and Gradual Recession – Other areas showed moderately higher low-confidence percentages (4-6%) alongside substantial high-confidence flooding, indicating extended waterlogging zones persisting beyond standing water recession. This suggests hydrological characteristics related to terrain, drainage infrastructure, or soil properties promoting water retention
  - Khaisa Jamalpur (19% high, 6% low)
  - Narkatiya Bhandara (18% high, 6% low)
  - Kuboul Dhagha (6% high, 4% low)
  - Jamalpur (5% high, 3% low)
  - Suryapur (21% high, 3% low)
- Extensive Soil Saturation in Accumulation Zones – Certain regions displayed consistently high low-confidence percentages (11-13%) alongside moderate-to-high high-confidence flooding (15-17%). This pattern is characteristic of low-lying accumulation zones where water spreads laterally and soil saturation persists long after surface inundation recedes. Actual flood impacts in these areas may be substantially more extensive than standing water alone, as soil saturation affects agriculture, infrastructure, and disease vectors
  - Manovar (17% high, 13% low)
  - Ghonghepur (15% high, 11% low)
- Lateral Water Dispersal Regions – Some areas demonstrated the most extensive low-confidence flooding (8-12% of area) despite relatively lower high-confidence percentages (3-6%), indicating substantial soil saturation with limited standing water. These areas suggest terrain promoting lateral water dispersal and infiltration rather than surface accumulation
  - Dhantola (5% high, 12% low)
  - Lohagara (6% high, 8% low)
  - Patharghatti (6% high, 9% low)
  - Barchoundi (3% high, 2% low) (borderline, mostly dispersal)
  - Dallegaon (2% high, 4% low)
  - Dholi (5% high, 7% low)

7. Conclusion

Critical constraints include satellite data availability variability, temporal misalignment between flood peaks and image acquisition (some Panchayats captured at peak, others during recession), and parameter thresholds kept deliberately broad given the multi-District scope. Two Panchayats could not be analysed due to missing imagery or boundary data. Despite these limitations, the analysis delivered quantitative inundation estimates providing a robust baseline for verifying the selection of the study Panchayats.

This analysis successfully mapped flood inundation across 19 Panchayats in six Bihar Districts using free, publicly available Sentinel-1 satellite data, achieving rapid quantitative assessment without specialized expertise. High-confidence flood areas ranged from 2% to 26% with geographic clustering reflecting District-scale hydrology. Multi-temporal, multi-orbit data integration substantially improved accuracy compared to single-date approaches.



Chapter 5

Assessment of Indicators of Loss and Vulnerability

1. Introduction

In Bihar, the DMD releases daily flood reports in the public domain and eventually compiles a consolidated Form-IX that is submitted to the Ministry of Home Affairs. While these reports document the overall scale of damage and the relief measures undertaken, their aggregated data flattens complex realities, obscuring who is most affected, how losses unfold, and why certain groups remain trapped in cycles of vulnerability and poverty.

This chapter moves beyond aggregation. It provides a household-level, data-driven account of how vulnerabilities, inequities, and flood typologies intersect to shape impacts and losses. The mapping of damages and resilience gaps, underscores why granular insights are vital for preparedness, response, recovery, and long-term resilience.

By positioning households at the centre of analysis as the basic unit of flood vulnerability, the assessment generated evidence that can drive precise, equitable, and sustainable strategies for flood management. The survey's objectives were,

- Profile the socio-demographic, housing, and spatial characteristics of flood-affected households, identifying pre-existing vulnerabilities that shape exposure and recovery
- Examine the causes and typologies of floods observed across surveyed households in the 21 Panchayats, situating household experiences within broader flood dynamics
- Quantify and categorize household-level economic losses, providing a detailed breakdown of damages to housing, assets and livelihoods
- Analyse cumulative and differential impacts across household groups, housing types, spatial locations, and flood typologies, to understand the social and spatial distribution of risk and loss
- Document and assess coping strategies adopted by households, distinguishing mechanisms of resilience from indicators of distress
- Assess vulnerability from a multidimensional perspective based on collated findings
- Capture community perspectives on needs and priorities, highlighting local expectations for recovery and pathways toward resilience

The assessment's wide coverage, 2,290 households across 134 Wards in 21 Panchayats in 7 Districts (Table 4), provided strong spatial representation, enabling meaningful comparisons of flood impacts.

When the river rose, it erased more than brick and mortar, leaving broken walls and uprooted lives in its wake

Table 4 - Distribution of survey respondents across various Districts, Blocks, Panchayats, and Wards

District	Block	Panchayat	Number of Wards	Number of respondents	Percentage share
Pashchim Champaran	Bairiya	Dakshini Patjirwa	6	115	5%
		Suryapur	2	38	2%
Pashchim Champaran Sub total			**8**	**153**	**7%**
Sitamarhi	Runni Saidpur	Mahesha Farakpur	9	151	7%
		Tilak Tajpur	4	69	3%
	Belsand	Chandauli	9	147	6%
		Jaffarpur	7	124	5%
		Kansar	4	69	3%
		Sauli Rupauli	2	37	2%
Sitamarhi Sub total			**35**	**597**	**26%**
Darbhanga	Kiratpur	Narkatiya Bhandara	7	128	6%
		Jamalpur	3	59	3%
		Kubol Dhanga	2	32	1%
		Khaisa Jamalpur	6	105	5%
Darbhanga Sub total			**18**	**324**	**14%**
Madhubani	Phulparas	Ramnagar	10	170	7%
Madhubani Sub total			**10**	**170**	**7%**
Saharsa	Mahishi	Manovar	6	98	4%
		Ghonghepur	11	174	8%
Saharsa Sub total			**17**	**272**	**12%**
Supaul	Sariagarh Bhaptiyahi	Dholi	10	206	9%
Supaul Sub total			**10**	**206**	**9%**
Kishanganj	Thakurganj	Dallegaon	8	128	6%
		Barchoundi	8	123	5%
	Dighalbank	Dhantola	9	144	6%
		Lohagada	8	123	5%
		Pattharghatti	4	62	3%
Kishanganj Sub total			**36**	**568**	**25%**
Grand Total			**134**	**2290**	**100%**

Form IX records 10,86,000 affected persons across the seven Districts included in the household-level flood loss assessment (Table 5). Using Cochran's formula, a representative sample for a population of this size would require approximately 384 respondents for a 95% confidence level. The survey, however, covered 8,685 individuals under 2290 households. This figure is more than twenty times the minimum required sample, indicating a robust and statistically reliable dataset.

Table 5 - Information from Form IX (2024) and the household-level assessment

District	Number of affected Panchayats reported in Form IX (In numbers)	Number of affected Panchayats included in the household-level loss assessment (In numbers)	Number of affected persons reported in Form IX (In numbers)	Number of affected persons included in the household-level loss assessment (In numbers)
Pashchim Champaran	44	2	73000	699
Sitamarhi	31	6	310000	2501
Darbhanga	21	4	225000	918
Madhubani	5	1	35000	919
Saharsa	35	2	261000	1421
Supaul	36	1	131000	678
Kishanganj	36	5	51000	1549
Total	208	21	1086000	8685

2. Methodology for Analysis

The survey covered eleven major themes, ranging from demographics, household composition, and housing characteristics to property losses before and after floods, document loss, damage to belongings, livelihood impacts, effects on vulnerable groups, coping strategies, and suggestions for mitigation. To examine these dimensions, the analysis was guided by principles of accuracy and transparency, applying established methods adapted to the dataset. Every step was carefully documented and implemented through structured processes, ensuring results that are both robust and reliable.

2.1. Data Collection and Initial Review

Overall, the household-level survey collected information from 2,295 households. Each record was carefully checked for completeness and accuracy. Records with essential missing details or clear errors, amounting to five cases, were excluded from the final analysis. This decisive action resulted in a valid sample size of 2,290 households, strengthening the credibility of the findings.

2.2. Data Cleaning and Transformation

The raw data presented numerous challenges, including inconsistencies and formatting issues due to responses being originally recorded in Hindi. The team undertook a meticulous data cleaning process, correcting errors and converting the information into a standardized format suitable for analysis. This crucial phase laid the foundation for all subsequent statistical work.

2.3. Addressing Data Quality - Outlier Management

Several households reported exceptionally high losses. To prevent distortion, percentile capping was applied and the top 1% of values were excluded (99th percentile). This step ensured that extreme or potentially erroneous values did not compromise the statistical accuracy of the findings, without unduly discarding evidence from the broad majority of participants. Moderate outlier exclusion, balanced the risks of manual entry errors, with the need for reliable statistics. Reported "no loss" values were treated as zero, and missing or clearly faulty responses were marked as "Not Available (NA)."This ensured clarity and avoided bias.

2.4. Descriptive and Inferential Analysis

The assessment employed a flexible, multi-stage approach tailored to the characteristics of the dataset and research objectives. Descriptive methods summarized the population, while inferential methods examined inter-variable relationships. Losses were analyzed at household, Panchayat, and District levels to generate both granular and aggregate estimates. Complementary qualitative analysis, using thematic methods, contextualized community experiences and perspectives. Together, the quantitative and qualitative components ensured a rigorous and context-sensitive evaluation of flood impacts.

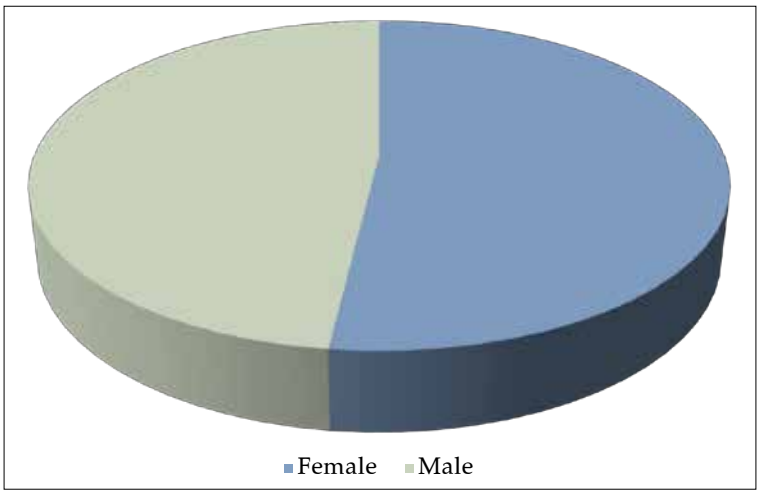
3. Pre-Existing Socio-Demographic, Housing, and Spatial Profile of Households and Interrelationships between Variables

Socio-demographic, housing, and spatial profiling of households across the 134 worst-affected Wards was essential to situate flood impacts within the wider contexts of vulnerability and resilience. These dimensions not only determine the scale of losses but also condition the capacity of households to cope and recover. Examining their interrelationships illuminates how variables such as family size, gender of household head, social groups, housing types, and spatial locations interact to mediate exposure, shape damage, and influence long-term recovery trajectories.

3.1. Socio-demographic

Gender - Figure 1 shows a relatively balanced gender distribution among the 2,290 survey respondents, with females comprising 51.9% and males 48.1%. This near parity was important for capturing the differentiated experiences, vulnerabilities, and perspectives of women and men in the context of floods.

Figure 1 - Gender composition of the total survey sample



Household head - A substantial majority of respondents (80.1%) identified as household heads, indicating that the survey largely captured perspectives of primary decision-makers and thereby enhancing the reliability of information on assets, losses, and coping strategies. Of the total households, 34.6% were Female-headed Households (FHH) and 65.4% were Male-headed Households (MHH).

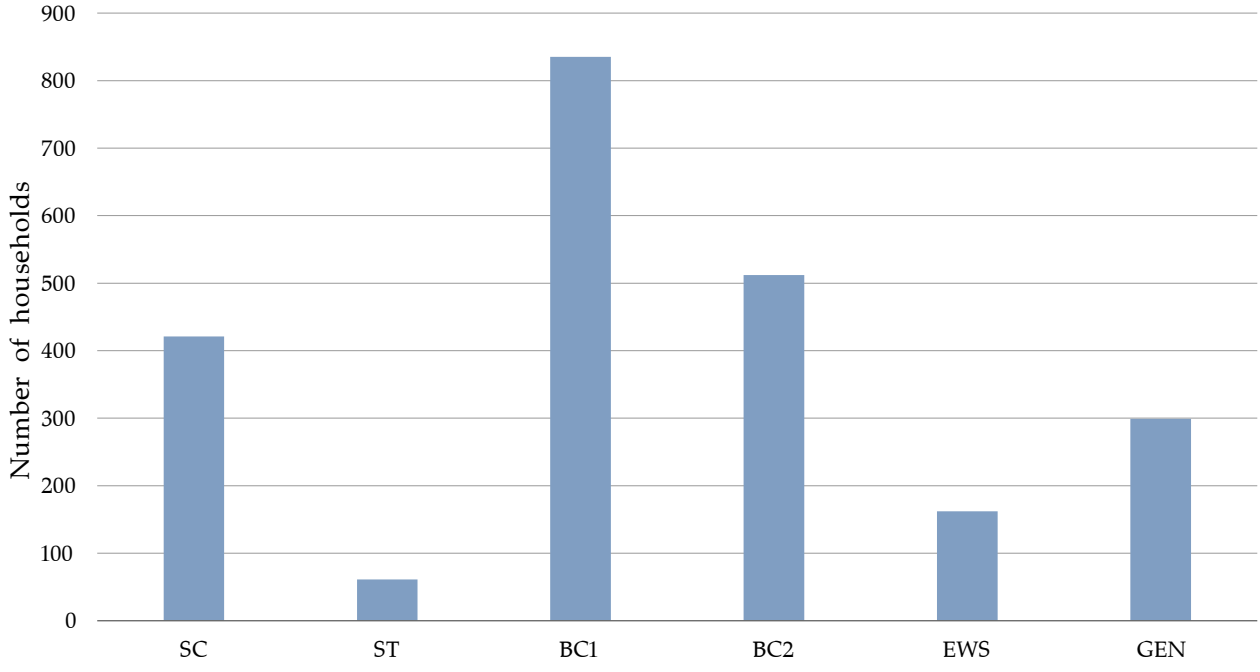
Education -The data revealed pronounced educational vulnerability. Over half of respondents (56.6%) reported having no formal education. In addition, 12.4% were literate without completing formal schooling. Only a minority had completed primary (16.4%), secondary (6.6%), and higher education (5.3%). In flood-prone regions of North Bihar, vulnerability

is more directly conditioned by determinants such as landholding arrangements, social hierarchies, access to credit, and opportunities for migration, rather than by educational attainment alone. However, limited education can constrain longer-term adaptive capacities, employment opportunities and achievement of upward socio-economic mobility.

Family Composition - Households in the surveyed area had an average family size of 3.79, with a male-to-female ratio of 1:0.69. The average number of earning members per household was 1.74, although more than one-third (36.9%) of households were dependent on a single income source. The population structure was skewed towards younger age groups, with 31.6% of family members below the age of 15 and only 2.6% above 60 years. Students accounted for approximately 37% of total household members, underscoring the demographic salience of education in a context where recurrent flooding often disrupts schooling and exacerbates vulnerabilities.

Social Groups - Figure 2 illustrates the heterogeneous social composition of the surveyed population. The largest group comprised respondents from Backward Class 1 (BC1), also referred to as the EBC, accounting for 36.5% of the sample. This was followed by Backward Class 2 (BC 2) at 22.4%. The Scheduled Caste (SC) and General (GEN) categories were represented in comparable proportions at 18.3% and 13.1%, respectively. Smaller shares were observed among the Economically Weaker Sections (EWS) and Scheduled Tribe (ST), at 7.1% and 2.6%. This distribution underscores the need to analyse flood impacts through a social equity lens, given that vulnerability, coping strategies, and access to relief are deeply mediated by social identity.

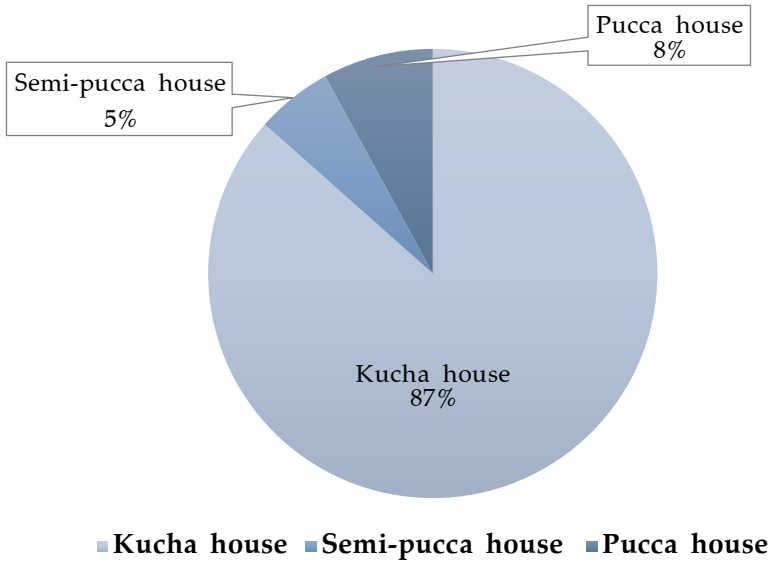
Figure 2 - Distribution of survey respondents across different social group categories



3.2. Housing

Figure 3 highlights pronounced structural vulnerability among surveyed households. A large majority (87%) resided in temporary (Kucha) dwellings constructed from mud, wood, or other non-durable materials, while only 7.9% lived in masonry (Pucca) houses and 5.5% in semi-masonry (Semi-pucca) structures. High percentage of the ownership of kucha housing underscores the economic precarity of households in the surveyed flood-affected Panchayats, where limited investment in durable construction heightens exposure to flood-related damages.

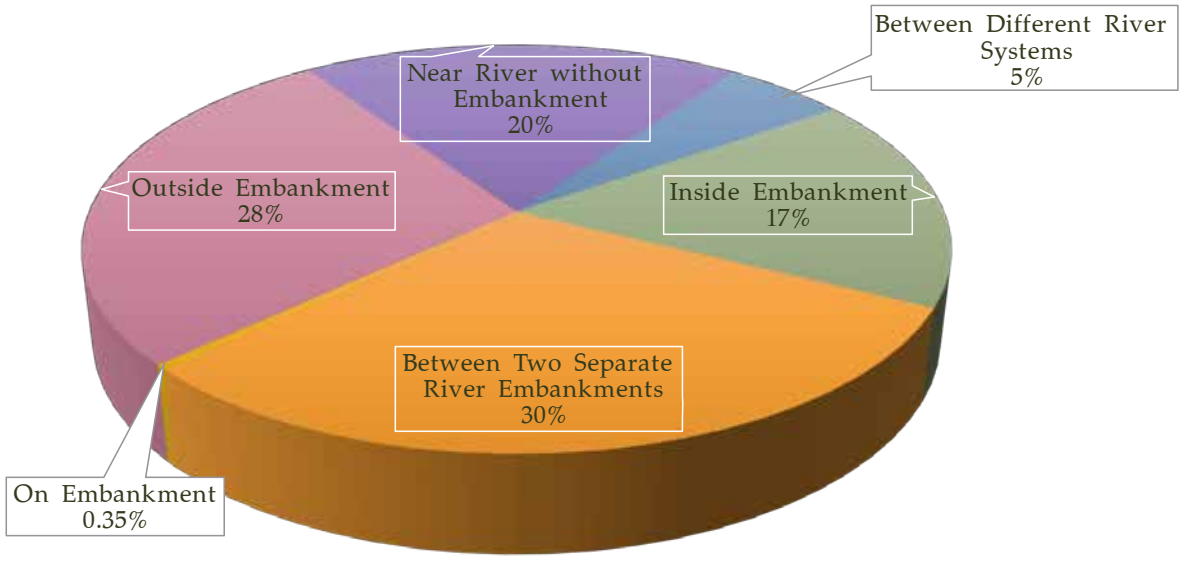
Figure 3 - Primary construction type of respondent houses before the flood



3.3. Spatial

Figure 4 profiles the settlement distribution of surveyed households across different flood-affected spatial locations. Nearly one-third (30%) lived between two separate river embankments, in Darbhanga and Saharsa Districts. Another 28% were situated outside embankments in Districts such as Sitamarhi, and Madhubani. Seventeen percent of the total surveyed households were located in Pashchim Champaran District within the additional embankments of the Gandak River in the countryside, in Madhubani District within the embankments of the Bhutahi Balan River, and in Supaul District inside the embankments of the Kosi River. A notable proportion included 20% of households near a river without embankments in Kishanganj District. And 5% positioned between different river systems without embankments, yet again in Kishanganj District. Another 0.35% lived on embankments in Sitamarhi, Darbhanga, and Saharsa Districts. Of the surveyed households, 58% were in the countryside (including between two separate river embankments and outside embankments). These spatial locations are often assumed relatively safer because of the flood protection structures, yet the concentration of affected households in these areas suggests that residing in the countryside offered limited protection against the 2024 Phase 2 floods.

Figure 4 - Distribution of households based on their spatial location relative to rivers and embankments

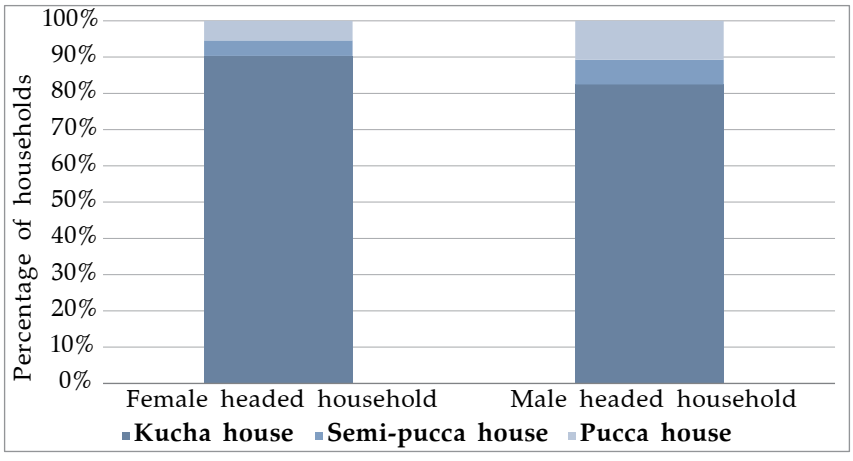


3.4. Interrelationship between Variables

This section examines the baseline vulnerability of the surveyed households within the broader socio-demographic, housing, and spatial context, emphasizing the interrelationships among these factors in shaping both their exposure to floods and their capacity for resilience.

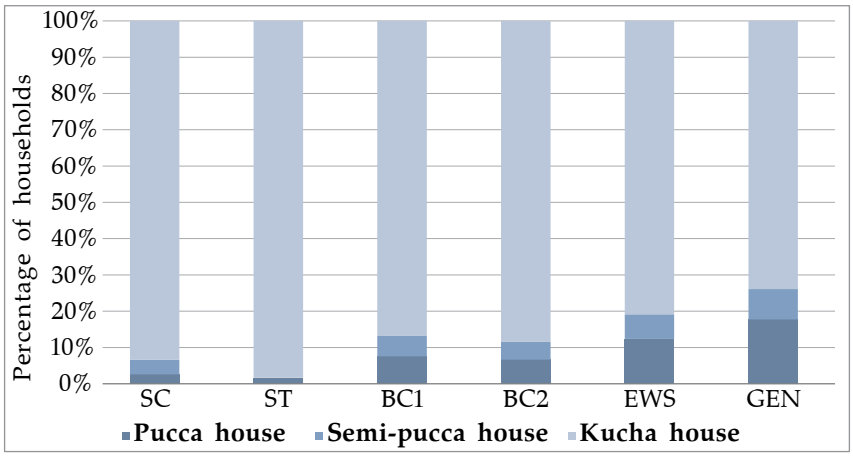
Distribution of House Type by Gender of Household Head - Approximately 91% of FHH resided in kucha houses, compared with 84% of MHH. Conversely, only 3.9% of FHH owned pucca dwellings, relative to 10% of MHH (Figure 5). This disparity underscores a pronounced gendered dimension of housing vulnerability, with FHH disproportionately exposed to physical risks and, consequently, at greater risk of flood-related damage.

Figure 5 - Distribution of house type by gender of household head



Distribution of House Type by Social Groups - The analysis of house type distribution across social groups (Figure 6) reveals deep-rooted structural vulnerabilities in the surveyed flood-affected Panchayats. Kucha houses were prevalent across all communities, but the highest proportion was found to be in SC and ST households, where nearly all houses were kucha structures. More than 90% of BC1 and BC2 households also resided in kucha or semi-pucca dwellings. This lack of durable housing magnifies the devastation during floods, perpetuating cycles of loss and poverty. In contrast, GEN and EWS groups display a gradual shift toward semi-temporary and masonry structures, highlighting socio-economic disparities that shape flood resilience.

Figure 6- Distribution of house type by social groups

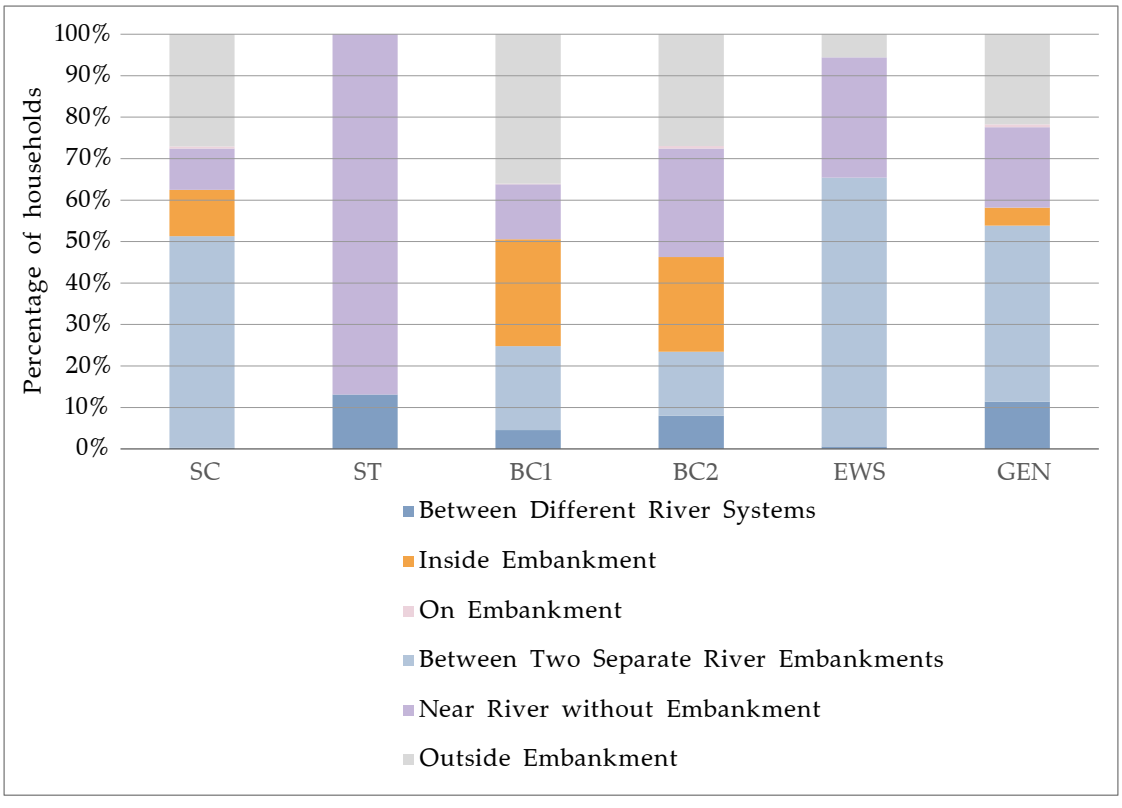


Distribution of Social Groups by Spatial Location - ST households were entirely located either between different river systems (13.11%) or near unembanked rivers (86.89%), leaving them highly exposed to flash floods. Social stratification shaped the distribution further in the six spatial categories. BC1 households were present in most locations but concentrated outside embankments (36.04%) and inside embankments (25.74%), with smaller shares between two separate river embankments (20.23%) and near unembanked rivers (13.29%). BC2 households were more evenly spread, with sizeable proportions outside embankments (21.73%) and near unembanked rivers (26.17%).

Around half of SC households (51.06%) and nearly two-thirds of EWS households (64.81%) resided between two separate river embankments. GEN households appeared across all six spatial categories, but the largest clusters were between two separate embankments (42.47%), outside embankments (21.73%), and near unembanked rivers (19.39%). SC households, though disproportionately concentrated between two separate river embankments (51.06%), also had a significant share outside embankments (27.07%).

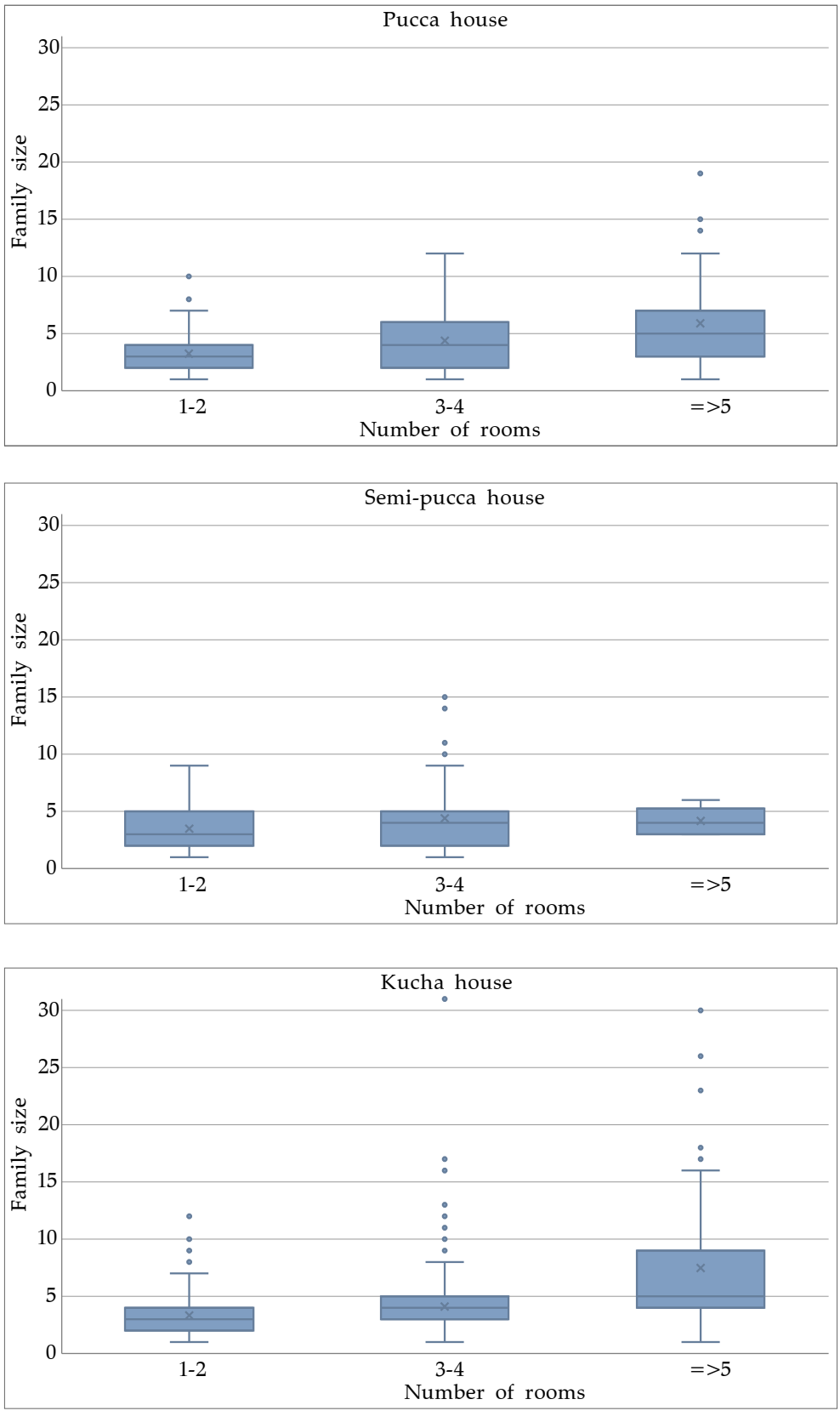
These distributions illustrated how social group and class hierarchies intersected with geography exposing them to floods.

Figure 7- Distribution of social groups by spatial location



Distribution of Family Size by Number of Rooms and House Types - Across house types, family size broadly scaled with the number of rooms, but the patterns varied (Figure 8). Kucha houses, which constituted the overwhelming majority of cases, showed a clear progression from a median family size of three members in one-two room dwellings to five members in larger houses. Alongside, extreme overcrowding in some instances were reported where the family size exceeded 30. Pucca houses, though fewer in number, displayed a more proportional relationship. According to the box plot, family size rose steadily with room count and exhibited much narrower ranges, suggesting relatively better alignment between household size and housing capacity. Semi-pucca houses showed steady scaling in family size for one-two and three-four room categories. However, interpretation for houses with more than five rooms is limited by the very small sample (n=6), making it difficult to assess the trend.

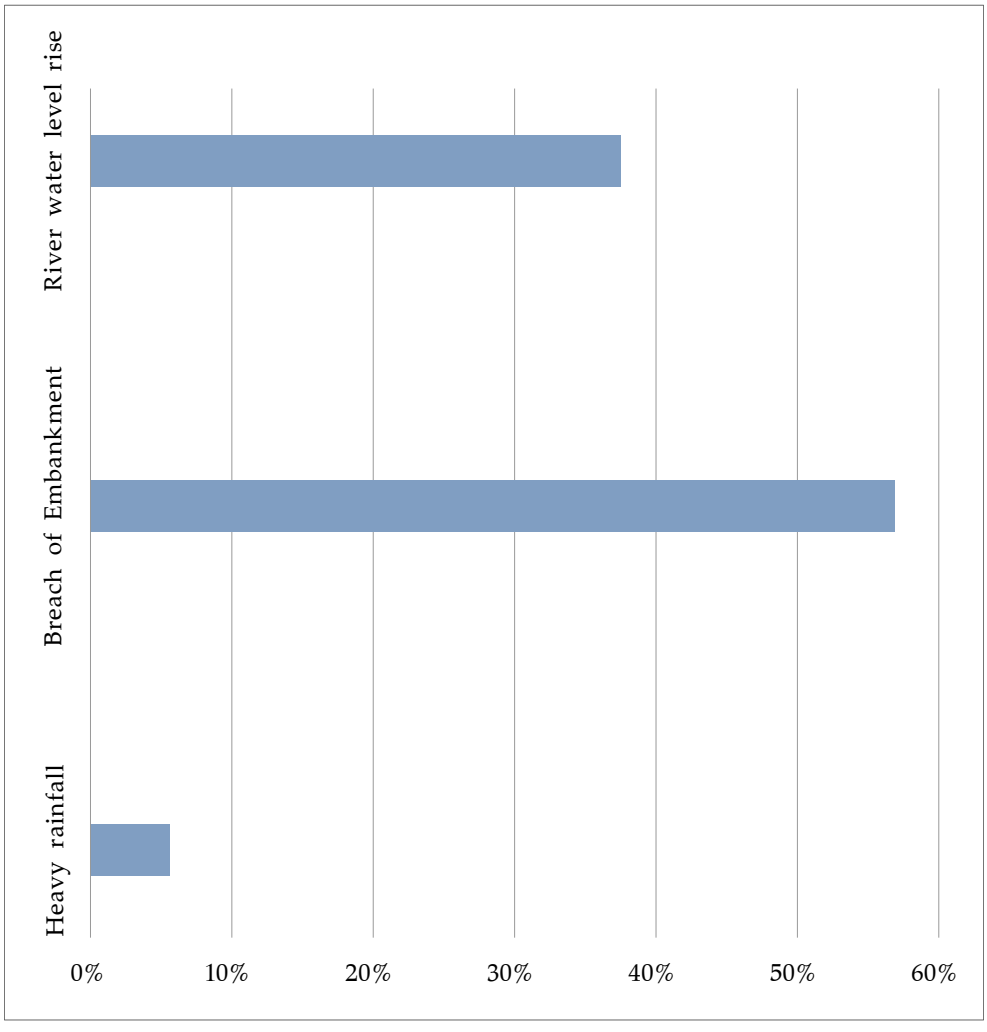
Figure 8- Distribution of family size by number of rooms and house types



4. Causes and Typology of Floods

The inception of any effective disaster management strategy lies in understanding the triggers of the hazard itself. Figure 9 is a representation of the perception of respondents on the causes of flooding. The majority of households, 56.9% attributed the flooding to a breach of an embankment. A rise in the river water level was cited by 37.5% of respondents. Heavy rainfall was seen as the primary cause by a much smaller group 5.6%. This perception points towards infrastructure failure (embankment breaches) as a critical driver of flooding in the study area.

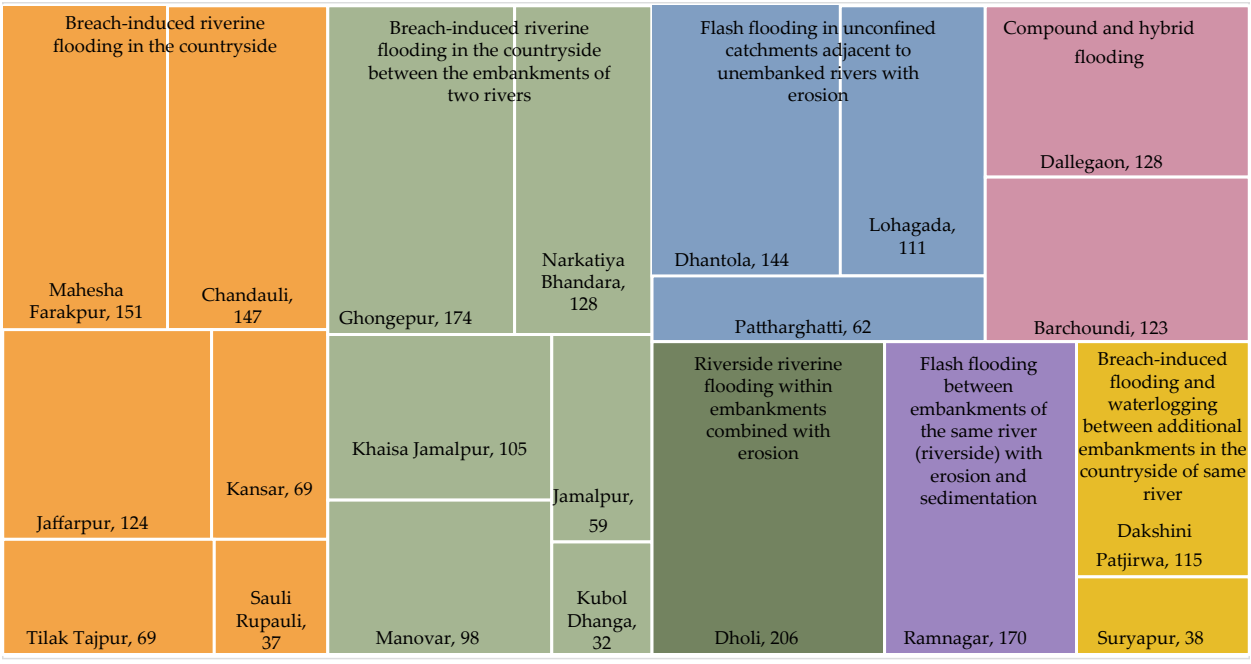
Figure 9 - Primary causes of flooding as reported by the survey respondents



The treemap (Figure 10) illustrates how different flood typologies affected households across Panchayats, highlighting the complex and differentiated character of hazards in the study area. Breach-induced flooding dominated, with three categories, flooding in the countryside, flooding between embankments of the same river system, and flooding with waterlogging between embankments of two different rivers. Together they accounted for the largest share of affected households. Breach-induced riverine flooding in the countryside had the widest spread, impacting Panchayats such as Tilak Tajpur (69 households), Mahesha Farrakpur (151), Chandoli (147), Jaffarpur (124), Sauli Rupauli (37), and Kansar (69). Breach-induced flooding and waterlogging between embankments of two different rivers similarly affected Panchayats, including Jamalpur (59), Kubol Dhanga (32), Narkatiya Bhandara (128), Khaisa Jamalpur (105), Manovar (98), and Ghongepur (174). Flash floods in unconfined catchments adjacent to unembanked rivers emerged as another significant typology, with Dhantola (144 households), Pattharghatti (62), and Lohagada (111) among the worst hit. Other categories, such as compound and hybrid flooding, riverside riverine flooding with erosion, and flash flooding

within embankments, were more localized, usually limited to one or two Panchayats, yet still caused notable damage. Overall, the 2024 breaches pushed floodwaters into settlements and lands long assumed to be "flood-safe," underscoring that vulnerability was shaped less by proximity to rivers than by the dynamics of breaches, waterlogging, and cross-system interactions.

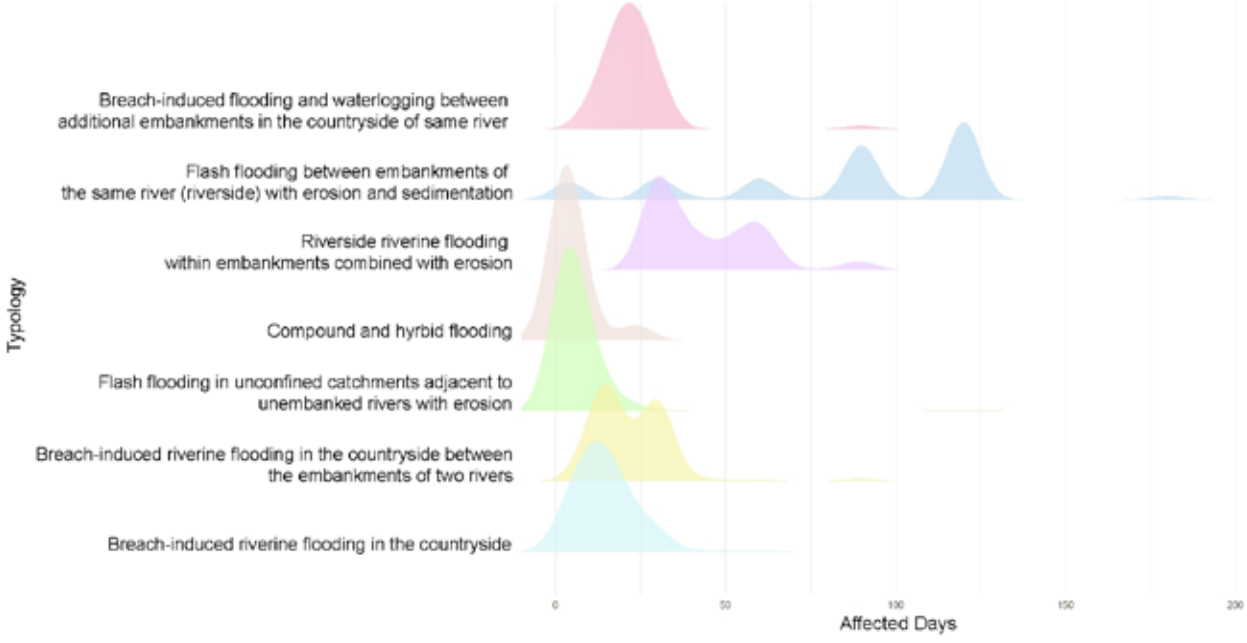
Figure 10 - Distribution of households by flood typologies and Panchayat



Note –The number corresponds to the number of respondents from each Panchayat

Figure 11 shows clear variations in flood duration across different typologies. In breach-induced riverine flooding in the countryside and breach-induced flooding and waterlogging between additional embankments in the countryside of same river, most respondents experienced flooding lasting less than 25 days and the distributions were largely concentrated between 0-50 days. These typologies exhibited a similar temporal pattern, with a few outliers also reporting durations above 50 days, possibly reflecting the impeded drainage and compounded waterlogging in low lying areas. A comparable trend was observed in breach-induced riverine flooding in the countryside between the embankments of two rivers, though this typology also recorded a prolonged period of flooding between 25-40 days. This extended duration likely reflects slower drainage and compounded waterlogging in inter-embankment zones. In compound and hybrid flooding and flash flooding in unconfined catchments adjoining unembanked rivers with erosion, the flood duration was generally much shorter. Most respondents experienced fewer than 10 days of flooding, and all events subsided within 25 days. This aligns with the typology's rapid onset and quick drainage once rainfall ceases. In contrast, flash flooding between embankments of the same river (riverside) exhibited a more complex temporal pattern. The distribution showed multiple peaks, indicating both short-duration (under 30 days) and prolonged or recurrent flood events lasting beyond 50 days, and in some cases, even exceeding 100 days. The variability in flood duration can be attributed to the hydrological complexity arising due to the presence of three river systems – embanked Bhutahi Balan, along with the unembanked old course of Bhutahi Balan and Bihul Rivers. Similarly, riverside riverine flooding within embankments combined with erosion showed a multi-peaked pattern. In this case, however, the variation stems from overlapping flood and erosion processes occurring at different times. Notably, this is the only typology where the distribution does not begin at zero, suggesting that all 206 respondents from this flood typology were impacted by floods in varying proportion.

Figure 11- Distribution of flood affected days as per typology



5. Economic Loss and Damage Assessment

This section examines the economic loss and damage experienced by households during floods, drawing on survey-based evidence to capture the scale and nature of impacts. It looks at household-level losses across different categories, analyses how these are shaped by household characteristics, and compares variations across flood typologies and spatial contexts. Together, the assessment provides a comprehensive view of the financial burden of floods and the unequal vulnerabilities that influence recovery.

5.1. Overall Household-level Losses

The compiled survey data showed varying economic losses and damage across all 2290 households, with a total reported loss figure of ₹126 cr. The analysis presented in Figure 12 provides a granular, ranked breakdown of the total financial impact by twenty specific loss categories, moving beyond aggregate numbers to reveal the anatomy of household economic distress.

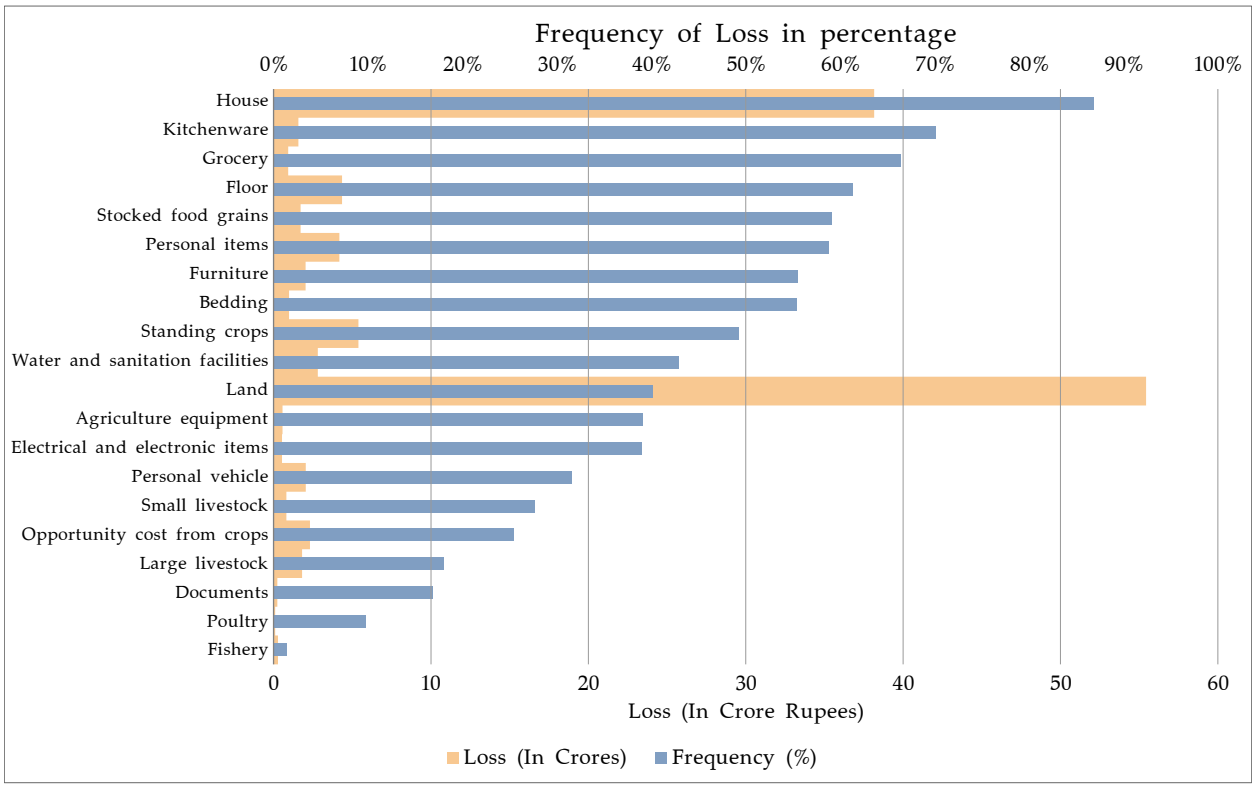
The data explicitly identifies two major drivers of economic loss that dominate all other categories. Land lost and damaged during flood is the single largest component of financial impact, accounting for a staggering ₹55.44 cr in aggregated losses. This is followed by the estimated reconstruction cost of the house damaged during flood, which totals ₹38.30 cr. Together, these two categories represent the overwhelming majority of the total economic burden captured in the survey, underscoring that floods in this region are fundamentally a crisis of core asset destruction, striking at the foundations of household economic security.

Following these two primary categories, the losses diversify but decrease significantly in magnitude. Agricultural losses, including crops lost and damaged (₹5.30 cr) and crops lost in the subsequent season due to flood (sedimentation/ erosion) as opportunity cost (₹2.31 cr), represent the next most significant tier of damage. Other substantial costs include the "reconstruction of the floor of the house" (₹4.35 cr) and the loss of "personal items" (₹4.18 cr). Losses related to livestock, vehicles, and household goods, while devastating for individual families, are of a lower order of magnitude in the aggregate financial picture.

This hierarchy of loss carries glaring implications. The destruction of land and housing is not only a one-time economic shock, but it represents a deeper crisis that can trigger a cascade of secondary social and economic impacts not directly measured in these figures. For a rural household in Bihar, land is the primary engine of income generation, food security, and often the only form of collateral for accessing credit. Its loss or degradation can initiate a vicious cycle of debt and impoverishment. Similarly, the destruction of a house results in displacement, loss of security, and the diversion of all future savings and income towards rebuilding.

Representing the frequency distribution of reported losses, Figure 12 also highlights that the more frequently reported losses were not always the most financially significant. House damaged during floods was the single most reported category (1,990 households - 86.9% of the total surveyed household), and also the second-largest component in monetary terms, underscoring its central role in the flood's impact, particularly for socially and economically vulnerable groups. Beyond this, commonly reported losses included kitchenware (1,606 households - 70.1%), groceries (1,521 - 66.4%), stocked food grains (1,355 - 59.1%), personal items (1,346 - 58.7%), and furniture (1,271 - 55.5%), pointing to the widespread erosion of day-to-day essentials and core household assets that immediately disrupt daily existence. Although these categories were more frequently reported than land damage (920 - 40.1%) or crop losses (1,129 - 49.3%), their aggregate monetary value was far smaller. Even crop losses, despite being reported more often than land damage, accounted for a smaller share of the total financial impact, which remained dominated by land. The figure suggests a dual pattern. Structural losses such as land and houses create the largest financial shocks, while high-frequency but lower-value losses in food, household goods, and personal items deepen immediate distress and shape the recovery trajectory of most households.

Figure 12 - Value and frequency of reported losses



For the ease of analysis across vulnerability indicators, the 20 loss categories were consolidated into six broad groups - land, housing, agriculture, livestock, personal and household assets, and water, sanitation and hygiene (WASH). This simplified grouping provides a clearer lens for examining differential vulnerabilities in the subsequent analysis.

Table 6 - Thematic grouping of loss categories

Categories	Sub-categories
Housing	Estimated reconstruction cost of house and floor damaged
Personal and household assets	Estimated replacement cost of documents, personal items, kitchenware, grocery, bedding, electric and electronic items, household furniture, personal vehicles and stocked food grains
Land	Estimated value of land damaged
WASH	Estimated replacement cost of drinking water, sanitation and hygiene infrastructure damaged
Livestock	Estimated replacement cost of large animals, small animals, poultry and fisheries lost
Agriculture	Estimated value of crop lost, lost crop opportunities, and replacement cost of agricultural equipments

Figure 13 and 14 summarize the composition of losses across these six groups in terms of financial weight (relative to total reported monetary loss) and frequency (relative to total reported instances of loss). Land and housing remained the largest contributors of monetary loss, together accounting for around 77% of total losses. However, while housing was also the most frequently reported loss (24.7%), land-related losses emerged as the least reported, at 11%. This trend was observed across many other categories. Livelihood-related losses, for instance, including agriculture (18%) and livestock (11%), were reported relatively frequently, underscoring their centrality in rural livelihoods. However, their aggregate financial weight was modest (6.6% and 2.4% respectively of the total loss). Similarly, losses of personal and household assets were among the most frequently reported (23.4%) but together constituted only 11.3% of total monetary losses. Notably, WASH-related losses represented the smallest monetary share at 2.2%, but still amounted to ₹2.8 cr, and were reported almost as frequently as livestock and land losses (11.8%), highlighting the often-overlooked burden of disrupted sanitation and drinking water systems.

Viewing losses solely through the lens of aggregate monetary impact risks overlooking those that are widespread, yet individually of lower value. While high-value but low frequency losses, such as land, deserve attention, recovery narratives must also recognize low-value but high-frequency losses that deeply affect everyday life. This assessment, therefore, considers not just the monetary dimension of losses, but also their nature and manifestation, to capture the true magnitude of the overall losses.

Figure 13 - Composition of loss categories by value

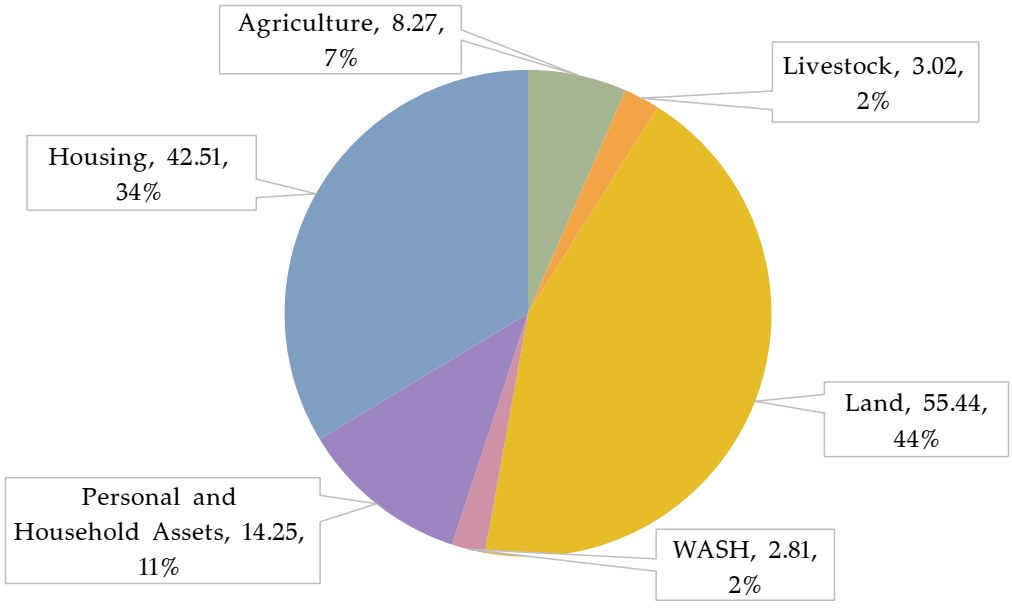


Figure 14 - Composition of loss categories by frequency

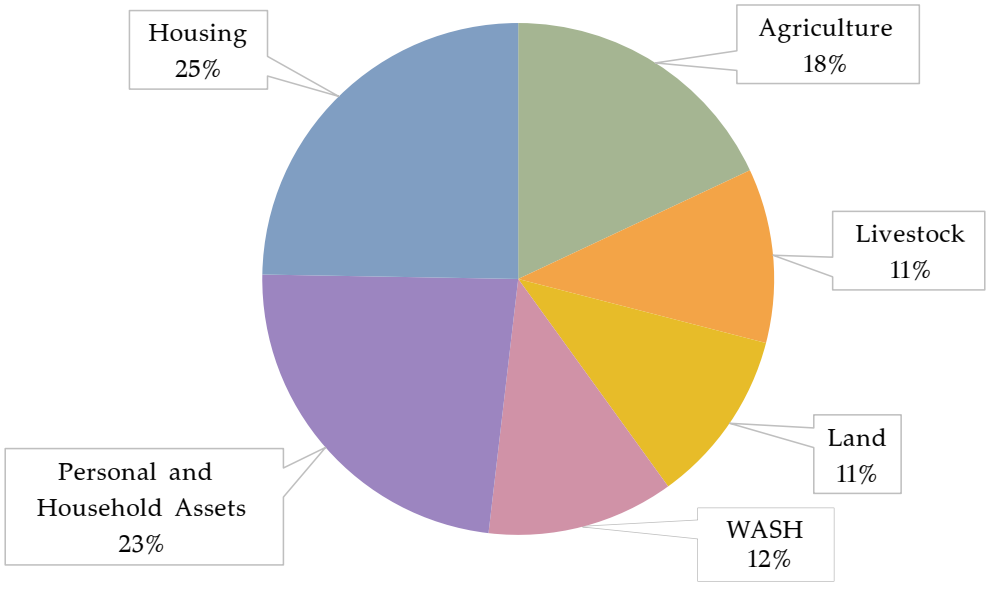
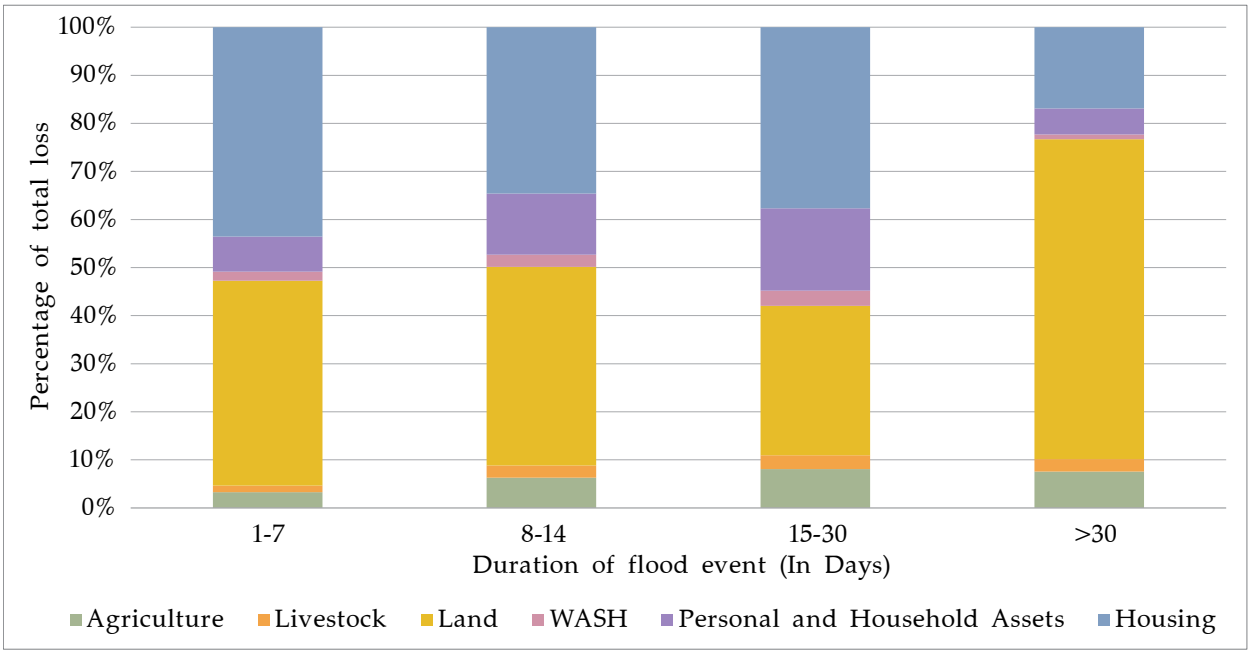


Figure 15 represents how the share of household losses change as the duration of flood events increases. For floods lasting 1-7 days, the losses were almost evenly divided between housing (43.5%) and land (42.6%), with only small shares of losses related to personal and household assets (7.3%), agriculture (3.3%), livestock (1.4%), and WASH (1.9%). As floods extended to 8-14 days, the share of agricultural losses nearly doubled to 6.3% and losses to personal and household assets rose to 12.7%, while housing and land remained the dominant categories.

Silted fields left barren after the breach-induced floods

For floods lasting 15-30 days, personal and household assets (17.2%) and agriculture (8.1%) took on greater weight, signalling broader financial erosion beyond immediate structural damage. When floods persisted beyond 30 days, however, land losses surged to 66.5%, overshadowing all other categories as housing dropped to 16.9% and asset losses to 5.4%. Taken together, the data shows that shorter floods weigh most heavily on housing and land, medium-duration floods increasingly strain household items and agriculture, and prolonged floods disproportionately devastate land, undermining livelihoods and recovery prospects. The figure thus makes clear that flood impacts evolve over time, ultimately shifting the impact from immediate physical damage (related to housing, household-assets and WASH services), to long-term erosion of livelihoods and food security.

Figure 15 - Loss profile by duration of flood



5.2. Assessment of Loss through Household Characteristics

Examining losses through socio-demographic and structural household characteristics as indicators of vulnerability, introduces another layer to the prevailing perspectives on flood impacts. It reveals that the value of monetary loss does not always capture the true extent of who is most affected and how deeply, highlighting the need to interpret losses within the broader context of inequality and exposure.

Patterns of loss, reflected sharp disparities between asset-rich and asset-poor households. Approximately 92% of households residing in kucha houses were reportedly affected, compared to 70.9% and 78% of those in pucca and semi-pucca houses respectively. However, as illustrated in Figure 16, households in pucca dwellings experienced the highest absolute losses, with median and average losses of ₹8.2 lakhs and ₹15 lakhs respectively. Semi-pucca and kucha houses reported similar median losses of approximately ₹2.9 lakhs and ₹2 lakhs, respectively. The interquartile range (IQR) for semi-pucca structures was broader (₹1-8 lakhs), while losses in kucha houses were concentrated between ₹1-4 lakhs. Notably, the average loss for semi-pucca structures (₹8.6 lakhs) was nearly double that of kucha structures (₹4.4 lakhs). This indicates that those in more permanent housing structures had higher asset concentrations, leading to greater monetary losses during floods. Accordingly, households residing in kucha dwelling likely possessed fewer or lower-value assets. Consequently, the economic losses assessed at the household level was comparatively lower than among pucca households.

Figure 16 - Household loss by house type

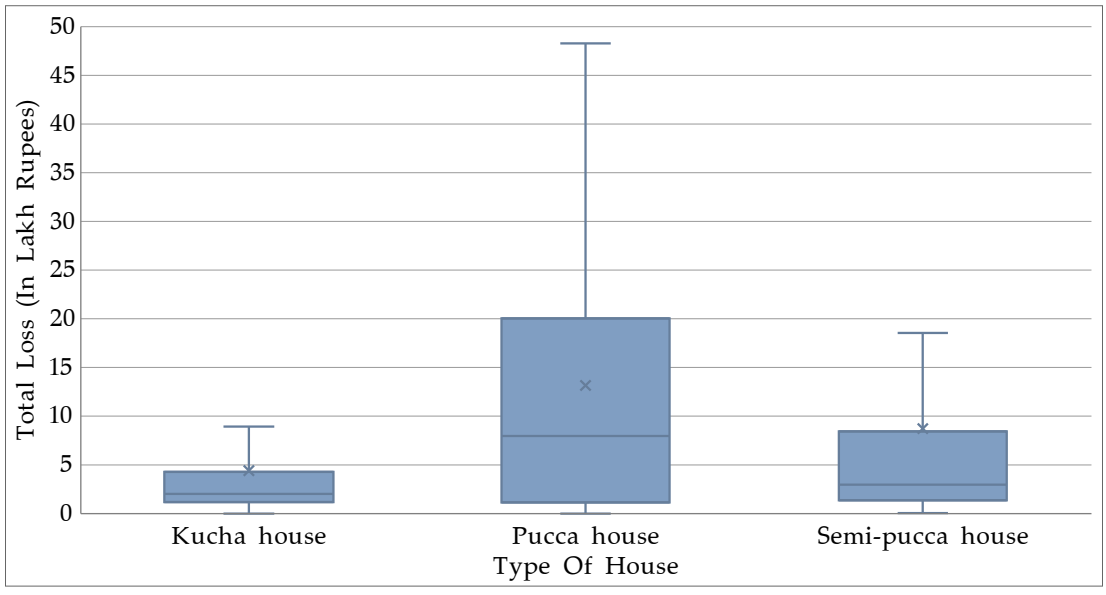
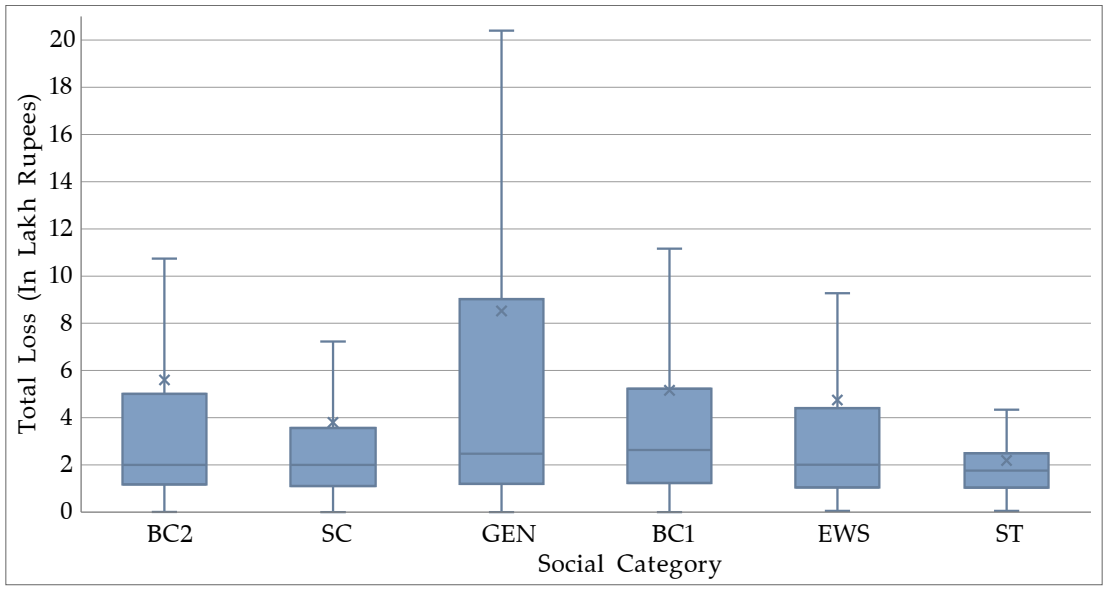


Figure 17 reinforces the social dimension underlying the relationship between house type and household-level economic losses. Ownership of pucca houses was notably uneven across social groups, SC (2.6%), ST (1.6%), BC1 (7.5%), BC2 (6.6%), GEN (17.7%), and EWS (12.3%). Consistent with the earlier hypothesis, the most pronounced losses were observed among GEN households. They recorded both the highest mean (₹9.8 lakh) and a high median (₹2.5 lakh), along with a notably wide IQR, indicating both higher and more variable losses within the group. Overall, the distribution reflects greater asset concentration and exposure of high-value assets. BC1, BC2, and EWS households formed a middle band, with comparable median losses (around ₹2–2.6 lakh) and moderately wide spreads. Their upper quartile values remained around ₹4-5 lakh. By contrast, SC and ST households recorded both the lowest central values and the narrowest IQRs, indicating that their losses were more tightly clustered towards the lower end. Importantly, these lower recorded losses do not imply resilience, but rather economic vulnerability. Fewer assets were at risk to begin with, and even moderate rupee losses carry disproportionately severe consequences for wellbeing and recovery.

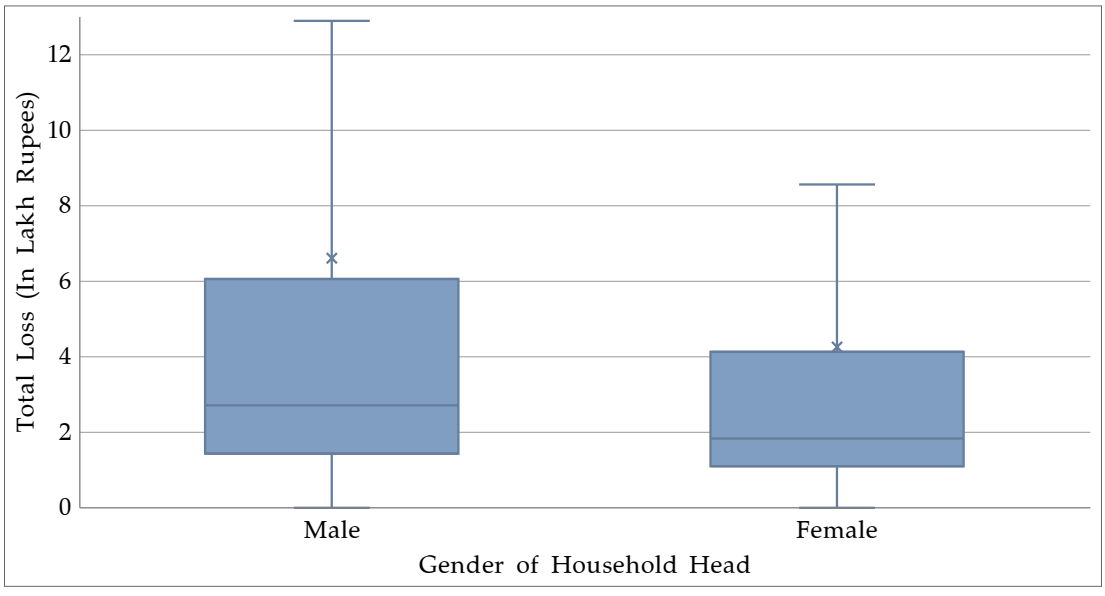
Figure 17 - Household loss by social group



A similar pattern is observed in Figure 18 between gender-headed households. MHH, which previously showed higher ownership of pucca structures, also experienced higher total losses on average, with both mean and median values

exceeding those of FHH. This reflects higher asset accumulation, likely linked to ownership of larger properties, more valuable housing, or broader livelihood-related assets. MHH headed losses also displayed greater variability, ranging mostly between ₹1.5-5.5 lakh, with extreme cases surpassing ₹12 lakh. FHH, by contrast, reported lower absolute losses concentrated between ₹1.5-4 lakh, with outliers rarely exceeding ₹9 lakh.

Figure 18 - Household loss by gender of household head



Altogether, these findings suggest that while damage was widespread, measuring loss in absolute monetary terms can disproportionately highlight those who have more to lose in rupees. In reality, however, even smaller financial losses can be far more devastating for marginalized households given their limited resources, making recovery more difficult and prolonged.

5.3. Loss Assessment by Typology and Spatial Analysis

Figures 19 and 20 together illustrate how household losses varied across flood typologies, highlighting both cumulative and differential impacts. Across all categories, losses displayed high variability, while some households reported negligible or no damage, others experienced catastrophic impacts. Consequently, the mean values for each typology exceed the medians, as a few extreme cases disproportionately pull the averages upward, underscoring the uneven distribution of impacts.

Breach-induced riverine flooding in the countryside (cumulative loss of ₹33.5 cr across 597 households) and breach-induced flooding between embankments of two river systems (₹24 cr across 596 households) generated the largest cumulative losses. The scale of total loss reflects the relatively large number of surveyed households in these typologies, rather than disproportionately high per-household damages. Median losses remained in the range of ₹1.8–1.9 lakh, with an IQR of roughly ₹1–4 lakh. By contrast, flash flooding between embankments of the same river (riverside) with erosion and sedimentation presented a markedly different profile. Though affecting only 170 households, cumulative losses touched ₹26 cr, and the median household loss rose above ₹10 lakh, the highest among all typologies. The wide IQR (₹5.7-16.3 lakh) and extreme maximum values reflect highly destructive localised impacts.

Breach-induced flooding and waterlogging between additional embankments in the countryside of same river, with a smaller sample of 153 households, reported cumulative losses of ₹2.4 cr. This typology recorded the lowest median loss of ₹1 lakh, with most households reporting losses between ₹0.6 and ₹1.6 lakh. Compound and hybrid flooding

(₹17.9 cr across 251 households) and flash flooding in unconfined catchments adjacent to unembanked rivers with erosion (₹14.6 cr in 317 households) registered moderate median losses of ₹1.5 lakh and ₹2 lakh, respectively. For flash flooding in unconfined catchments, household losses were more narrowly distributed between ₹1.4 and ₹4.1 lakh, compared to compound and hybrid flooding, which exhibited a wider spread of ₹1 to ₹7 lakh. This suggests that while most households that experienced compound and hybrid flooding, faced moderate damages, a subset experienced disproportionately high losses that substantially raised the upper quartile values.

Riverside riverine flooding within embankments combined with erosion produced total losses of ₹7.6 cr across 206 households. The median loss was ₹3.5 lakh, the second highest among all typologies, with an interquartile range of ₹2.4 - 4.5 lakh. These elevated central values, coupled with a relatively narrow spread, indicate consistently high economic losses driven by erosion-related flooding.

Figure 19 - Total loss by typology

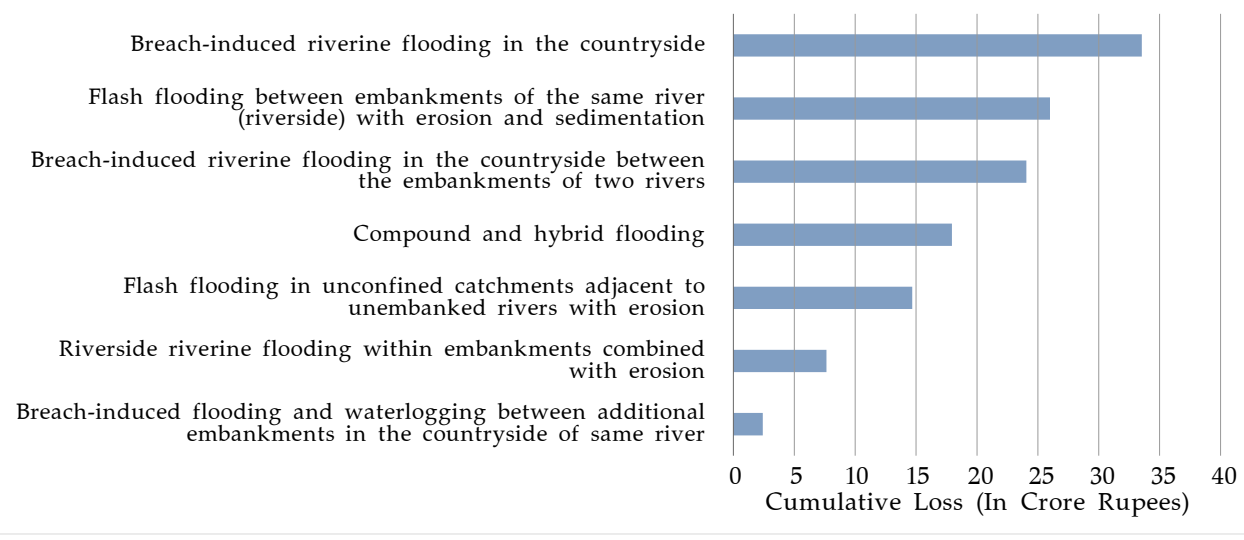
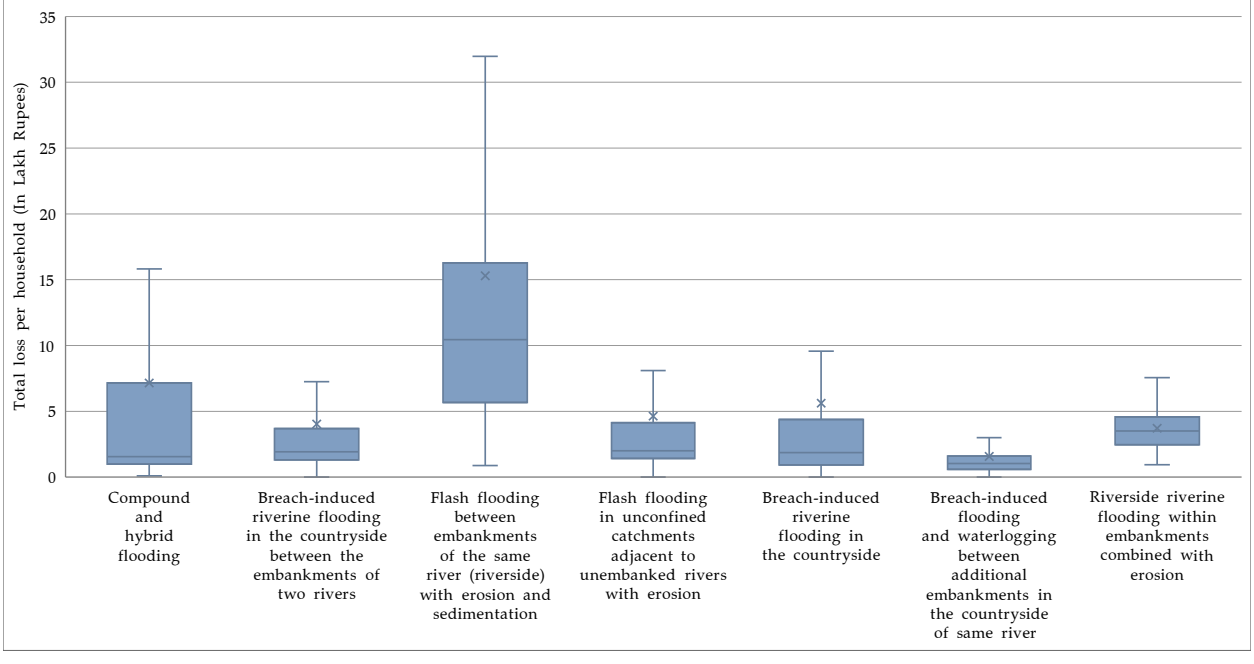


Figure 20 - Household loss by typology



Floods and siltation rendered this toilet unusable

Figure 21 shows how total losses were distributed across categories for different flood typologies. The three breach-induced typologies showed similar shares of housing damage at around 42-43%. Among the three, breach-induced riverine flooding in the countryside and breach-induced flooding and waterlogging between embankments of two river systems had nearly identical profiles, 18-20% of losses came from personal and household assets, 2.6-3.6% from WASH, 23.1-26.9% from land, about 2.4% from livestock, and 6.2-7.9% from agriculture

On the other hand, breach-induced flooding and waterlogging between additional embankments in the countryside of same river stood out for its unusual profile. It recorded the highest proportion of WASH-related losses among all typologies (14.3%), alongside elevated shares of personal and household asset losses (22.1%). It also showed the second-highest contributions from agriculture (13.6%) and livestock (5.6%) losses. In sharp contrast, land loss accounted for only 2%, the lowest share observed across all typologies. This concentration on household services and movable assets suggests a qualitatively different pattern of disruption.

Land losses were most pronounced under compound and hybrid flooding (63.9%) and flash flooding between embankments of the same river (riverside) with erosion and sedimentation (84.1%). However, the rest of the composition differed. Compound and hybrid flooding also included high housing damage (30.3%), with negligible values in other categories, reflecting extensive impacts on immovable assets. This is likely due to the highly destructive nature of the high velocity and compounded flow of floodwaters experienced in this typology. Flash flooding between embankments of the same river (riverside) with erosion and sedimentation, in contrast, exhibited the lowest housing losses across all typologies (9.4%), with agriculture (5.5%) as the only other significant category. The dominance of land-related loss helps explain why cumulative loss in this typology was exceptionally high despite its relatively limited representation in the sample. Land and housing losses also dominated the profile for flash flooding in unconfined catchments adjacent to unembanked rivers, again reflecting the destructive force characteristic of flash-flood flows. Land accounted for roughly one-third of total losses, while housing constituted more than half, the highest housing share observed across all typologies. Other categories of loss constituted only a marginal share of the overall profile.

For riverside flooding within embankments combined with erosion, the impact profile was distinctly multi-sectoral. Land loss (32.8%), agriculture (20.1%), losses to personal and household assets (19.6%), livestock (14.0%), and

housing loss (11.7%) were all significant. This dispersion across categories indicates that erosion-induced riverine flooding generated diverse and concurrent impacts, thereby increasing both the scale and complexity of the overall loss profile.

Figure 21 - Loss profile by typology

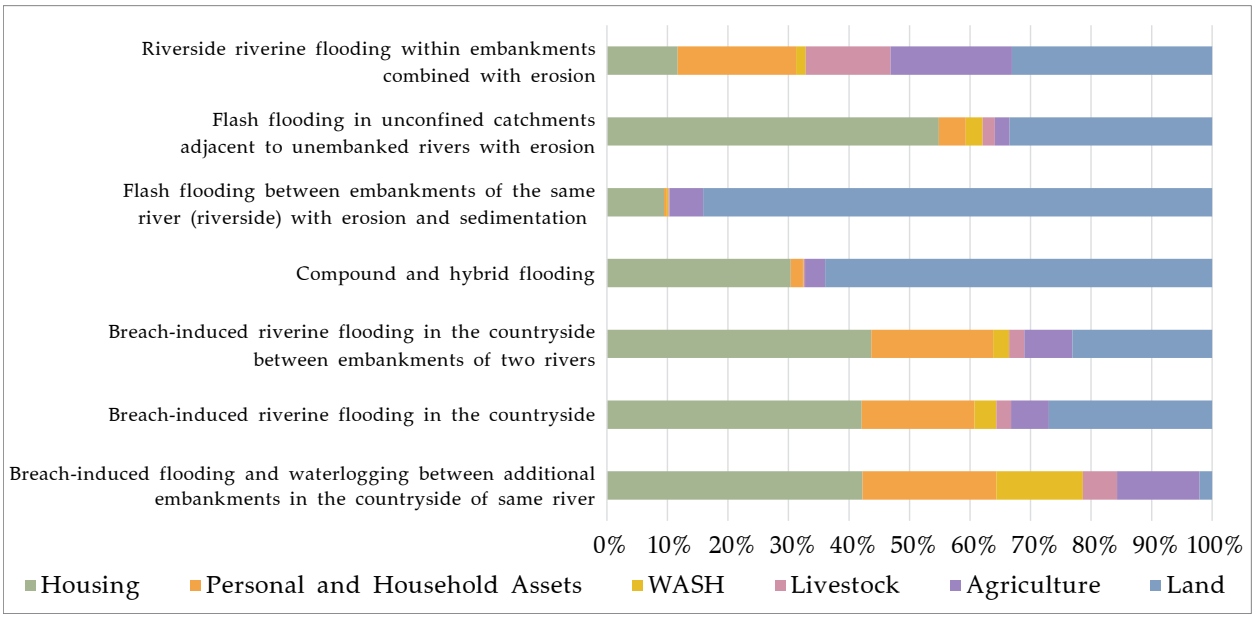


Table 7 presents a disaggregated analysis of total household-level loss across distinct flood typologies and spatial locations. It enables a comparative understanding of how different flood types manifest across varied geomorphic and infrastructural settings, such as between river systems, between or inside embankments, near rivers with or without embankments, and outside embankment zones. The objective is to capture the complete spatial footprint of each flood typology to inform a technically grounded interpretation of loss patterns.

Each typology demonstrates a unique spatial configuration, revealing how hydrological behaviour interacts with the built flood-control infrastructure and settlement patterns.

- Riverside riverine flooding within embankments combined with erosion represents a confined yet severe flood type, with 100% of losses occurring inside embankments. These events are driven by high river stages and hydraulic pressure that trigger both inundation and inner-bank erosion, leading to the loss of land, housing, and assets within supposedly protected corridors. This typology underscores that even areas inside embankments remain exposed to recurrent, localized hazards.
- Breach-induced riverine flooding in the countryside is spatially dispersed, with 12.7% of household losses between embankments, 1% on embankments, and 86.3% outside embankments. This spread suggests that while breach initiation points may occur along embankment lines, the damage extends deep into open countryside, especially in settlements which have been proclaimed as safe
- Flash flooding between embankments of the same river reflects a complex loss pattern. Owing to the interaction of three interconnected river systems, the embanked Bhutahi Balan, its old course, and the Bihul River located outside the embankment, losses were distributed across two spatial locations, 11.6% within the embankment and 88.4% outside. The higher concentration of losses outside the embankments corresponds to settlement patterns, with 19.4% of respondents residing inside the embankment and 80.6% outside. While in most other typologies the location of losses aligns closely with settlement distribution, Ramnagar presents an exception. Here, although most respondents lived outside the embankments, their agricultural landholdings were largely situated between

them. In this typology, more than 80% of total losses were land-related. Consequently, the distribution of total losses shown in the figure does not accurately represent where the most severe impacts occurred. The embanked area likely experienced greater losses, as sudden, short-duration inflows rapidly overwhelmed the confined space

- Breach-induced flooding and waterlogging between embankments of two river systems show an extreme spatial concentration, with 99.7% of household losses recorded between two separate embankments and 0.3% on embankments. This indicates that inter-embankment tracts, often drainage-saturated and hydraulically enclosed, bear the brunt of such events, suffering from prolonged inundation and water stagnation
- For breach-induced flooding and waterlogging between additional embankments in the countryside of same river system, losses were entirely concentrated outside embankment zones (100%), suggesting that the failure of inner embankments can displace risk beyond their intended protection perimeter
- Compound and hybrid flooding, which combines multiple hydrological processes affects multiple spatial locations simultaneously. Here, 35.3% of household losses occur between different river systems, while 64.7% occur near rivers without embankments, pointing to the complexity of overlapping water systems and the multidirectional flow of floodwaters in inter-connected basins
- Flash flooding in unconfined catchments adjacent to unembanked rivers – Information not provided

Together, these spatially disaggregated loss patterns highlight that embankments, while intended to contain rivers, also redefine the geography of risk. Areas between or near embankments endure high-intensity, waterlogged losses due to breaches and drainage impediments, while outside embankments, losses arise from widespread inundation caused by overflow and unregulated flow dispersal.

This typology-space interaction reinforces the need to move beyond generic flood categorization and adopt a location-sensitive interpretation of household losses. Understanding where and how specific flood types intersect with settlement patterns is essential for designing responsive mitigation, drainage improvement, and recovery strategies. It also demonstrates that structural interventions like embankments can redistribute rather than eliminate risk, making spatial diagnostics an indispensable part of flood-loss assessment and planning in Bihar's dynamic riverine landscape

Migration as a critical coping response to floods

Table 7 - Distribution of total loss across typologies by spatial location

Typology/Spatial locations	Outside embankment	On embankment	Near river without embankment	Inside embankment	Between two separate river embankments	Between different river systems
Riverside riverine flooding within embankments combined with erosion	NA	NA	NA	100%	NA	NA
Breach-induced riverine flooding in the countryside	87.88%	0.89%	NA	NA	11.23%	NA
Flash flooding between embankments of the same river (riverside) with erosion and sedimentation	88.41%	NA	NA	11.59%	NA	NA
Breach-induced flooding and waterlogging between embankments of two river systems	NA	0.29%	NA	NA	99.71%	NA
Breach-induced flooding and waterlogging between additional embankments in the countryside of same river system	NA	NA	NA	100%	NA	NA
Compound and Hybrid Flooding	NA	NA	64.67%	NA	NA	35.33%
Flash flooding in unconfined catchments adjacent to unembanked rivers	NA	NA	100%	NA	NA	NA

When the spatial locations are grouped into two broad categories, outside embankments and inside embankments, a clear pattern emerges. Areas outside embankments (including locations outside embankments, between two separate river embankments, and on embankments) together accounted for roughly ₹82.9 cr in losses, while settlements inside embankments recorded about ₹13.1 cr. This contrast shows how embankments often redistribute flood risk, creating concentrated pockets of vulnerability rather than reducing overall exposure. Respondents living near unembanked rivers and between different river systems reported losses of ₹26.3 cr and ₹6.3 cr, respectively, reflecting varied risk profiles across riverine settings.

Table 8 - Distribution of total loss across spatial locations

Spatial Locations	Total Loss (₹)	Percentage of Total Loss
Between different river systems	6,34,24,181	5.02%
Between two separate river embankments	27,75,57,385	21.97%
Inside embankment	13,07,36,797	10.35%
Near river without embankment	26,29,66,364	20.82%
On embankment	36,71,450	0.29%
Outside embankment	52,46,10,321	41.53%
Grand total	1,26,29,66,500	100%

6. District and Panchayat-level Summary of Losses

In Pashchim Champaran, the flooding was primarily breach-induced, accompanied by waterlogging between additional embankments in the countryside of the same river. Respondents considered these areas as effectively lying within the embankments. The survey covered two Panchayats from this District, Dakshini Patjirwa and Suryapur, encompassing six highly affected Wards with 115 households in the former, and two severely impacted Wards with 38 households in the latter. The total loss recorded across both Panchayats was ₹2.41 cr.

In Sitamarhi District, the flood typology prevalent during the 2024 floods was breach-induced riverine flooding in the countryside. The survey covered two blocks, Runisaidpur and Belsand. Within Runisaidpur Block, two Panchayats, Tilak Tajpur and Mahesha Farakpur, were included, covering four and nine affected Wards respectively, with 253 and 543 households. The combined losses in these two Panchayats amounted to ₹15.11 cr. In Belsand Block, four Panchayats, Chandauli, Jaffarpur, Kansar, and Sauli Rupauli, were surveyed, encompassing nine, seven, four, and two affected Wards respectively, with 147, 124, 69, and 37 households. The total losses across these four Panchayats were estimated at ₹18.42 cr. Overall, Sitamarhi District recorded total losses of ₹33.53 cr across 35 affected Wards.

In Darbhanga, the 2024 flooding was breach-induced riverine flooding in the countryside between the embankments of two rivers. Four highly impacted Panchayats in Kiratpur Block, Jamalpur, Khaisa Jamalpur, Kubol Dhanga, and Narkatiya Bhandara, were covered in the survey. These Panchayats encompassed three, six, two, and seven affected Wards respectively, with 59, 105, 32, and 128 surveyed households, totalling 324 households. The cumulative losses recorded across these four Panchayats amounted to ₹11.15 cr.

In Madhubani, the survey covered Ramnagar Panchayat under Phulparas Block, which experienced flash flooding between embankments of the same river (riverside), accompanied by erosion and sedimentation. The survey encompassed 10 affected Wards and 170 households. The total loss recorded in Ramnagar was ₹25.99 cr.

In Saharsa, the Phase 2 floods of 2024 were characterized as breach-induced riverine flooding in the countryside between the embankments of two rivers. The survey covered two Panchayats in Mahishi Block, Manovar and Ghonghepur, encompassing six and eleven affected Wards respectively, with 98 and 174 households, totalling 272 households. The total losses across these two Panchayats were ₹4.77 cr and ₹8.13 cr respectively, amounting to ₹12.90 cr across 17 Wards.

In Supaul, the dominant typology was riverside riverine flooding within embankments combined with erosion. The survey covered Dholi Panchayat in Sariagarh Bhaptiyahi Block, which had 10 affected Wards and 206 households. The total losses recorded in this Panchayat were ₹7.64 cr.

In Kishanganj, the dominant flood typology was flash flooding in unconfined catchments adjacent to unembanked rivers, accompanied by erosion. In Dighalbank Block, three Panchayats, Dhantola, Lohagada, and Pattharghatti, were surveyed, encompassing nine, eight, and four affected Wards respectively, with 144, 111, and 62 households, totalling 317 households. The combined losses across these three severely impacted Panchayats were estimated at ₹14.69 cr. In Thakurganj Block, flooding was compound and hybrid in nature, caused by the interaction of multiple water sources. Two Panchayats, Barchoundi and Dallegaon, were surveyed, each comprising eight affected Wards and covering 123 and 128 households respectively, totalling 251 households. Total losses in Thakurganj Block were valued at ₹17.55 cr. Overall, Kishanganj District recorded total losses of ₹32.63 cr across 37 affected Wards.

7. Coping Strategies during the Flood

To cope with the losses caused by the Phase 2 floods of 2024, households across the surveyed Panchayats adopted a range of strategies, spanning immediate, distress-driven responses to longer-term recovery measures. This section outlines these varied coping efforts and examines how different social groups navigated their recovery pathways, revealing the uneven capacities and constraints that shaped during and post-flood adaptation.

7.1. Key Coping Strategies During Floods

In Table 9, displacement emerged as one of the most widespread coping responses. Nearly 82% of respondents reported having to relocate often to embankments, schools, or elevated community spaces, as floodwaters inundated their homes.

Food insecurity was almost universal. An overwhelming 92% of households experienced a reduction in meal quantity during floods, while 84% survived primarily on food stocks stored beforehand. This underscores the precariousness of household food reserves and the absence of reliable emergency support systems.

Borrowing, both of food and money, served as critical lifelines. About 75% of affected families relied on relatives and neighbours for food assistance, reinforcing the centrality of social networks in times of crisis. Simultaneously, 67% were compelled to borrow cash from local moneylenders, often at high interest rates, revealing the economic strain that accompanies physical displacement.

Financial support from migration also played a significant role. Nearly 68% of respondents depended on remittances from family members working elsewhere, highlighting how migration functions as a safety net in the surveyed Panchayats.

Together, these strategies reflect a survival system sustained by social ties, informal credit, and prior preparation, yet one that exposes the fragility of livelihoods repeatedly tested by floods.

At the sharper end of the coping spectrum, households reported turning to distress-driven strategies such as migration and asset liquidation to survive the aftermath of flooding. Nearly half (45%) of all respondents experienced post-flood migration, an unmistakable signal of both the disruption caused by floods and the limits of local resilience. Migration, often temporary yet recurring, becomes a forced adaptation strategy rather than a choice, reflecting the absence of viable livelihood options during recovery periods.

While migration was common, the liquidation of physical and material assets, though less frequent, remains a powerful indicator of economic distress. About 35% of households reported mortgaging jewellery to meet urgent needs, demonstrating how personal valuables serve as the first line of financial recourse. Around 15% of families were compelled to mortgage or sell livestock, assets central to agrarian livelihoods and food security, signifying a serious erosion of livelihood buffers. The sale or mortgaging of land, considered the final and most desperate option, was rare (10% and 4%, respectively), yet each instance represents a deep, often irreversible blow to household stability and future income. The sale of jewellery, though reported by only 12%, similarly points to the depletion of emergency reserves among already strained families.

Taken together, these findings reveal a layered hierarchy of coping mechanisms. Households first attempt to reduce consumption and draw on food stocks, then depend on social support, borrowing, and remittances. When these mechanisms are exhausted, migration and asset liquidation emerge as last resorts. The progression from subsistence adjustments to distress-driven measures reflects not only the severity of flood-induced shocks but also the structural inadequacy of formal relief and recovery systems. Each successive coping step marks a deepening of vulnerability, underscoring the urgent need for more resilient and equitable mechanisms to support flood-affected populations.

Table 9 - Distribution of household level responses for possible coping strategies

Strategy	Yes (%)	No (%)	Net Yes (%)
During the floods, was it necessary to relocate to temporary accommodation?	82	13	87
Were meals reduced during the floods?	92	5	95
Relied on stored household food stocks, as agricultural activities were suspended during the floods?	84	9	91
Did the migration increase after the floods?	45	49	48
During the floods, did household rely on remittances sent by migrant family members?	68	25	73
During the floods, was it necessary to borrow money from local moneylenders?	67	28	71
During the floods, was it necessary to mortgage land?	10	84	10
During the floods, was it necessary to mortgage livestock?	15	78	17
During the floods, was it necessary to sell land?	4	88	4
During the floods, was it necessary to sell livestock?	15	78	16
During the floods, was it necessary to borrow food from relatives?	75	20	79
During the floods, was it necessary to sell jewellery?	12	82	13
During the floods, was it necessary to mortgage jewellery?	35	58	38

7.2. Social Dimensions of Coping Strategies

Table 10, showcases the marginalized communities faced significantly greater hardships and resorted to more severe coping mechanisms during floods. The ST community reported the highest rates of distress sales and mortgages, with 36% mortgaging land, 56% mortgaging livestock, 57% selling livestock, and 58% selling jewellery. These figures reflect the scarcity of resources and limited options available to ST households, compelling them to liquidate essential assets to cope with flood impacts. It is important to note that in the Phase 2 flood assessment, the respondents from the ST community were only found in Kishanganj District. Hence, the overall sample size of the ST respondents was relatively small (n = 61). A smaller sample size typically increases the margin of error, therefore, the findings might be interpreted as indicative rather than representative.

Similarly, the SC community experienced acute food insecurity and financial strain, with 89% borrowing food from relatives and 80% resorting to loans from moneylenders. These high reliance rates indicate fragile support systems and indicate a heavy dependency on informal networks during crises.

Other groups such as BC1, BC2, and the EWS also exhibited significant vulnerabilities, with high percentages facing food shortages (91-92% relying on stocked food) and needing temporary accommodations during the floods (75-91%). The GEN category faced considerable challenges, including high dependence on remittances (82%) and borrowing from moneylenders (62%).

Overall, the data reveals stark disparities in flood vulnerability and coping capacity across social groups. Marginalized communities generally possess fewer assets and weaker safety nets, leading to more drastic coping strategies that jeopardize long-term resilience. In contrast, even relatively better-off households experience hardship but tend to rely more on remittances and less on distress sales of critical assets. These patterns emphasize the need for targeted support and recovery programs that address both immediate needs and the deeper structural inequalities shaping vulnerability.

Table 10 - The differential adoption of coping strategies across various social groups including in percentage (%)

Strategy	BC1	BC2	EWS	GEN	SC	ST
During the floods, was it necessary to relocate to temporary accommodation?	87	75	91	90	93	100
Were meals reduced during the floods?	97	91	96	98	95	79
Relied on stored household food stocks, as agricultural activities were suspended during the floods?	91	86	92	88	95	89
Did the migration increase after the floods?	57	48	12	39	51	34
During the floods, did household rely on remittances sent by migrant family members?	76	54	76	82	83	53
During the floods, was it necessary to borrow money from local moneylenders?	68	71	78	62	80	76
During the floods, was it necessary to mortgage land?	7	10	7	15	14	36
During the floods, was it necessary to mortgage livestock?	13	22	3	17	18	56
During the floods, was it necessary to sell land?	4	6	1	3	4	24
During the floods, was it necessary to sell livestock?	14	23	11	11	15	57
During the floods, was it necessary to borrow food from relatives?	73	77	87	77	89	90
During the floods, was it necessary to sell jewellery?	10	16	15	8	10	58
During the floods, was it necessary to mortgage jewellery?	26	39	53	47	42	77

Nearly 80% of surveyed households reported having no knowledge of flood insurance or financial risk-transfer mechanisms, while only about 20% were aware of such options. This substantial divide in awareness means the majority remain unprotected, bearing the full cost of recovery and reconstruction themselves after flood events. The stark lack of knowledge points to broader challenges, including limited outreach, societal barriers, and low levels of engagement with formal financial institutions in many communities.

In summary, the Phase 2 floods of 2024 exposed widespread food insecurity, displacement, and heavy reliance on borrowing and remittances among households. Marginalized groups faced harsher impacts, often resorting to distress asset sales and increased migration. The low awareness of flood insurance further exacerbates vulnerability.

8. Vulnerability Assessment Framework

The analysis and interpretation of the findings of the household-level flood loss survey demonstrated that a narrow focus on economic damage fails to capture the true depth of vulnerability. The households with the greatest pre-existing susceptibility often appear to have 'less at risk' when, in fact, they have everything to lose. This section addresses this gap by proposing a framework that redefines vulnerability beyond absolute economic metrics. Instead of relying on a weighted additive index, this framework adopts a multiplicative vulnerability ratio to capture interactions between dimensions rather than treating them as simple sums. This approach more accurately reflects the vulnerability paradox, wherein households with fewer assets appear to have lower exposure but are, in fact, far more vulnerable due to weak adaptive and coping capacities. The formulation

$$V = \frac{Exposure \times Sensitivity}{Adaptive\ Capacity \times Coping\ Capacity}$$

ensures that low adaptive or coping capacity exponentially increases vulnerability, while high capacity meaningfully reduces it.

Such mathematical modelling is essential as it transforms complex, qualitative socio-economic realities into a quantifiable and comparable index. This ensures that interventions are both equitable and effective by enabling the systematic identification and prioritization of the households that are genuinely most vulnerable. The following framework synthesizes hazard, socio-demographic, spatial, and institutional data into a robust template that can be adapted based on data quality and availability.

8.1. Vulnerability Assessment Matrix

Drawing on indicators identified in the household-level flood loss survey, as well as additional relevant factors, this framework organises vulnerability into four key dimensions: exposure, sensitivity, adaptive capacity, and coping capacity. Together, these dimensions encompass the conditions that heighten a household's susceptibility to flood impacts. Each dimension has components that are assigned a specific weight, as illustrated in Figure 22. Tables 11 to 14 translate the conceptual framework into an operational matrix, enabling each vulnerability dimension to be assessed through clearly defined components and indicators

Figure 22 - Vulnerability assessment framework

8.1.1. Exposure Dimension

Exposure, captures the degree to which a household is physically exposed to flood hazards.

Table 11 - Exposure matrix

Component	Indicator	Value Categories	Data Source	Weight
Spatial Location	Distance/ relation to embankments and rivers	Between two separate embankments; Outside embankments; Near river without embankment; Inside embankment; Between different river systems; On embankments	Global Positioning System (GPS) coordinates and flood typology mapping	0.3
Housing Type	Construction material & structural vulnerability	Kucha house; Semi-pucca house; Pucca house	Housing survey and vulnerability assessment	0.25
Flood Duration	Days of inundation and persistence	Duration normalized against maximum duration observed	Flood duration mapping and household reports	0.25
Flood Typology	Flood type severity and complexity	12 typologies	Enhanced typology framework with four new types	0.2

8.1.2. Sensitivity Dimension

Sensitivity, reflects inherent household characteristics that heighten impact when exposed to floods.

Table 12 - Sensitivity matrix

Component	Indicator	Value Categories	Data Source	Weight
Demographics	Dependency ratio and family composition	Dependency ratio	Demographic survey data	0.25
Social Group	Caste/ social category vulnerability	ST/SC/EWS/BC1/ BC2/GEN	Social group analysis and coping strategies	0.3
Gender	Gender of household head and vulnerability	FHH/MHH	Gender-disaggregated analysis	0.25
Economic Status	Asset ownership and loss patterns	Low / Medium / High	Economic loss assessment and asset inventory	0.2

8.1.3. Adaptive Capacity Dimension

Adaptive Capacity, represents the longer-term ability of households to adjust, reorganise, and reduce future risk.

Table 13 - Adaptive capacity matrix

Component	Indicator	Value Categories	Data Source	Weight
Education	Educational attainment and capacity	Secondary education or higher; Primary or literate only; No formal education	Education profile analysis	0.3
Assets	Land housing livestock value and diversification	Low / Medium / High	Comprehensive asset assessment	0.25
Income Diversity	Income source diversity and stability	Single / Limited / Diverse	Livelihood analysis and earning patterns	0.25
Social Networks	Remittance access and social capital	Weak / Moderate / Strong	Remittance dependency and network analysis	0.2

8.1.4. Coping Capacity Dimension

Coping Capacity, captures the resources and support systems that enable households to withstand and recover from shocks.

Table 14 - Coping capacity matrix

Component	Indicator	Value Categories	Data Source	Weight
Financial Access	Insurance/credit access and financial inclusion	No Access / Limited / Adequate	Insurance awareness and formal finance access	0.25
Institutional Support	Government support access and effectiveness	Inadequate / Moderate / Adequate	Relief access and institutional response analysis	0.2
Community Support	Social capital strength and networks	Weak / Moderate / Strong	Community networks and mutual support analysis	0.3
Recovery Capacity	Post-disaster rebuild and recovery capacity	Slow / Moderate / Fast	Recovery time and capacity assessment	0.25

Each indicator is scored on a 0-1 scale, where higher values reflect higher vulnerability. Scores are assigned based on the Value Categories listed in the tables. For instance, a kucha house would receive a high score (e.g., 0.9), while a pucca house would receive a low score (e.g., 0.1). Similarly, a household with no access to formal credit or insurance would receive a high coping-capacity score (e.g., 0.9), whereas a household with active insurance or credit access would

receive a lower score (e.g., 0.2). These examples illustrate the scoring logic; the full scoring rubric can be adapted as needed depending on data availability and operational requirements. The scores for each component are then multiplied by their respective weights within each dimension, summed to form a dimension score.

8.2. Mathematical Expression of Vulnerability

Upon calculating the normalized scores for each dimension from the weighted matrix, the overall Vulnerability Index (V) can be computed.

$$V = \frac{Exposure \times Sensitivity}{Adaptive\ Capacity \times Coping\ Capacity}$$

This formula is designed to address the vulnerability paradox. Exposure and Sensitivity are the drivers of potential impact. A high score in either increases the numerator of the overall risk, reflecting greater inherent susceptibility. Adaptive Capacity and Coping Capacity, on the other hand, are the buffers. Their placement in the denominator captures their mitigating effect. Stronger capacities reduce vulnerability by counterbalancing high exposure or high sensitivity.

For instance, a household may have only moderate exposure or sensitivity but extremely limited adaptive and coping capacity. When Adaptive Capacity and Coping Capacity are very low, the denominator shrinks, producing a high V score. This mirrors real-world situations where losses that are small in absolute terms still become catastrophic for the most marginalized households because their buffers are inadequate or absent. The resulting values allow households to be ranked and classified for targeted support, ensuring that vulnerability is interpreted not only by the scale of loss but by the capacity to withstand and recover from it.

9. Community-Derived Priorities – Towards Integrated, Multi-Domain Resilience

A careful analysis of household-level responses reveals that flood-affected communities articulate a sophisticated and deeply contextualized vision of flood resilience, one that sharply transcends the limitations of conventional, infrastructure-centric flood management paradigms. Rather than seeking isolated or sector-exclusive solutions, respondents consistently demonstrated a systems-thinking approach, emphasizing the need for coordinated, multi-sectoral interventions spanning the physical, social, economic, and institutional domains.

9.1. Relational Risk Perception and Multi-Layered Demands

Survey findings establish that community expectations are fundamentally interwoven across domains of loss and adaptation. Respondents framed their needs within a resilience cluster model, where the safeguarding of shelter, assets, and livelihoods was inseparable from the maintenance of public services, community infrastructure, health, and social equity. Within this framework, communities envisioned flood resilience as an ongoing co-production, requiring the alignment of state support, local agency, and adaptive innovation.

9.2. Comprehensive Physical and Infrastructure Solutions

Demand for resilient private housing goes beyond flood-proofing houses in a technical sense. Households called for elevation of structures, use of flood-resistant materials, retrofit and maintenance incentives, and, where necessary, policies facilitating strategic relocation from high-hazard zones. Proposals for asset protection were similarly multi-level, encompassing the household (elevated platforms, waterproof storage), the community (shared storage, resilient community infrastructure), and critical public services (elevated and solar-backed sanitation and water supply nodes).

Forty-seven articulated interventions, systematically categorized under eleven thematic clusters, demonstrated communities rejection of single-point interventions. Instead, populations demanded synergistic clusters spanning resilient housing, asset safeguarding, inclusive and robust public infrastructure, reliable energy, and layered livelihood protection.

9.3. Diversified Livelihood and Risk Mitigation Strategies

Agrarian and livestock-dependent populations highlighted the extreme precarity caused by small, fragmented landholdings and recurrent crop destruction. Their recommended adaptation measures were comprehensive, which included adoption of diversified, flood-tolerant cropping regimes; Targeted agricultural credit and insurance; Post-flood compensation frameworks; Timely dissemination of agromet advisories; Riverbank protection; And mechanisms for equipment access. Livestock safeguarding was treated as both a rescue operation (elevated livestock shelters, fodder management) and a pre-emptive, health-focused agenda (mandatory vaccination, rapid veterinary response).

Households further recognized that income security necessitates opportunities beyond farm-based livelihoods. Priorities were set on skilling, micro-entrepreneurship, access to emergency credit, and mechanisms for organized, safe migration. These requests reflects an acute awareness of the intersectional vulnerabilities produced by unplanned migration and limited non-farm absorption capacity in rural labour markets.

9.4. Health Security and Gendered Dimensions of Resilience

Communities' health-related demands were both practical and attuned to structural exclusion. Central to their expectations were the decentralized delivery of mobile medical services, prepositioned medical commodity stocks, and surge capacity for health and nutrition relief to women, children, elders, and PwDs during crisis events. Gender justice was explicit, with specific demands for menstrual hygiene products, safe sanitation, nutrition support for pregnant and lactating women, and gender-responsive health infrastructure. This reflects the lived experience of cumulative gender and disability-related disadvantages across successive flood events.

9.5. Social Equity, Early Warning, and Institutional Decentralization

Flood-affected populations insisted on a disaster response architecture that is both decentralized and participatory. They called for local volunteer rescue teams, democratized decision-making spaces, and community-driven preparedness strategies. Early warning systems are required to address digital divides, hence, a combination of digital alerts, public loudspeaker networks, interpersonal outreach, and community-managed warning infrastructure was advocated to maximize last-mile inclusiveness. These preferences reflect an empirically grounded distrust in centralized one-size-fits-all communication and response mechanisms.

9.6. Schematic Synthesis and Conceptual Implications

What emerges is a paradigm shift, the surveyed households rejected infrastructural determinism and proposed instead a layered, people-centered model of disaster resilience. Their articulated priorities, categorized across clusters such as resilient housing, community safety, healthcare delivery, livelihood diversification, public infrastructure, and gender-specific health, define a holistic, socially embedded agenda for flood management policy and practice.

The evidence underscored the need for policy frameworks and programmatic interventions that moved beyond the correction of infrastructural deficits towards the facilitation of locally adapted, multi-sectoral, and equity-sensitive resilience systems. It was not simply that people wanted more, they wanted interventions that reflected the complexity and intersectionality of their lived realities, and that strengthened both collective and individual adaptive capacities over the entire flood-management cycle. Future recovery and resilience efforts must build on the community's own understanding of losses, needs, and their interconnections within the recurring flood context of North Bihar.

10. Conclusion

The analysis in this chapter shows that flood vulnerability in North Bihar stems from a complex and diverse set of factors, each exerting its own influence while also converging to amplify risks. Quantitative assessments reveal a highly skewed loss profile, with catastrophic impacts on land and housing, while detailed qualitative insights and disaggregated data underscore how marginalized communities, especially the SCs, STs, and FHH, are disproportionately affected both in terms of relative loss and erosive coping strategies. Resilience, therefore, cannot be reduced to infrastructure repair or cash compensation alone.

Importantly, the chapter establishes that affected communities possess an acute awareness of their interlinked risks and articulate a comprehensive vision for resilience that transcends narrow, sector-specific interventions. Their expectations span from structural adaptation of dwellings and public services to innovations in agricultural practice, diversified livelihood opportunities, decentralized health and flood response, inclusive early warning dissemination, and tailored social protection. This holistic, community-informed agenda directly challenges and extends conventional flood management paradigms still cantered on engineering and relief distribution.

By centering household and community experience, the chapter makes clear that future recovery planning, flood resilience and compensation policies in Bihar must be grounded in granular, vulnerability-weighted approaches, capable of capturing the true breadth of loss and the complexity of resilience needs. Linking local evidence to policy development will be critical for enabling equitable allocation of resources, fostering community agency, and building sustained resilience to recurrent flooding in the region.

CHAPTER 6

Community Perspectives and Institutional Reflections

1. Context and Rationale

Vulnerability, as defined in the Intergovernmental Panel on Climate Change's (IPCC) Third Assessment Report, is determined not only by exposure to hazards but also by sensitivity and adaptive capacity, factors influenced by social group, class, gender, disability, land ownership, and social capital (IPCC, 2001). In Bihar, these socio-economic inequalities are deeply entrenched, shaping how communities experience and respond to floods. Recognizing these complexities, the assessment employed a mixed-methods approach that went beyond the household-level survey to incorporate participatory consultative methodologies, emphasizing situated knowledge and lived experience to capture the nuanced realities of flood-affected communities.

2. Forms of Consultation

The process began with RVs, which allowed the assessment team to verify flood impacts, evaluate site accessibility, build trust with PRI representatives, and refine Panchayat and Ward selection. This early engagement also revealed flood typologies and thematic priorities.

PFMs were valuable for recognising the epistemic authority of affected communities to map inundation pathways, breached embankments, blocked escape routes, degraded farmlands, and public infrastructure locations. Communities negotiated spatial memories to produce maps capturing impacts often missed by satellite imagery or official reports. This community-led mapping created what Holloway (2003) calls an "epistemic bridge" between lived experience and policy-making, challenging the neutrality of purely technocratic assessments.

Thereafter, FGDs explored flood impacts on agriculture, health, sanitation, livelihoods, education, public services, and psychosocial well-being, with facilitators ensuring inclusion of women, adolescents, elderly, and PwDs.

KIIs added institutional depth, bringing together insights from government officials and civil society actors to provide a nuanced account of existing flood management approaches and paradigms.

Community consultation in Kansar Panchayat, Sitamarhi District, where villagers collectively map and discuss flood impacts

3. Participatory Flood Mappings and Focus Group Discussions

As part of the 2024 Household-Level Flood Loss Assessment, PFMs and FGDs were conducted in 10 Panchayats across seven Districts. Grounded in Haraway's (1988) situated knowledges, these exercises aimed to foreground the experiences of those most affected by floods, often excluded from formal disaster governance, and to legitimize local knowledge over technocratic approaches. Consistent narratives across 10 Panchayats highlighted systemic vulnerabilities shaped by marginalisation, infrastructure deficits, and institutional exclusion (Cutter, Boruff, and Shirley, 2003).

These participatory methods positioned communities as active collaborators in risk identification and resilience-building rather than passive recipients of aid (Vasileiou et al., 2022). By centering local knowledge, they support a shift from top-down disaster management to context-specific, inclusive strategies that can inform institutional reform and effective flood risk governance (Ogra, 2025). Ultimately, integrating PFMs and FGDs was both a methodological and political necessity.

Table 15 - List of Panchayats where FGDs and PFMs were conducted

District	Block	Panchayat	Most Affected Wards
Pashchim Champaran	Bairiya	Suryapur	Wards - 7 and 8
Sitamarhi	Runisaidpur	Mahesha Farakpur	Wards - 1, 3, 6, 8, 9, 10, 12, 13 and 14
Sitamarhi	Belsand	Kansar	Wards - 1, 10, 11, 12 and 10
Darbhanga	Kiratpur	Narkatiya Bhandara	Wards - 1, 2, 3, 4, 5, 6 and 7
Madhubani	Phulparas	Ramnagar	Wards - 4, 5, 6, 7, 8, 11, 12, 13, 14 and 15
Saharsa	Mahishi	Manovar	Wards - 1, 2, 3, 4, 5 and 6
Supaul	Saraigarh Bhaptiyahi	Dholi	Wards - 1, 4, 5, 7, 8, 9, 10, 11, 12 and 13
Kishanganj	Thakurganj	Dallegaon	Wards - 1, 2, 3, 5, 6, 8, 9 and 10
Kishanganj	Dighalbank	Lohagada	Wards - 1, 2, 3, 4, 7, 8, and 9
Kishanganj	Dighalbank	Dhantola	Wards - 3, 5, 6, 9, 10, 11, 12, 15, and 16

4. Synthesis of Findings Across Panchayats

Drawing on qualitative data from PFMs and FGDs, the participatory exercises produced both Panchayat-specific insights and a consolidated understanding of flood-affected villagers' lived realities and situated knowledge. The findings are synthesised below under six broad themes, which foreground locally relevant contexts and enable analysis across Panchayats. Each theme is further divided into subthemes to capture the main areas of community experience and observation.

4.1. Flood Preparedness and Early Warning

This theme examines the availability and effectiveness of early warning systems, the state of institutional preparedness, and the extent of Panchayat-level readiness prior to the floods as articulated by the flood-affected communities. Pre-flood measures and sufficient lead time are critical to lessen impact, yet community accounts revealed a reliance on ad hoc responses rather than systematic, well-coordinated preparedness

- Early Warning – The lead time for flood warnings across the Panchayats was very limited, often confined to a single day before the onset of flooding, as seen in Suryapur and Kansar. Early warnings were also issued in other locations, including Mahesha Farakpur, Narkatiya Bhandara, Manovar, and Lohagada. However, the anticipated preparedness measures, such as pre-positioning of boats, stocking essential food and drinking water, arranging medicines, and deploying medical personnel, were not carried out. Consequently, despite receiving advance alerts from the District Administration, the Panchayats remained without basic services when the floods struck
- Institutional Preparedness – Despite all 10 Panchayats being situated in highly flood-prone geographies, institutional preparedness was critically inadequate or, in some cases, virtually absent. Pre-flood preparations outlined in the Government of Bihar's standard operating procedure (SOP) for flood management appeared to have been rarely, if ever, fully implemented. These include the identification and preparation of safe evacuation routes and shelters, arrangement of relief camps, conduct of mock drills, stocking of essential items such as food, fuel, and fodder, and training of local task force and PRI members in flood management and emergency response. Consultations revealed that, in practice, local task forces had been formed only in Narkatiya Bhandara and Dholi. Designated flood shelters and relief camps were operational only in Narkatiya Bhandara, Dholi, Manovar, and Mahesha Farakpur. Cattle shelters, essential for protecting livestock during floods, were arranged solely in Dhantola. Community training and mock drills had not been conducted in any of the 10 Panchayats prior to the monsoon season

Table 16 - Government of Bihar's standard operating procedure for flood management

Phase	Key Activities (Grouped for Clarity)
1. Pre-Flood Preparedness	Monitoring and Planning - Repair rain gauges, transmit data, map flood-prone areas/resources, develop contingency plans for crops/departments
	Operational Setup - Form task forces & rescue teams, depute supervisors/nodal officers, activate control rooms, establish communication plans, train stakeholders
	Infrastructure and Logistics - Protect embankments, repair roads, identify shelters, pre-position boats/life jackets, clear pending payments for boats/sailors
2. During Flood Response	Emergency Operations - Issue early warnings, deploy boats, conduct damage assessment, evacuate population, coordinate National Disaster Response Force (NDRF)/Army/Air Force support, manage embankment breaches
	Essential Services - Provide healthcare (human/animal), care for pregnant mothers, restore water/hand pumps, arrange animal feed, dispose of bodies/carcasses
	Coordination and Relief - Hold regular task force meetings, manage relief camps, process ex-gratia payments, engage NGOs/communities, handle media/grievances, submit daily reports, prepare fund requests
3. Post-Flood Actions	Relief Distribution - Distribute gratuitous relief, assess total damage, provide farmer loans/ insurance, maintain relief camps, pay ex-gratia grants
	Restoration and Review - Reconstruct damaged infrastructure, prevent epidemics, submit final report, provide utilization certificates, document lessons learned
4. Long-Term Reconstruction	Area Rehabilitation - Rehabilitation of erosion victims, long-term reconstruction of flood-affected zone

Note - Data summarized from Government of Bihar. (n.d.). Standard Operating Procedures for Flood Management. Disaster Management Department, Bihar

- Panchayat-level Readiness – Only engaged locals from Suryapur reported taking measures such as stockpiling grains before the floods. This was likely prompted by the heightened anxiety the community described around

potential embankment breaches ahead of each monsoon season. An insight emerged from discussions with residents of Mahesha Farakpur, the construction of an embankment in 2008 had inadvertently led to a decline in community preparedness, making the population more vulnerable to sudden breaches and rapid-onset floods. Participants from Dallegaon, Manovar, and Ramnagar consistently noted that a combination of sudden onset, severe flood intensity, and inadequate lead time prevented households from making timely relief preparations

4.2. Hazard Context and Exposure

This theme captures the environmental and structural factors that heightened vulnerability and shaped the severity of impacts during the 2024 floods. The findings highlight how geography, river morphology, and human interventions such as embankments and drainage systems directly influenced flood patterns and community exposure.

- Embankment-Driven Risks – In several Panchayats, embankments designed as protective barriers instead became major sources of flooding due to breaches. Suryapur, located in the countryside of the River Gandak and confined between additional embankments in the countryside of same river, was inundated when the PD Ring Bandh failed. Kansar, situated in the countryside of Bagmati and Manushyamara Rivers, and Narkatiya Bhandara and Manovar, both positioned between embankments of the Rivers Kosi and Kamla Balan, similarly experienced destructive flooding triggered by embankment failures. Each Panchayat, though located in the countryside generally considered a flood-free zone of these embanked rivers, experienced severe flooding in 2024. Ramnagar, spread across both countryside and riverside areas (along the Bhutahi Balan River), faced vulnerabilities on multiple fronts. While Dholi, confined between embankments of the Kosi River, suffered from restricted river flow that raised flood levels and caused extensive inundation alongside significant erosion
- Drainage Congestion – Prolonged water congestion emerged as a critical hazard in many Panchayats, driven by blocked channels, inadequate drainage infrastructure, and the loss of natural wetlands. In Suryapur, limited syphons and culverts along the Champaran Bandh obstructed the outflow of floodwaters. In Mahesha Farakpur, poorly planned internal roads and a faulty drainage network impeded the flow of flood and rainwater, resulting in prolonged waterlogging. The situation was further aggravated by the disappearance of ponds and wetlands that once served as natural retention basins. Consequently, surface runoff remained unabsorbed, even when the area was submerged during the 2024 floods. Kansar faced prolonged stagnation as surrounding embankments of the Bagmati and Manushyamara Rivers trapped flows. In Ramnagar, the Bhutahi Balan embankment blocked the natural flow of water from the countryside toward the river, while Lohagada, particularly in low-lying Wards, endured persistent water stagnation due to inadequate outflow systems. These conditions prolonged inundation, damaged cultivable land, and heightened the risk of waterborne disease outbreaks
- Erosion – Severe riverbank erosion during the September 2024 floods devastated Ramnagar, Dholi, Dallegaon, and Lohagada, leading to large-scale losses of homestead and farm lands. In Ramnagar, sections within the Bhutahi Balan embankments experienced massive erosion, destroying cropland and houses along the riverbank. In Dholi, releases from the Kosi Barrage intensified river levels and scouring, eroding both fields and settlements. In Dallegaon and Lohagada, unregulated flows led to further land loss, displacement, and economic vulnerability. Across these Panchayats, recurrent erosion has repeatedly undermined livelihoods, housing security, and community resilience
- Multi-River Dynamics – Panchayats such as Dallegaon, Dhantola, and Lohagada faced compound flooding due to the convergence of both small and large raging rivers. Ramnagar too was especially impacted by the combined flows of the old Bhutahi Balan channel and Bihul rivers, in the countryside. cross-border hydrology continues to exacerbate these risks. Heavy rainfall in Nepal's upstream catchments frequently triggers sudden surges in discharge, which combine with local flows to intensify downstream flash flooding. The interaction of these transboundary rivers raises water levels abruptly and accelerates inundation, creating unpredictable hazards that communities struggle to anticipate or withstand

4.3. Damage to Housing, Agriculture, and Livestock

At the onset of floods, the most immediate and widespread impact to livelihoods arises from the destruction of settlements, livestock, and agricultural land. This theme captures the scale and nature of damage, the disruptions to income sources, and the cascading effects on future livelihood security

- Housing and Settlements – In Mahesha Farakpur, approximately 100 houses were reportedly completely destroyed, with over 200 partially damaged. Huts were particularly vulnerable to damage, as evidenced in Kansar, Narkatiya Bhandara, Manovar, Dholi, Dallegaon, and Dhantola. Hundreds of huts were damaged in Manovar, while nearly 25 percent of all huts in Dholi were reportedly fully destroyed. There was large-scale displacement of the villagers in Dholi due to the floods and the consequent land erosion. Similarly, in Lohagada, families from several Wards faced prolonged displacement, in some cases lasting nearly three months. While all households located in flood-prone areas face vulnerability to flooding, the impact is invariably more pronounced among landless families and economically marginalized groups, who lack the financial buffers necessary to cope with the demands of recovery.
- Agriculture – According to preliminary inputs from PRI representatives, both harvested produce and standing crops were extensively damaged across all 10 Panchayats. In each of the Panchayats, Mahesha Farakpur, Narkatiya Bhandara, Manovar, and Dholi, over a thousand acres of paddy were destroyed. Additionally, an estimated 50 to 60 irrigation pump sets were lost in Mahesha Farakpur. Flash floods in Ramnagar and Lohagada Panchayats, and a riverine flood in Dallegaon Panchayat, caused severe farmland erosion. Similar erosion was observed in Dholi, where riverside riverine flooding within the embankments resulted in the loss of hundreds of acres of paddy fields. Manovar and Narkatiya Bhandara, both affected by the breach in Kosi's western embankment, experienced substantial sedimentation. This sediment buildup impacted the land quality and cultivability considerably delaying the sowing of Rabi and subsequent seasonal crops,. The vast crop damage combined with reported erosion and sedimentation indicates both immediate loss of harvests and long-term impacts, hindering future agricultural productivity and recovery efforts.
- Livestock – Due to the sudden arrival of floods and the absence of safe cattle shelters, livestock suffered heavily in Suryapur, Mahesha Farakpur, Narkatiya Bhandara, Dholi, and Lohagada. According to the respective PRI representatives, Dholi alone is estimated to have lost over one thousand animals, while Lohagada documented the death of approximately one hundred livestock. Farmers in Mahesha Farakpur faced additional economic strain from having to purchase cattle feed, as their wetland, which provided the fodder had been submerged. Villagers of Narkatiya Bhandara described how the lack of arrangements for fodder, water, medical treatment, and shelter led to many cattle, falling ill, or dying due to inadequate care.

4.4. Disruption of Essential Services

This theme examines the condition and functionality of infrastructure and basic services during the flood period, including evacuation and shelter arrangements, drinking water, sanitation, food availability, healthcare, education, and roads. It considers administrative efforts, community-led adaptations, and informal mechanisms, as well as the impacts on vulnerable groups, who face heightened risks and barriers to safety and recovery. Wherever possible, based on the availability of information, the condition of these systems before and after the floods were examined within the subthemes

- Evacuation and Shelter Arrangements – Across all 10 Panchayats, submerged or damaged roads had hindered movement, and subsequently evacuation. Residents consistently described an absence of institutional support. For instance, government boats or emergency transport were unavailable in most Panchayats, and designated flood shelters existed only in Mahesha Farakpur, Narkatiya Bhandara, Manovar, and Dholi. Evacuations were largely self-organised. Panchayats such as Narkatiya Bhandara, Dholi, and Dallegaon depended on a limited number of

private boats, while residents in Ramnagar and Kansar used improvised flotation devices like banana stems and tied tubes. Displaced families across Panchayats took shelter on embankments, rooftops, schools, or roadsides, while informal hubs like Mahesha Farakpur's Kwahi Chowk and pucca homes in Kansar provided some refuge. In Kansar, some residents even reported climbing trees for shelter. In Dholi, engaged locals emphasised a deliberate effort to remain united as a community for mutual support. Here, male members actively assisted vulnerable families by facilitating evacuations and delivering essential supplies during the floods. While these informal efforts played an instrumental role in providing relief, they also spotlight the vulnerability of those without access to any informal or formal safety nets. Elderlies and PwDs faced significant mobility challenges, making makeshift evacuation and shelter arrangements difficult or impossible to use. For women and children, sheltering in open, public spaces heightened risks to personal safety

- Drinking Water Supply – Prior to the 2024 floods, Functional Household Tap Connection schemes, such as Har Ghar Nal Ka JalYojana, were operational in the Wards of Mahesha Farakpur, Kansar, Ramnagar, Narkatiya Bhandara, Manovar, Dholi, Dallegaon, and Lohagada Panchayats. However, several residents reported that these schemes were only partially functional or had limited coverage, particularly in Ramnagar, Dholi, Narkatiya Bhandara, Dallegaon, and Lohagada. In Dhantola, they were entirely non-functional. During the floods, pipelines and related infrastructure were damaged, while submersion rendered handpumps unusable, except those on elevated platforms. Government responses were minimal, with clean water provided only in Narkatiya Bhandara. Elsewhere, residents relied on distant handpumps (Suryapur, Mahesha Farakpur, Ramnagar, Manovar), boiled unsafe river water (Kansar, Lohagada), or received water brought in from less-affected areas (Dholi). Drinking water infrastructure was not fully restored after the floods at the time of the FGDs, with pipeline repairs carried out only in Suryapur and Kansar, and handpump repairs only in Suryapur and Mahesha Farakpur. In many Panchayats, including Ramnagar, Manovar, Dallegaon, Dhantola, and Dholi, communities continued to depend on distant or unreliable sources for an extended period
- Sanitation Facilities – Open defecation was already widespread in several Panchayats, including Narkatiya Bhandara, Manovar, Ramnagar, Lohagada, and Dholi, even before the 2024 floods. Floodwaters rendered most public and private toilets unusable across all Panchayats, with temporary facilities constructed only in Manovar and Narkatiya Bhandara. As a result, open defecation became the only option, often on embankments, roadsides, rooftops, or directly into floodwaters. These conditions posed acute health risks and deepened hygiene-related hardships, particularly for women, the elderly, and PwDs. Women highlighted heightened risks to safety and dignity in exposed areas, alongside the lack of private spaces for bathing and changing. The unavailability of menstrual hygiene products, highlighted in Dholi and Dallegaon, further compounded these challenges. Despite the scale of the crisis, repair efforts were minimal. Public toilets were not restored in any Panchayat, households in Kansar undertook repairs at their own expense, and in Narkatiya Bhandara fewer than 15% of households had resumed toilet use at the time of consultation
- Food Availability – With houses inundated, cooking spaces were submerged and stored food grains damaged across most Panchayats, exacerbating both economic strain and food availability. Although official relief distributions took place, residents in Mahesha Farakpur, Dholi, and Dallegaon described them as uneven and insufficient. Community kitchens operated in Mahesha Farakpur, Ramnagar, Manovar, and Narkatiya Bhandara, but in Manovar they functioned only briefly, and in Mahesha Farakpur many residents found them inaccessible. In Dholi, neighbours improvised by cooking collectively on elevated platforms (chowki on chowki). Yet hunger remained widespread, people in Dallegaon and Manovar reported going without food for days. Local efforts filled the gaps, shopkeepers in Mahesha Farakpur offered food and essentials on credit, while residents and social workers in Lohagada distributed food and water. In Manovar, support came from maternal families, relatives, and neighbours who delivered food and dry ration during the flood period

- Healthcare Access – The 2024 floods severely disrupted healthcare across all Panchayats, exposing deep structural gaps in rural health systems. Several areas had no local health centres, while others were inaccessible or non-functional at the height of the emergency. Dallegaon, for instance, lacked a permanent health centre, while facilities in Kansar and Lohagada remained dysfunctional during the flood period. In Suryapur, Ramnagar, and Narkatiya Bhandara, damaged roads and the absence of nearby services made reaching distant facilities extremely difficult. Emergency medical staff were not mobilised in Suryapur, Mahesha Farakpur, Kansar, Manovar, Dholi, Dallegaon, Lohagada, and Dhantola. Mahesha Farakpur, Ramnagar, and Narkatiya Bhandara reported temporary camps or first-aid centres. Distribution of medicines was minimal and uneven, as noted in Manovar. The absence of safe shelters, drinking water, food, and sanitation facilities created conditions ripe for diarrhoea, skin infections, insect and snake bites, and other illnesses, many of which went untreated. In Kansar, outbreaks of diarrhoeal disease were frequently reported. Residents of Dhantola expressed concern about heightened risks of waterborne diseases due to deteriorating hygiene conditions. In the absence of formal care, villagers in Suryapur and Ramnagar turned to unregistered local practitioners, and those in Dholi and Narkatiya Bhandara travelled long distances under hazardous conditions at their own expense. Due to the lack of resources and absence of government support, it is inadvertently the poorest families that suffered severely. The lack of timely and localised care had alarming consequences for pregnant women, children, the elderly, and individuals with chronic or emergency health conditions. This concern was raised in multiple FGDs, including Suryapur, Kansar, Ramnagar, Narkatiya Bhandara, Dholi, and Dallegaon. Accessing health facilities was especially difficult for individuals with limited mobility. Residents from Dallegaon reported that routine illnesses became life-threatening amidst the breakdown of medical services and medicine supply. In Dholi, the absence of emergency obstetric care led to the death of both mother and infant, while in Dallegaon, women in labour had to be physically carried across the river to reach medical help
- Educational Continuity – Schooling was disrupted in nearly all Panchayats. In Suryapur, Mahesha Farakpur, Kansar, Ramnagar, Manovar, Narkatiya Bhandara, and Dallegaon, schools remained closed for one to two months due to inundated buildings or inaccessibility. In Narkatiya Bhandara, girls, young children, students from poorer households, and children with disabilities (CwD) were especially affected, as access roads stayed muddy or waterlogged for weeks after waters receded. In Manovar, attendance stayed low even after reopening, with teachers using microphones and outreach to bring students back. The status of education in Dholi Panchayat remained abysmal. In Narkatiya Bhandara, residents noted that despite prolonged closures and damage to classrooms, furniture, and materials, no bridge courses, special classes, or community learning initiatives were introduced to recover lost time, a situation echoed across all 10 Panchayats

4.5. Financial Assistance for Recovery

In the aftermath of the floods, affected communities expressed dissatisfaction with compensation and long-term recovery support. This theme documents the types of financial assistance provided post-flood and presents community accounts regarding the coverage and accessibility of such provisions.

- Gratuitous Relief (GR) - The GR amount was reported to have been distributed in Mahesha Farakpur, Kansar, Ramnagar, Narkatiya Bhandara, Manovar, Lohagada, and Dhantola. However, engaged locals in Kansar and Narkatiya Bhandara noted that compensation only reached some households, with several eligible families excluded from the list of recipients
- Damage Compensation - Compensation for crop or housing losses was mostly absent at the time of the FGDs. In Narkatiya Bhandara, some recipients whose houses were unaffected reportedly received housing compensation. In Dholi, engaged locals unanimously reported receiving no rehabilitation or financial support. In Lohagada and Dhantola, families had not received compensation for crop loss, livestock damage, or land and housing destruction at the time of the FGDs

4.6. Community Perspectives on Long-Term Resilience

This theme captures the priorities consistently emphasised by locals across Panchayats for long-term, proactive resilience planning, including investments in structural safety, accessible services, and institutional accountability. Building on these priorities, communities have identified specific vulnerabilities and proposed locally grounded solutions, offering a clear blueprint for moving from reactive, ad hoc crisis response to sustained resilience building.

- Early Warning, Rescue, and Emergency Preparedness - Panchayats including Suryapur, Kansar, Manovar, Narkatiya Bhandara, Dholi, Ramnagar, Dhantola, and Dallegaon highlighted the need to institutionalise early warning systems and pre-position emergency resources. Communities called for dedicated rescue boats and trained local operators to ensure timely evacuations during flood events. Additionally, engaged locals in Dallegaon and Dholi proposed the establishment of community-driven grain storage facilities and community kitchens to ensure basic food needs are met promptly during crises
- Strengthening Healthcare Access in Flood-Prone Areas - Most Panchayats such as Suryapur, Mahesha Farakpur, Kansar, Narkatiya Bhandara, Ramnagar, Dholi, Dallegaon, and Lohagada identified healthcare access during and after floods as a persistent and critical gap. Residents advocated for the establishment of flood-resilient sub-health centres equipped with essential medicines and staffed by trained personnel to provide timely and reliable care. Ensuring medical assistance is accessible across all Wards and reaches the most vulnerable groups was emphasized as a priority
- Ensuring Continuity of Education in Flood-Prone Areas - Panchayats including Suryapur, Ramnagar, Narkatiya Bhandara, Dallegaon, and Dhantola highlighted the need for flood-resilient school infrastructure located away from high-risk locations to ensure uninterrupted education during and after flood events. They further emphasised the importance of constructing elevated access roads and improved drainage to ensure safe, uninterrupted schooling, particularly for girls, younger students, and CwD
- Flood-Resilient Structures and Essential Services - There was a universal call for infrastructure specifically designed to endure flood conditions. Panchayats like Kansar, Narkatiya Bhandara, Ramnagar, Dholi, Dallegaon, and Lohagada called for the construction of flood-resilient shelters for both people and livestock, equipped with essentials such as food, water, fodder, lighting, and medical kits. Residents in Kansar and Dhantola further proposed flood-resistant housing to address recurring damage and displacement. Additionally, most Panchayats, including Mahesha Farakpur, Ramnagar, Manohar, Dallegaon, Lohagada, and Dhantola, stressed the importance of flood-proof sanitation facilities and drinking water systems, to ensure access to safe water and functional, inclusive toilets during times of inundation
- Strategic interventions - Suggestions from several Panchayats underscored the critical need for structural interventions to be strategically designed and properly maintained to mitigate rather than exacerbate flood impacts. Mahesha Farakpur, Ramnagar, and Narkatiya Bhandara pointed to the need for elevated roads and culverts that remain operational during inundation. Drainage improvements were emphasised in Mahesha Farakpur and Narkatiya Bhandara, while Dallegaon called for a new bridge to restore access to nearby villages cut off since the 2017 floods. In Kansar, residents advocated for bridges designed to allow water outflow to prevent waterlogging. Communities also called for the reinforcement of the PD Ring Bandh in Suryapur and new embankments along the Gehuma and Mechi rivers in Manovar and Dallegaon respectively

5. Collated Perspectives from Key Informants

KIIs with District officials and civil society actors provided crucial perspectives on administrative responses, community experiences, and systemic challenges, while also identifying opportunities for more inclusive, resilient disaster management. Table 17 lists the actors interviewed, and their inputs have been organized under eight key themes.

Table 17 - Affiliation of key informants

Name	Affiliation
Key Informant 1	PRI representative in Pashchim Champaran
Key Informant 2	District-level officer from Sitamarhi
Key Informant 3	River activist from Sitamarhi
Key Informant 4	District-level officer from Darbhanga
Key Informant 5	Member of CSO in Madhubani
Key Informant 6	District-level officer from Saharsa
Key Informant 7	Senior District-level officer from Supaul
Key Informant 8	Social worker and member of Supaul-based CSO
Key Informant 9	Member of Supaul-based CSO
Key Informant 10	Senior District-level officer from Kishanganj

5.1. Institutional Framework and Capacity Building

In the pre-flood phase, Key Informant 6 reported extensive District-wide capacity-building through Aapda Mitra (Community Volunteers for Disaster Response) training programs for school children, public representatives, and Public Distribution System (PDS) suppliers. Sessions led by the State Disaster Response Force (SDRF) ensured that each circle had at least one designated resource person trained to respond to disasters such as earthquakes, fires, and floods. According to the Key Informant 4, Darbhanga demonstrated a similarly strong preparedness system, with Disaster Management team under the District administration playing a pivotal role in coordinating risk reduction measures and facilitating inter-departmental response.

Key Informant 2 acknowledged significant operational gaps but framed them as opportunities to strengthen the system. With no dedicated disaster teams below the District level, the burden had fallen heavily on Revenue Officers and Clerks (karamcharis). He stressed the importance of decentralising disaster governance to the Block and Panchayat levels and actively involving local stakeholders. His recommendations included establishing dedicated teams, formal SOPs, and checklists to enhance functional preparedness. This perspective was echoed by Key Informant 1, who observed that restrictive administrative protocols often prevented timely local action. He described how such constraints limited Mukhiyas' ability to allocate resources flexibly during emergencies.

Key Informant 5 reinforced these concerns by highlighting how top-down planning frequently overrode local realities. Infrastructure decisions, including embankment construction and shelter placement, often reflected political or economic interests rather than actual flood vulnerabilities. Schools and health centres continued to be built in flood-prone areas, rendering them unusable during emergencies. Infrastructure funding still prioritised embankments and road repair over drainage systems or the elevation of critical public facilities. Schemes such as Pradhan Mantri Awas Yojana (PMAY) housing or toilet construction were applied uniformly, without accounting for flood risk differentials. He called for truly risk-informed planning that was spatially responsive and grounded in local inputs through strengthened Gram Panchayat Development Plans (GPDPs).

Key Informant 8, lamented the absence of the Kosi Peedit Vikas Pradhikaran (KPVP) since 2006 and highlighted systemic denial of flood damage by authorities. He criticised the relief-centric mindset of the government, where floods are being treated as an annual occurrence followed by perfunctory relief. Officials, he argued, often denied damages in court affidavits and ignored field evidence, thereby suppressing the true scale of suffering.

5.2. Early Warning Systems and Preparedness Measures

Key Informant 8, described an initiative by his organisation, a foot march (padayatra) from Supaul to Patna in early 2024, aimed at alerting authorities and the media to growing flood risks driven by climate change and upstream vulnerabilities in the Himalayan region. His organization recommended household-level surveys of families living between embankments and advocated for their resettlement as a long-term preparedness measure. These appeals were dismissed, and when the floods arrived later in the year, warnings from Nepal ultimately proved the most credible early alerts.

Key Informant 2, described the 2024 floods as sudden and overwhelming, triggered by high-intensity rainfall in Nepal. The flow caused severe and prolonged flooding, aggravated by critical infrastructure failures. Blocked outlets of the Bagmati bridge, caused by siltation and poor coordination between agencies such as the National Highways Authority of India (NHAI) and the Water Resources Department (WRD), led to upstream water accumulation and subsequent embankment breach. Belsand Block remained isolated for 36 hours, even stranding senior officials from the District.

In contrast, Key Informant 4, described a comparatively coordinated and systematic response. When six lakh cusecs of water were released from the Kosi barrage on September 29, the District's early warning system was promptly activated. River Kosi in Narkatiya Bhandara Panchayat started flowing over the embankment between 1200 and 1400 hrs, triggering swift field-level actions including evacuation, embankment monitoring, and shelter mobilisation. A multi-cellular coordination mechanism was activated under the Deputy Development Commissioner (DDC), comprising units for lighting, sanitation, flood control, relief material distribution, and media monitoring.

Key Informant 6, similarly noted successful coordination with the WRD, which enabled early access to water release data. Alerts were disseminated through loudspeakers and boat-based announcements in villages such as Jalle and Ghonghepur. Circle offices submitted daily reports detailing the extent of flooding, including Ward-wise data of affected population.

At the Panchayat level, Key Informant 1 shared examples of local preparedness. Villages constructed large raised earthen platforms (200x200 ft and 5-6 ft high) to serve as refuge during floods. Households purchased plastic drums to preserve grain and food supplies. Many families that had invested in concrete houses had doubled as temporary shelters for others. Such efforts were particularly important because government aid, such as dry food, polythene sheets, and cooking arrangements, rarely arrived on time.

5.3. Evacuation, Relief Arrangements, and Essential Services

Key Informant 10 stated that the SSB, which oversees the state's longest international border stretch along Nepal in the District, played a central role in the flood response. The 19th Battalion focused on safe evacuation and rescue operations, while the 12th Battalion concentrated efforts in Terhagachh Block. Local religious institutions, particularly madarsas, were also involved in providing vital support during the floods. Unlike other flood-prone regions of Bihar where larger boats are essential, the flood typologies in Kishanganj demand motorboats for swift rescue and relief.

Key Informant 2 underscored the absence of evacuation infrastructure during the 2024 floods. No functional rescue boats were available, and even traditional wooden boats were submerged. Communities outside embankments were among the worst affected. Relief was limited to dry food packet distribution and a few community kitchens.

In Saharsa, Key Informant 6 described a more structured response. Eleven boats were deployed, each capable of carrying four persons at a time. Displaced persons were sheltered on embankments, and rooftop spaces within villages were used as refuge points, resulting in a noticeable reduction in makeshift roadside encampments. Personal boats were mobilised, and both community-based organisations and government departments contributed to relief efforts. The Emergency Operations Centre (Apatkalin Sanchalit Kendra) improved communication and service delivery. Community Health Centres (CHCs) provided healthcare, and Key Informant 6 emphasised that all affected individuals were attended to.

Key Informant 4 presented a comprehensive relief model, shaped by long experience with recurring floods. Evacuations were coordinated with PRI representatives and community members. Relief packets were prepared at decentralised centres, with 3,800 air-dropped to inaccessible areas and 30,000 polythene sheets distributed. Mobile toilets (segregated by gender), 54 community kitchens (serving 0.85 million meals), and solar lighting were provided. Lighting was provided using Mukhyamantri Solar Lights, and 74 pregnant women accessed medical care via boat ambulances, including one childbirth conducted in Khaisa Jamalpur. Additional measures included livestock immunization, fodder distribution, chlorination, mobile water ATMs, and raising and disinfecting of handpumps.

Yet, systemic weaknesses persisted. Key Informant 8 described visiting Kiratpur Block in Darbhanga where no relief had reached communities 38 hours after an embankment breach, and food distribution only began after appeals to senior officials. He added that in Supaul, rescue efforts failed entirely. Stranded families received no boats, camps lacked basic facilities, and food was distributed only once or twice. His organisation intervened with donations and temporary centres.

Key Informant 9 expanded on these ground realities, explaining how the suffering of flood-affected families, particularly women and children, often remained invisible to decision-makers. People were forced to live for days on rooftops, went without food, faced snake bites, and lacked safe and private spaces for defecation.

5.4. Livelihood and Displacement

The economic fallout of the floods was both widespread and severe. Key Informant 5 described how two consecutive floods within the Bhutahi Balan embankments in Ramnagar Panchayat in 2024, one in February and another in late September, wiped out both the Rabi and Kharif crops. Wheat was submerged just before harvest, while paddy fields were washed away months later. Heavy sand deposition across agricultural lands drastically reduced soil fertility, compounding the struggles of farmers already facing erratic weather. With traditional cropping cycles disrupted, farmers face mounting uncertainty in planning, sowing and harvesting, threatening both livelihoods and local food security.

Key Informant 3 pointed to broader ecological degradation dismantling traditional livelihoods. Siltation has dried rivers, fish populations have declined sharply, and water-based occupations are no longer viable. With housess and agricultural lands repeatedly destroyed, outmigration has become a survival strategy. Families increasingly depend on remittances from members working in Punjab, Delhi, and other states. As he starkly put it, "Without outside earnings, everyone here would die." He also linked disaster-induced poverty and displacement to rising frustration, crime, and social tensions in flood-prone areas such as Belsand. He further noted that displaced families often negotiated informal land access or sharecropping in other villages, enabling them to sustain limited agricultural activity despite being uprooted.

5.5. Damage Assessment and Compensation

In Kishanganj, flooding caused by the Mechi River resulted in severe damage to houses and worsened erosion across the District. However, the Key Informant 10 noted that the standard protocol for disbursing GR was not applicable, as the floodwaters did not remain stagnant in the villages for the mandated 48-hour duration.

Key Informant 4, Darbhanga explained a structured, multi-layered compensation system in which facilitation teams at the Panchayat level assessed damages by housing type, covering both human dwellings (pucca and kuccha houses, huts) and livestock shelters (cattle sheds). The Aapda Sampoorti Portal (Disaster Compensation Portal) enabled real-time, Aadhaar-seeded data entry at the Ward level, which was validated by the Baadh Anushravan Samiti (Flood Monitoring Committee). Funds were then transferred directly to beneficiaries via Direct Benefit Transfer (DBT), with Public Financial Management System (PFMS) verification ensuring transaction transparency. Key Informant 6 stated that in Saharsa, physical damage was minimal and Form IX was used to document flood impacts. However, Key Informant 2 cautioned against over-reliance on digital systems, noting that ground-level verification remains weak and often inaccurate.

Local leaders and civil society actors described deeper systemic flaws. Key Informant 1 cited the example of his Panchayat, where out of nearly 12,000 affected residents, only 282 received the ₹7,000 relief amount due to portal shutdowns at the time of the KII. He called for universal coverage and a simpler processes for verification and disbursement.

Key Informant 8 highlighted cases of defunct portals, exploitation by middlemen, and widespread exclusion. In Supaul and Darbhanga, over 900 families whose housess were destroyed received no compensation, while officials filed false affidavits denying damage. Relief distribution was arbitrary. Joint families received partial payments, and those without ration cards were excluded.

Key Informant 9 added that floods frequently destroyed identity documents, forcing families to pay bribes for replacements. A general lack of awareness about entitlements further prevented many eligible households from accessing support, compounding the disaster's impact.

5.6. Structural, Technical, and Environmental Interventions

After the 2024 breach of the Kosi's western embankment, which inundated parts of Darbhanga, Key Informant 4 shared immediate risk-reduction measures undertaken. These included closing the breach, deploying boats in flooded areas to help restore electricity poles, and efforts to promptly restore the embankment.

In response to the District-wide issue of river erosion, the Key Informant 10 pointed out that anti-erosion works were already underway. For the year 2024-25, three sites in Kochadhaman Block were taken up. For the subsequent year, 14 additional locations were identified, and preparations for the interventions have already been completed.

Key Informant 2 emphasized broader structural challenges over immediate repair works. He identified siltation, encroachments, and inadequate maintenance as critical concerns, and recommended interventions such as augmenting surface water bodies, desilting smaller rivers, restoring springs, mapping rat and fox holes, and prioritizing groundwater recharge and rainwater harvesting.

Key Informant 6 focused on the shifting nature of monsoon patterns and the movement of flood zones within the plains. He called for notifying and protecting active river flow zones, removing encroachments from floodplains, resettling communities from within embankments to safer locations outside the embankments, developing canals on both east and west banks, and introducing infrastructure zoning to delineate flood-safe, impact, and high-risk areas. These insights from Key Informant 6 collectively reflect a spectrum of approaches, from immediate structural fixes to longer-term hydrological and environmental planning.

Civil society voices expressed sharper critiques. Key Informant 8 criticized the development paradigm that reduced rivers to drains within embankments. He argued that infrastructure projects such as roads, bridges, canals, and barrages, prioritized contractor-politician interests over ecological integrity and community well-being. This approach perpetuated

the false belief that only large engineered structures could control floods, despite lacking scientific transparency or credible impact assessments. Such interventions neglected floodplain communities, displacing them without resettlement options while depriving remaining residents of basic educational and healthcare facilities. Key Informant 8 advocated for context-sensitive infrastructure guided by geo-mapping, ecological realities, and community needs, emphasizing that true development required the prioritization of both environmental sustainability and social equity.

Key Informant 3 criticized Bihar's flood protection measures, arguing that embankments were poorly designed and weakened by illegal sand extraction from riverbeds, creating fragile structures prone to breaches. He cited the 1973 Bagmati Project, originally designed for flood control and irrigation, which had abandoned irrigation systems to focus solely on embankments. Development projects like roads and railways, implemented without consulting the irrigation department, disrupted river flows and caused ecological damage. He warned that unchecked sand mining by private operators destabilized riverbanks and degraded rivers like the Bagmati and Kamla, leaving farmers with sand-laden fields. He viewed current measures as short-term, environmentally damaging, and profit-driven rather than focused on long-term resilience.

Key Informant 5 attributed the Kosi embankment breach at Bhubhol to poor management and excessive pressure, calling it a routine infrastructural failure. Newly constructed sluice gates between the Kamla and Kosi river systems also failed, causing upstream waterlogging. He noted that villagers' increasing dependence on embankments could accelerate river encroachment and floodplain degradation. He highlighted how unregulated sand mining in the Bhutahi Balan has caused erosion, disrupted drainage, and altered the river's course, while contractor monopolies deny locals access to silt for farming and construction. Though climate variability intensifies flood risks, he emphasized that unscientific and inequitable construction practices significantly compound these impacts.

Key Informant 9 emphasized prioritizing humanity's relationship with nature to maintain ecological balance and achieve harmonious co-existence. He critiqued the cycle of environmental degradation and structural repair, questioning, "If it is humans who polluted the water and built flawed dams, then isn't it humans who need fixing first?" He noted that communities had adapted to seasonal erosion by routinely relocating.

Key Informant 1 advocated for universal adoption of permanent, flood-resilient structures as emergency flood shelters. He proposed eight- to ten-ft-high concrete platforms in every Ward, equipped with handpumps, segregated toilets and changing rooms for women's privacy, and covered spaces for cooking, bathing, and grain storage. These permanent structures, he stressed, should replace temporary mud shelters washed away annually.

5.7. Strategic Recommendations and Community Engagement

Administrative officials emphasized strengthening community-based preparedness through institutional and localized strategies. Key Informant 4 detailed efforts including awareness campaigns across nine blocks, master trainer programs supported by Bihar State Disaster Management Authority (BSDMA), multi-hazard awareness through the Nitish Pendant Initiative, and the 'Golden Hour Protocol' for critical first-hour response. Moreover, he credited forecasting support from Bihar Mausam Sewa Kendra for strengthening early warning capabilities.

Key Informant 2 stressed rebuilding preparedness as traditional knowledge had eroded, recommending swimming lessons, public education on flood cycles, and community sensitization to shift from reactive response to planned risk anticipation. Similarly, Key Informant 6 emphasized community-based preparedness through personal boats and decentralized planning structures to strengthen local response.

Key Informant 7, emphasized the need for a conceptualized, integrated intervention to realistically address the diverse challenges confronting riverine communities residing in flood-prone areas of the District. This underscores the imperative for a comprehensive, inclusive, and long-term programme aimed at transforming vulnerable habitats into resilient and sustainable settlements.

Key Informant 9 also advocated for enhancing the resilience of flood-prone habitations. He proposed developing model houses with safe structural designs aligned with the local flood contexts, that integrate water supply, sanitation, and rainwater harvesting. In addition, he stressed community engagement through two interventions. First, he recommended sustained awareness campaigns on water, sanitation, health, and hygiene during flood-prone months (June-October) while training local individuals in disaster response to enable community self-reliance. Second, he emphasized prioritizing income generation, arguing that economic empowerment is foundational to disaster resilience since communities without stable livelihoods cannot withstand repeated flood events.

Key Informant 5 emphasized river-specific, livelihood-oriented interventions including alternate crops suited to flood conditions, commercial aquaculture like makhana farming, agroforestry to combat erosion, and livestock rearing. He stressed that all livelihood interventions must be river- and flood-specific. He advocated documenting rivers' historical behaviour and community-river relationships to build understanding among younger generations and guide responsive planning. He recommended vulnerability and capacity assessments, seasonality mapping, and community dialogue to identify risk and resilience patterns.

Key Informant 3 advocated comprehensive irrigation development, asserting that honest implementation could alleviate river pressure, support year-round agriculture, and reduce flood destruction. In his view, if irrigation was developed with sincerity, 'the water would flow automatically.' He called for regional cooperation with Nepal, stressing that Himalayan rivers required joint upstream management since downstream solutions in Bihar remained incomplete without origin-point coordination. Lastly, he insisted that a thorough understanding of the lived experiences of flood-affected communities, the root causes of their vulnerability, and the region's unique hydrology was non-negotiable for any meaningful planning or strategy.

Key Informant 8 addressed rehabilitation and displacement, calling for government surveys of embankment-area residents to identify unrehabilitated people, growing families lacking space, and informal occupants. Rather than forced eviction, he proposed recognizing occupancy patterns and adjusting layouts or offering alternative land. He demanded reactivating the KPVP to ensure the protection and welfare of affected communities. On a broader note, he sought to challenge the false narrative that embankments and canals were flood solutions by educating younger generations and communities on the risks these projects posed.

6. Conclusion

The combined insights from flood-affected communities, government officials, and civil society actors contributed to a layered understanding of the state of flood management in Bihar, as understood through the accounts pertaining to the Phase 2, 2024 floods. Some District officials, particularly in Darbhanga and Saharsa, reported successful outcomes where preparedness and response mechanisms had been effectively implemented (such as community and task force training, strengthened early warning systems, improved interdepartmental coordination, field personnel deployment, technology integration, and availability of boats). These accounts, however, proved to be exceptions rather than the standard.

Other officials and public representatives acknowledged gaps in existing frameworks across preparedness, response, recovery and resilience stages, highlighting weak Panchayat autonomy, limited departmental coordination, absence of

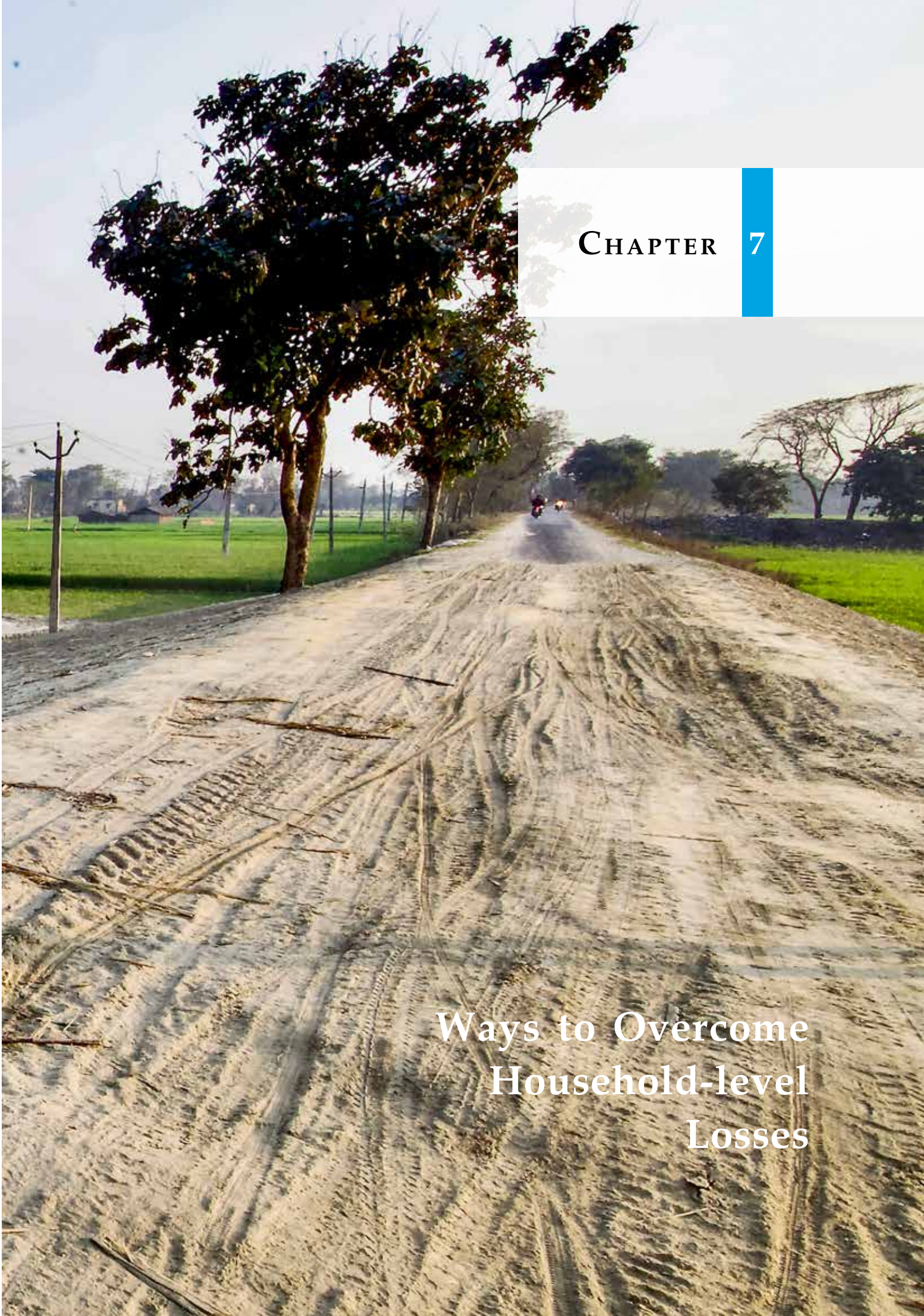
decentralized disaster institutions, and inadequate loss compensation. A particularly striking example was observed in Kishanganj, where flood-affected households were reportedly not entitled to compensation due to the short-lived nature of the District's flood typologies, despite extensive damage borne by its flood-affected Panchayats.

Civil society actors expanded on these institutional shortcomings, emphasising their compounded effects on both communities and the environment. Ultimately, communities were largely left to cope on their own during the Phase 2 2024 floods. Large-scale structural interventions for flood management neglect community needs from the outset, shifting risks and creating new vulnerabilities for local populations. And when such structures fail, communities rarely receive adequate protection. In the absence of timely institutional support, communities relied on ingenuity, solidarity, and makeshift arrangements to survive.

The participatory consultations fundamentally challenged the very lens through which flood impacts in Bihar are viewed. For outsiders, the oft-celebrated image of 'resilient' flood-affected communities obscures the harsher reality. Layers of systemic deprivation fundamentally perpetuate poverty and effectively reframe people's desperate struggle to survive as a supposed display of resilience. This endurance, however, does not translate into recovery. Instead, it perpetuates poverty as a permanent condition, compelling communities to live in a state of recovery from recurring crises rather than plan long-term progress.

The lessons from across the seven Districts are unambiguous. When local knowledge is treated as essential, not supplemental, preparedness improves and impacts can be mitigated. When institutional systems are flexible, able to release funds quickly, mobilise departments in unison, and adapt to real-time conditions, communities are better supported. And when infrastructure is flood-resilient by design, displacement and losses can be minimised.

Bihar's rivers should never be tamed. But the 2024 assessment shows that the struggles in the flood affected habitations can be lessened when institutional coordination and community agency converge. This requires a shift from episodic relief toward anticipatory, locally grounded planning that trusts the knowledge of those who live in the path of the water and work with them to build resilience year after year.



CHAPTER 7

Ways to Overcome Household-level Losses

1. Opportunities for Synergy between the Government of Bihar, Civil Society Organizations and Innovators to Minimize Household-level Losses and Build Resilience

The assessment highlights that focusing primarily on assets, risks undercounting impacts on the asset-poor, making inclusion essential. Solutions must therefore go beyond protection from flood hazards to nurturing habitats where people can live securely, recover equitably, adapt continuously, and build back better in the face of climatic challenges.

Building on the assessment's findings, this section underscores the importance of collaboration among the GoB, CSOs, and innovators[8] to reduce household-level losses and strengthen resilience. Each actor contributes a distinct strength, government ensures institutional capacity and scale. CSOs bring community trust and inclusion, and innovators offer technological and design-based solutions.

Harnessing these complementary roles can transform fragmented efforts into a cohesive, community-centred flood management system. By fostering shared responsibility, adaptive governance, and innovation, Bihar can move toward a future where flood resilience is embedded in everyday development, enabling secure, equitable, and sustainable living for all.

In sum, catalysing robust partnerships among GoB, CSOs, and innovators is foundational to building inclusive, adaptive, and forward-looking flood resilience in Bihar. Rooted in inclusion and system-wide resilience, this approach enables not merely survival, but a cycle of well-being, dignity, and opportunity, shaping flood-resilient habitats as thriving communities where no household is left behind.

2. Recommendations

This section consolidates actionable recommendations derived from the assessment's key findings, offering a structured framework to strengthen Bihar's flood governance. The recommendations are organized across four interconnected verticals, preparedness, response, recovery and resilience, to promote a holistic approach that bridges the gap between short-term relief and long-term risk reduction. It is important to emphasize that the recommendations outlined across the four verticals should be conceptualized, designed, and implemented with an understanding of the recurrent and frequent nature of flooding in Bihar. The assets and services established before, during, and after flood events must be structured to enable their repeated use. This can be achieved by promoting the sharing and reuse of services and resources among the affected population within a defined administrative unit, such as a Panchayat.

8 An innovator is an individual or institution that applies technology, design, and data-driven solutions to strengthen flood preparedness, response, and recovery, bridging science and community needs to drive scalable and locally relevant resilience practices.

Table 18 - Preparedness - Actions taken before floods

Sub-theme	Government	CSOs	Innovations
Panchayat-Level Volunteer Cadre for Flood Response	Form trained Panchayat volunteer teams to interpret and relay flood warnings; Create inclusive, Panchayat-specific evacuation plans for vulnerable groups. The key departments and authorities responsible include the BSDMA, DMD, District Disaster Management Authorities (DDMAs), District Magistrates (DMs), and PRIs	Ensure inclusion of vulnerable and marginalized groups as volunteers; Train local volunteers on traditional and modern tools of local flood early warnings and evacuation protocols; Train volunteers to document response experiences, identify gaps in early warning dissemination, and propose corrective strategies for future flood events	Multilingual audio and other alert tools in local language and dialects to be used by volunteers; Panchayat hazard maps and evacuation plans; Local innovation labs for low-cost rescue tools
Early Warning Systems	Enhance real-time hydro-meteorological monitoring and flood forecasting to provide actionable early warnings with adequate lead time; Activate Panchayat-level Emergency Operations Centres (EOCs); Use digital alerts, loudspeakers, door-to-door outreach, and community-based systems to ensure inclusive communication; Upgrade the BeFIQR app for real-time monitoring and updates. The key authorities and departments responsible include the Central Water Commission (CWC), India Meteorological Department (IMD), NRSC, Planning and Development Department (PDD), NDMA, FMISC, DMD, BSDMA, DDMAs, DMs, and PRIs	Transmit forecasts as actionable community guidance; Ensure timely alerts for vulnerable groups; Provide field-level feedback on the functioning of EOCs; Train communities to interpret warnings; Disseminate alerts through self-help groups (SHGs) and youth volunteers	Forecast translation into local languages; Real-time GIS maps of safe routes; Visual and audio tools for vulnerable groups

Sub-theme	Government	CSOs	Innovations
Shelters	Establish permanent Ward-level flood-resilient shelters with food and grain storage, safe drinking water, solar lighting/charging, medical kits, inclusive sanitation/bathing, and elevated handpumps; Designate women-safe areas with privacy screens and police support; Use shelters as meeting spaces or markets in non-flood months; Provide livestock shelters across the Panchayat with fodder storage, pre-monsoon vaccination, and emergency veterinary camps; Ensure government buildings are designed with essential services to serve as additional shelters. The key departments and authorities responsible include the BSDMA, DMD, Chief Minister Relief Fund (CMRF), Building Construction Department (BCD), Animal and Fisheries Resources Department (AFRD), Public Health Engineering Department (PHED), Lohiya Swachh Bihar Abhiyan (LSBA), DDMAs and DMs	Collaborate with local volunteers to map vulnerable habitations and households to plan the location of shelters; Facilitate participatory design of shelters to meet local needs; Pilot low-cost shelter designs using locally appropriate materials for replication; Monitor shelter usage, document gaps, and provide actionable feedback to District authorities for future improvements; Create a sustainable model for recurring community use of shelters, supported by a material rotation and reuse mechanism	Elevated modular shelters for humans and livestock using lightweight, prefabricated, relocatable, water-resistant and reusable local materials; Floating shelters with rainwater harvesting, filtration, and integrated early warning through radios, loudspeakers, and mobile alerts; Inclusive designs with dedicated spaces for vulnerable groups, co-created with communities; Skill development labs to promote low-cost, flood-resilient construction; Renewable energy solutions (solar mini-grids, lantern banks) for shelters, health centres, and communication
Readiness	Map and geo-tag elevated roads, embankments, and safe community spaces; Build temporary access paths and raised walkways in flood-prone Panchayats; Pre-position boats, medicines, food, fuel, fodder, sanitary napkins, and materials for makeshift dwellings at community level before monsoon; Conduct regular evacuation drills in flood vulnerable Wards. The key departments and authorities responsible include the BSDMA, DMD, WRD, AFRD, Food and Consumer Protection Department (FCPD), LSBA, Health Department (HD), DDMAs and DMs	Undertake asset and document protection awareness campaigns; Facilitate community-based monitoring of pre-positioned resources and shelter readiness; Co-create household-level flood-preparedness guide based on typology and socio-economic factors. Introduce availability of community-owned boats under cooperative models; Support regular evacuation drills in flood vulnerable Wards	Smart modular stockpiling hubs at village/Block level with solar power and digital tracking; Floating storage on pontoons/barges for fodder, fuel, and water; Mobile/GIS-based inventory to track stocks, expiry, and gaps in real time; Modular boats for different flood typologies

Sub-theme	Government	CSOs	Innovations
Education	Mandate all schools in flood-prone areas to update and adapt their School Disaster Management Plans (SDMPs) before June 1, ahead of the monsoon season; Designate and equip temporary learning spaces (TLS) in historically safe zones and ensure WASH and gender-safety; Issue official Interactive Voice Response System (IVRS)/ Short Message Service (SMS) alerts on learning resources, TLS locations, and safe re-opening timelines; Mobilize teachers (paid attendance incentives) for home visits and cluster-level teaching where feasible; The key departments and authorities responsible include the BSDMA, DMD, Education Department (ED), DDMAs and DMs	Activate community volunteers, children's clubs, SHGs and youth groups to staff TLS, run small group learning, and support safe commutes; Identify community learning hubs on higher ground and plan logistics; Register vulnerable children (girls, socially and economically marginalized, CwD) with the school committee for priority support and tracking; Assist schools to develop SDMPs	Zero-rated IVRS/SMS lesson delivery and alerts (telecom partnerships) for short audio lessons, reminders, and registration assistance; Pre-printed home packets designed for self-study and small-group use; Simple mobile learning via WhatsApp voice notes / short videos where connectivity allows; Auto-enrolment lists to disseminate content
Health Services	Establish clear protocols for rapid deployment of emergency/mobile medical teams and temporary health camps; Maintain strategic stockpiles and prepositioning of essential medicines and equipment; Ensure adequate trained staff with focus on vulnerable groups; Design a Ward-level rotation system to ensure continuous medical coverage; Plan mobile veterinary teams and animal health points with medicines, fodder, and supplies to safeguard livestock; The key responsible departments and authorities include the HD, AFRD, DMD, DDMAs, and DMs	Iterate flood-related health risks (waterborne diseases, hygiene, maternal and newborn care, chronic illness) using local languages and culturally relevant methods; Develop training modules on emergency health response, first aid, illness detection, and maternal-child health; Organize preparatory health camps and antenatal drives with focus on immunization and nutrition; Support in stockpiling medicines, hygiene kits, ORS, and water purification supplies; Coordinate with District administration for integrated healthcare services	Modular floating clinics on boats or pontoons in flood-inaccessible areas; Solar-powered, elevated, waterproof medical lockers at Ward/Panchayat level; Early warning alerts with health and veterinary advisories on precautionary measures to address disease outbreaks during floods; Virtual Reality / Augmented Reality-powered simulation for health emergency preparedness; Maternal-child health and livestock birthing kits pre-positioned at strategic community points to reduce mortality during access disruptions

Table 19 - Response - Immediate measures during floods

Sub-theme	Government	CSOs	Innovations
Evacuation	Allocate government boats as per flood typologies in affected areas; Position community boats and tractors for quick deployment; Assign trained teams to support vulnerable groups in all possible ways; Involve local communities in evacuation, first aid, and shelter management; Equip Panchayat and Block committees with mandates, and resources for response; Encourage schools to map alternative evacuation routes to be prepared for worst-case scenarios; The key responsible departments and authorities include the BSDMA, DMD, DDMAs, PWD, RDD, Social Welfare Department (SWD), NDRF, SDRF, HD, Panchayati Raj Department (PRD) and DMs	Source local boats and tractors for rapid deployment; Train communities in evacuation, first aid, and shelter management; Provide mobility aids for vulnerable groups; Ensure timely deployment of transport suited to flood typologies; Equip Panchayat and Block committees with mandates and resources; Map alternative routes and deploy rescue vehicles for worst-case scenarios	Solar-powered megaphones, and community loudspeakers for remote dissemination; Drones to monitor floods and support evacuations in hard-to-access areas; Real-time mapping of safe routes with GIS and Artificial Intelligence (AI)-powered tools
Relief Delivery	Establish a unified command system with GIS-based mapping to design multi-modal transport plans, monitored through live dashboards for real-time coordination Standardize relief kits and activate last-mile delivery through Aapda Mitr; Distribute tarpaulins for household-level temporary shelters and maintain Block-level fodder banks Operate and scale community kitchens through SHGs under JEEViKA; Build capacity on logistics, community kitchens; The key responsible departments and authorities include the BSDMA, DMD, DDMA and DMs	Bridge delivery gaps by mapping inaccessible areas and creating locally adapted transport and communication solutions; Prioritize last-mile delivery through community leaders and grassroots networks to reach stranded households; Empower SHGs and volunteers to operate community kitchens for food access and social cohesion; Monitor relief distribution in real time, document gaps and successes, and feed evidence to authorities for accountability; Prioritize vulnerable groups throughout the relief operations	Modular relief kits with essential supplies that can be easily transported and delivered through blocked routes; Drone-assisted systems to deliver critical items in inaccessible areas; Dedicated app to map relief work, issue SOS alerts, report shortages, and enable targeted responses

Sub-theme	Government	CSOs	Innovations
Water and Sanitation	Install flood-resilient handpumps and protected water points in vulnerable areas and shelters; Pre-deploy zero-energy purification units, chlorination systems, and distribute water purification tablets and hygiene kits; Set up gender- and PWD-responsive temporary toilets within relief camps and shelters; Maintain Block-level buffer stocks and mobile repair teams for quick restoration of water and sanitation systems; The key responsible departments and authorities include the BSDMA, DMD, PHED, LSBA, AFRD and DMs	Distribute purification tablets and portable containers for storing purified water for drinking and cooking; Install zero-energy household filters; Pilot low-cost flood-resilient safe drinking water system and emergency toilets; Train local volunteers to undertake water quality testing through field kits; Monitor and document functionality of water and sanitation facilities, and report gaps to authorities; Conduct awareness campaigns on safe water handling, hygiene, and sanitation to prevent disease outbreaks	Low-cost and zero-energy household water filters such as earthen bio-sand units; Solar-powered portable purification units; Temporary rainwater harvesting systems with tarpaulin and portable containers; Portable eco-toilets, floating toilets on bamboo rafts, and raised plinth toilets with local materials; Flood responsive dignity kits for women and adolescent girls; Atmospheric water generators using condensation
Education	Ensure functioning of TLS; Send out official IVRS and SMS alerts to inform families about available learning resources, locations of TLS, and regularly update the timelines for safe school reopening; Deploy teachers, with attendance-based incentives, to conduct home visits and facilitate cluster-level teaching wherever conditions allow; Support schools in actively mapping and using alternative evacuation routes to ensure safe movement during severe flood situations; The key departments and authorities responsible include the BSDMA, DMD, ED, DDMAs and DMs	Facilitate community volunteers, children's clubs, SHGs, and youth groups for TLS, small group learning, and safe commutes; Support community learning hubs on higher ground with logistical inputs; Coordinate with school authorities to provide support for children	Deply working strategies to collaborate with the concerned State Authority and Department, District Administration and CSOs to streamline the execution of the innovative interventions mentioned in the preparatory phase

Sub-theme	Government	CSOs	Innovations
Health Services	Deploy boat ambulances and mobile medical camps in inaccessible areas; Ensure uninterrupted medicines, vaccination, and maternal-child services through decentralized units; Strengthen disease surveillance, rapid response, and hygiene awareness; Provide targeted care for vulnerable groups; Prioritize psychosocial support with trained professionals; Collaborate with Panchayats, ASHA workers, and CSOs to reach vulnerable groups; Integrate menstrual health management with hygiene kits and safe sanitation; Deliver veterinary care through mobile livestock vaccination and treatment camps; The key responsible departments and authorities include the DMD, HD, PHED, AFRD, DDMAs and DMs	Support government efforts by managing boat clinics and ambulances for human and livestock care; Monitor mobile medical camps and community health facilities; Provide structured feedback to authorities for corrective action; Take initiative to maintain pre-stocked emergency kits with medicines, menstrual health products, and water purification tablets; Deliver psychosocial care and counselling with focus on vulnerable groups; Train volunteers for real-time community health mapping to enable targeted response	Mobile app that enables vulnerable households to directly contact healthcare professionals for human and veterinary care; Drone-based systems to map stranded households and deliver medicines and ORS

Table 20 - Recovery and Resilience - Post-flood restoration and long-term measures to reduce risks and exposure

Sub-theme	Government	CSOs	Innovations
Housing	Adopt owner-driven reconstruction (ODR) tailored to local flood typologies and household capacities; Through ODR, enable the transition from temporary to permanent housing by offering households choices for design and construction materials; Expand PMAY and state schemes by integrating ODR with targeted support for marginalized groups; Within the ODR framework, support low-income households through pooled funds, extend concessional loans to middle-income groups, and incentivize high-income groups to follow resilient building codes; The key responsible departments and authorities include the NDMA, BSDMA, DMD, RDD and DMs	Advocate with and provide technical guidance to GoB on ODR framework; Pilot ODR in a flood affected Panchayat; Identify pool of funds from diverse sources (State Disaster Response Fund, PMAY, Corporate Social Responsibility (CSR), and concessional loans) and customize them for ODR to promote fiscal incentives for marginalized households; Assist communities in accessing funds for ODR; Monitor ODR processes to uphold equity and accountability; Document ODR experiences and lessons for scaling; Strengthen ODR by supporting SHGs with seed funds, skills, and construction livelihoods; Advocate expansion of housing subsidies and inclusive policies for ODR; Facilitate linking of ODR with resilient building codes and financing options	Digital flood damage registry linked to beneficiary verification; Visual tools for aiding comprehension about the entire process of ODR; Incremental housing resilience vouchers for materials and labour; Low-premium insurance tied to ODR loans; Cluster-based relocation models with ODR framework

Sub-theme	Government	CSOs	Innovations
Infrastructure	Institutionalize flood-risk mapping for village roads, drainage channels, embankments, chaurs, public infrastructure, and utilities, and ensure their flood-resilient construction to avoid worsening flood impacts. Redesign and reconstruct road networks in flood-affected Panchayats with resilient materials to maintain access to essential services; Amend internal drainage in Panchayats to ensure free water flow; The key departments and authorities responsible include the BSDMA, DMD, WRD, Rural Works Department (RWD), Road Construction Department (RCD), PRD, Rural Development Department (RDD), Jal Jeevan Hariyali (JJH), Bihar State Bridge Construction Corporation Limited (BSBCCL), Bihar State Road Development Corporation Limited (BSRDCL), DDMAs and DMs	Support community-driven flood risk mapping and rural infrastructure assessment; Carry out social audits to ensure the quality and accountability of government projects; Expand livelihood options for local skilled and unskilled workers by training them in flood-resilient construction and maintenance practices; Advocate for the integration of flood resilience into rural development schemes	GIS, remote sensing, and AI-based models for high-resolution flood mapping and risk analysis at the Panchayat level; Micro-drainage plans through hydrological modelling; Integrated flood management model with controlled storage discharge of water for irrigation
Flood-resilient Community Infrastructure	Relocate or retrofit schools, anganwadis, and community buildings from or in high-risk zones; Combine satellite-based mapping and real-time monitoring for prioritized repairs; Safeguard electricity by flood-proofing transformers, promoting underground cabling, and expanding elevated solar mini-grids; Mandate resilient school construction; create temporary flood-resilient learning spaces with replaceable and reusable materials; Conceptualize resilience bonds pooling CSR, State Disaster Response Fund, and Multilateral Development Bank funds for rebuilding schools, anganwadis, and rural connectivity; Establish integrated funding mechanisms combining National and State Disaster Response Funds, government schemes, CSR, funds for river erosion through National Disaster Mitigation Fund (NDMF) or new flood management programs for rapid restoration of public services. The key responsible departments and authorities include the, NDMA, BSDMA, DMD, RWD, RCD, ED, Department of Energy (DoE), DDMA and DMs	Use participatory mapping to document damage and push for fair and timely recovery; Strengthen community-based monitoring systems for early damage reporting; Conduct social audits to track the quality and timelines of restoration efforts; Train members of flood-affected households, including local masons, women, and youth, in resilient construction techniques, and engage them in restoring public infrastructure as an alternative livelihood opportunity; Create manual on elevated, flood-resilient schools serving as community shelters with protected storage; Develop guidelines for flood-safe planning and alignment with government programs for inclusive, resilient infrastructure	GPS-based registry of public infrastructure across the District, categorized by flood typologies; Floating or modular schools in chronically inundated areas; Digital learning continuity kits with solar-powered tablets and offline content; Climate-resilient rural roads with permeable materials; Modular prefabricated bridges for rapid deployment; Real-time flood monitoring sensors along critical flood-prone routes; Elevated community-owned solar towers and mini-grids

Sub-theme	Government	CSOs	Innovations
WASH	Restore and strengthen WASH services; Implement multi-sectoral recovery integrating water, sanitation, hygiene, and resilient planning; Ensure climate- and flood-resilient piped water supply systems and household connections, in response to local flood typologies; Upgrade sanitation with flood-resilient toilets, raised plinths, and modular systems; Provide financial support to Panchayats and households for flood resilient and ecologically sustainable sanitation technologies; Integrate menstrual hygiene management with safe facilities and supplies; Run hygiene campaigns on handwashing, safe storage of water, and sanitation through health workers and PRI representatives; Train local bodies and volunteers for WASH management; Integrate WASH recovery with schools, health centres, and community facilities. The key government departments and authorities are BSDMA, DMD, RDD, PHED, DDMAs and DMs	Mobilize communities and local knowledge to complement government WASH recovery, with Village Water and Sanitation Committees; Demonstrate temporary rainwater harvesting, flood-resilient community water points, and sanitation technologies; Advocate for gender-sensitive and inclusive WASH policies; Support marginalized households in accessing schemes, subsidies, and Panchayat-level resources; Eliminate open defecation and restore household and community toilets with government support, prioritizing vulnerable households; Monitor WASH recovery jointly with District administration and conduct its independent assessments; Establish grievance redressal mechanisms for WASH services at Panchayat level; Undertake community-based water quality monitoring as a critical WASH recovery strategy; Document and share lessons with District administration; Develop a Panchayat-level long-term WASH resilience strategy	Flood-resilient sanitation technologies (EcoSan [Phaydemand Shauchalay], modular toilets, elevated platforms, relocatable facilities); Alternative water sources (rainwater harvesting, atmospheric water generation etc.); Leverage digital platforms for real-time monitoring of WASH services, integrate mobile-based community feedback, and apply GIS-based mapping of WASH services in flood-prone zones to enable proactive and timely response; Flood-resistant construction materials and climate-resilient designs to enhance durability; Integrated financing mechanisms combining State Disaster Response Fund, Jal Jeevan Mission, Swachh Bharat Mission (Gramin) (SBMG), CSR, and multilateral support to ensure equitable and sustainable WASH recovery

Sub-theme	Government	CSOs	Innovations
Livelihood Restoration	Expedite crop loss compensation to facilitate timely Rabi cultivation; Provide special livelihood support packages for landless, marginal, small, and big farmers; Prioritize restoration and preservation of productive land through erosion control, drainage realignment, sediment and waterlogging management; Promote climate-smart practices like integration of flood-tolerant and early maturing varieties, staggered and precision crop planning aligned with monsoon variability; Promote traditional and modern flood resilient cultivation techniques. Rehabilitate ponds and adopt flood-adapted aquaculture models; Restore livelihoods for landless and non-farm households through income support, skill training, and asset replacement; Promote small-scale enterprises aligned with local demand (tailoring, handicrafts, masonry, carpentry, agro-processing etc.); Provide temporary employment (Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA), public works) for immediate income; Support community marketplaces and infrastructure repair; Prioritize landless, FHHs, Dalits, and PwDs Expand safety nets with emergency credit, concessional loans, and index-based crop/livestock insurance; Provide cash transfers and micro-grants for lost tools, stocks, and inputs; Facilitate subsidized credit, microfinance, and low-interest loans for micro-enterprises and small trades; Strengthen SHGs to reduce indebtedness and aid reconstruction; Integrate disaster funds, CSR, and government schemes for sustained investment	Facilitate access to quality seeds, inputs, and equipment; Establish community seed banks; Train farmers in resilient cultivation, soil restoration, and water management; Promote climate-smart agriculture with flood-tolerant varieties and organic inputs; Provide technical guidance for crop recovery and waterlogging management; Support farmer access to Pradhan Mantri Fasal Bima Yojana (PMFBY) and input subsidies through awareness and facilitation; Deliver rapid recovery support including seed replacement and technical advice Establish community fodder banks, temporary shelters, and mobile veterinary services; Support fishery recovery through pond rehabilitation and flood-adapted aquaculture Facilitate household access to PMFBY, subsidies, insurance, and emergency credit through awareness and documentation support and inclusion of marginalised groups and FHHs; Strengthen SHGs, cooperatives, and community funds for liquidity and resilience; Advocate for transparent and fair compensation with community monitoring	Digital flood-damage registries and GIS mapping for crops, land, livestock, and fisheries; Platforms to track landless and non-farm households, asset loss, and support allocation; Participatory data systems and early-warning integration for inclusive planning; IoT, remote sensing, and satellite forecasting for precision farming and damage assessment Flood-resilient agronomic practices and integrated crop-livestock-fish farming; Early-maturing and flood-tolerant crop varieties; Demonstration farms and model villages for resilient cultivation and livelihoods; Solar-powered, flood-proof irrigation; Fodder banks, community hatcheries, and mobile veterinary services for livestock and fisheries Index-based insurance with mobile verification for rapid, equitable payouts; Micro-insurance and financial products for non-farm livelihoods; Integrated financing (State Disaster Response Fund, PMFBY, central schemes, CSR, multilateral support) for sustained investment

Sub-theme	Government	CSOs	Innovations
Livelihood Restoration	Engage local institutions in catchment and drainage management; Integrate Disaster Risk Reduction (DRR) into livelihood schemes to reduce future risks The key government departments and authorities are BSDMA, DMD, Agriculture Department (AD), WRD, RWD, AFRD, Minor Water Resources Department (MWRD), PRD, RDD, SWD, Department of Labour Resources (DLR), Science, Technology and Technical Education Department (STTED) - Bihar Skill Development Mission, Department of Industries (DoI), Cooperative Department (CD), Bihar Rural Development Society (BRDS), Infrastructure Development Authority (IDA), SC and ST Welfare Department, Finance Department, Revenue and Land Reform Department (RLRD), PDD, Department of Environment, Forest and Climate Change (DoEFCC), DDMA and DMs	Promote income diversification through skills training, vocational courses, and micro-enterprise support; Provide technical guidance for restoring tools, stock, and business assets; Facilitate safer migration pathways linking workers to urban opportunities with safeguards; Encourage collective entrepreneurship models such as group handicrafts or shared services; Mobilize landless households and non-farm workers in recovery and reconstruction Mobilize communities to adopt flood-resilient practices; Strengthen community institutions for collective resource management and financing; Monitor recovery and document challenges for improved targeting and transparency	Mobile apps for integrated and spatial location specific information on weather alerts, flood forecasts, and crop advisory; Mobile-based skill training and mentorship programs; E-commerce linkages for handicrafts, produce, and micro-enterprises Alternative livelihoods such as agro-processing and eco-tourism; Flexible workspace models, shared equipment hubs, and mobile service units for non-farm enterprises

Sub-theme	Government	CSOs	Innovations
Social Protection and Inclusion	Develop robust and transparent methods for compiling lists of affected households; ensure dual verification by both PRI representatives and government-appointed officials; Institutionalize flexible identity verification to prevent exclusion due to loss of documents; Guarantee distribution of GR and loss compensation to all households affected by floods within a calendar year; Calculate GR amounts proportionate to the scale and typology of floods; Design differentiated compensation frameworks based on flood typology, asset losses, social and economic vulnerabilities, and livelihood disruptions; Provide crop compensation aligned with the extent of damage and landholding; Extend household damage compensation proportionate to housing typology, asset losses, and severity of damage, while integrating the aspiration to support the transition of households from temporary to permanent housing Ensure automatic enrollment of flood-affected elderly, widows, and PwDs into key pension schemes using the official list of flood-affected individuals; For households that have lost essential documents during the floods or face challenges in accessing designated portals, ensure schemes are accessible through both online and offline application options	Map household vulnerabilities through door-to-door surveys with women's groups, health workers, and community-based organizations (CBOs); Share omission and risk lists with authorities for inclusive targeting Advocate equitable access to relief for marginalized groups (landless, FHH, elderly, minorities); Monitor and report distribution to ensure transparency and accountability Assist asset-poor households in restoring IDs, proofs, and social protection enrolments; Guide asset-rich households in accessing government schemes, credit, and subsidies Mobilize households for community recovery; Facilitate skill training, vocational programs, and enterprise development; Provide technical support for restoring assets, tools, and livestock; Promote cooperatives and collective entrepreneurship	Mobile apps, SMS/IVRS, and open-source platforms for mapping vulnerable households, tracking asset losses, and prioritizing support; Portable biometric, photo, or community-verified registration kits for rapid inclusion of landless and undocumented populations; Micro-insurance and index-based financial products linked to social protection schemes for non-farm livelihoods; Blockchain or distributed ledger systems for transparent tracking of entitlements and grievance redressal; Anonymous report-and-watch platforms for households to flag unmet needs or corruption to District administration

Sub-theme	Government	CSOs	Innovations
Social Protection and Inclusion	Introduce subsidized community-based crop and flood insurance for asset-poor and tenant farmers; Conduct awareness and enrolment drive via Panchayats, JEEViKA, and local institutions Institutionalize rapid document recovery and on-site enrolment camps post-disaster; Regularly cross-reference government databases (Below Poverty Line, PDS, pensions, SHG etc.) to proactively identify and incorporate excluded households Institutionalize multi-stakeholder social audits and periodic reviews; Establish single window redressal system at Block- and District-level for swift resolution The key government departments and authorities are BSDMA, DMD, PRD, AD, PPD, RDD, SWD, DDMAs and DMs	Establish savings groups, cooperatives, and community funds; Train grassroots response teams for mapping, verification, and feedback; Document recovery challenges and provide evidence-based inputs to District administration Conduct workshops on flood preparedness, early warning, and climate-resilient livelihoods Mobilize volunteers for psycho-social counselling, especially for children, women, and elderly Facilitate leadership opportunities for women and marginalized communities to drive recovery and resilience Partner with flood-affected communities for real-time monitoring, feedback, and gap reporting of recovery and resilience building initiatives to the District administration	

Sub-theme	Government	CSOs	Innovations
Education	Allocate financial and human resources for building flood-resilient schools and infrastructure in vulnerable areas, which includes raising plinths, elevating toilets and water points, and reinforcing foundations and electrical fittings; Conduct rapid school damage assessments using standard templates; Fund and supervise fast repairs (classrooms, latrines, drinking water, furniture); Fund and implement bridge courses and remedial accelerated learning programmes (age and grade, inclusive for CwD); Provide targeted conditional support (replacement textbooks, uniforms, travel arrangements etc.); Coordinate mid-day meal continuity; Deploy mental-health / psychosocial support teams; Train teachers in trauma-sensitive pedagogy; Relax administrative barriers (admission deadlines, documentation) and run official back-to-school/enrolment drives; Use MGNREGA / public works for community tasks that support school repairs and safe access works; Institutionalize SDMPs in every school with annual reviews and drills; Integrate school triggers with District early-warning systems; Budget recurring teacher training (DRR, remedial pedagogy, inclusive education etc.) and maintain para-teacher rosters; Allocate contingency repair and learning continuity funds at District/ block levels; Ensure explicit budget lines and schemes for girls, CwDs, and poorest households; The key government departments and authorities are BSDMA, DMD, ED, RWD, SWD, DDMAs and DMs	Strengthen SDMPs; Map flood-safe zones and advocate for flood-resilient school infrastructure and alternative learning spaces; Organise community clean-ups and minor repairs (painting, furniture shifting etc.) to enable rapid reopening; Run bridge-course sessions led by trained para-teachers, volunteers, and SHG members; Provide psycho-social first aid and establish peer-support networks; Link families to counsellors and referral services; Mobilise and distribute replacement materials locally; Facilitate documentation recovery (help obtain duplicate certificates); Participate in enrolment drives, home visits, and conditional-support targeting to reduce dropouts; Maintain rosters and train local para-teacher and community learning facilitators; Operate and sustain child protection mechanisms, school committees, and community-based monitoring to keep equity and inclusion central; Negotiate and manage local convergence (linking SHGs, CBOs, and Panchayats) to pre-position learning kits and psychosocial resources; Advocate for inclusive practice and ensure CwDs and girls remain prioritised in local education planning	Rapid digital tools for damage assessment and school status dashboards (mobile survey apps) to prioritise repairs and trigger funds; Tele-counselling platforms and IVRS psychosocial modules for widespread trauma support; E-portals / hotlines to accelerate replacement documentation, facilitate flexible admissions, and register students for bridge courses; EdTech micro-modules for teacher re-orientation (short videos, downloadable PDFs, audio guides etc.) that work offline; Resilient design prototypes and open-source building plans (raised plinths, stilt designs, modular classrooms etc.) for adoption by local governments; Seasonal contingency learning kits and digital content repositories (radio scripts, IVRS scripts, printable packets etc.) for rapid scale-up; Data-driven targeting for the most vulnerable by using simple Management Information System to track girls, CwD, poorest households and measure return-to-school rates after flood events

Sub-theme	Government	CSOs	Innovations
Health	Restore and ensure accessibility of health services in flood-affected areas immediately after floodwaters recede; Ensure Ward-wise coverage of health facilities before, during, and after floods; Establish decentralized healthcare through resilient Ward- or cluster-level units with flood-resilient facilities; Design and construct primary health centres (PHCs), sub-centres, and hospitals based on flood-risk mapping and aligned with local flood typologies; Prioritize the development of flood-resilient rural health facilities in vulnerable areas; The key responsible departments and authorities include the BSDMA, DMD, HD, Pradhan Mantri - Ayushman Bharat Health Infrastructure Mission (PM-ABHIM), CMRF, National Health Mission (NHM), Bihar Medical Services and Infrastructure Corporation Limited (BMSICL), DDMAs and DMs	Advocate for special technical and financial provisions for health facilities in flood-prone areas; Build health cadre of volunteers and train community health workers; Support flood-risk mapping with community data to guide PHC and sub-centre location under PM-ABHIM; Design and promote low-cost flood resilient models like modular health units at Ward/cluster level; Ensure accountability and monitoring of CMRF and NHM funds for flood-resilient health facilities; Facilitate coordination between communities, BMSICL, and HD as redressal mechanism	Raised PHCs with modular prefabricated units; Solar-backed power for uninterrupted care; Mobile health units with stocked depots; Telemedicine and digital health continuity through expanded Health and Wellness Centres; Dual-use PHCs as shelters with early-warning systems

Sub-theme	Government	CSOs	Innovations
Rehabilitation	Conduct a comprehensive survey of households residing within embankments to document occupancy patterns and associated challenges, and subsequently identify and allocate suitable alternative homestead land in safe locations outside the embankment area; Establish dedicated provisions within existing central and state rehabilitation and resettlement policies and schemes to give priority to flood-affected and erosion-impacted households; The key responsible departments and authorities include the NDMA, BSDMA, DMD, RLRD, RDD, DDMAs and DMs	Map affected households, record land loss and occupancy for fair rehabilitation; Support families in accessing homestead land allocation and navigating legal/ administrative processes; Ensure relocation sites are acceptable, service-linked, and livelihood compatible; Strengthen community awareness about land entitlements; Facilitate State-community partnerships for transparent and equitable homestead land allocation for households within embankments	Cluster-based relocation models for flood-afftected households; Digital land entitlement platforms integrating cadastral data, GIS, and community validation for transparent allotment; Livelihood-linked relocation models combining housing, skill training, and enterprise hubs; Ecological-resilient settlement layouts with elevated plinths, green buffers, and decentralized services; Transitional housing units designed for portability and upgrade into permanent dwellings

3. Construction Processes of Phaydemand Shauchalay in Riverine and Flash Flood-Prone Areas

To reinforce the recommendations outlined under the verticals of preparedness, response, recovery, and resilience, this section elaborates on the intervention of sanitation security as an illustrative example. It outlines an operational framework that demonstrates how the proposed actions under each of the four themes can be translated into actionable strategies at the habitation level.

3.1. Technical Principles and Ecological Design

Phaydemand Shauchalay, a Disaster Resilient and Ecologically Sustainable Sanitation Technology (DRESST), developed by MPA, is an innovative ecological sanitation model developed for the riverine and flash flood-prone regions of North Bihar. It ensures year-round access to safe sanitation by combining robust structural measures with sound environmental safeguards. Having demonstrated its effectiveness in both riverine and flash flood habitats, the technology now stands as a proven model that warrants wider promotion as a resilient sanitation solution for the future.

Based on the Ecosan principle, a urine-diverting dry toilet (UDDT) system, it separates urine and faeces to enable on-site decomposition and safe reuse. This closed-loop design prevents effluent discharge, eliminates groundwater contamination, and promotes resource recovery for sustainable sanitation, ensuring continued access even during floods.

3.2. Model Selection Based on Flood Typology

Two structural models are adopted depending on the typology and severity of floods,

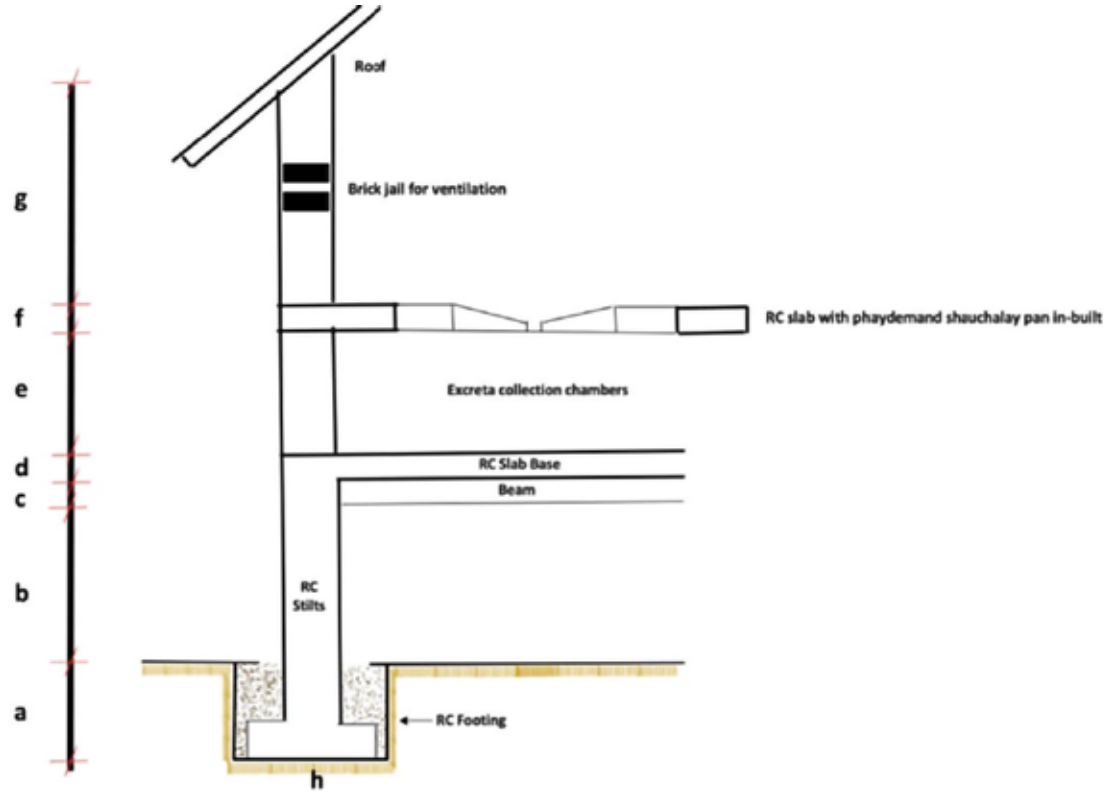
- Phaydemand Shauchalay on Stilts
- Phaydemand Shauchalay on Brick Plinth

Phaydemand Shauchalay, an innovative, disaster-resilient and ecologically sustainable sanitation model developed by MPA for riverine and flash flood-prone regions of North Bihar

These models are designed for the alluvial flood plains of North Bihar's rivers and are adapted to high groundwater conditions to ensure both durability and usability throughout the year.

3.2.1. Construction Process: Phaydemand Shauchalay on Stilts

Figure 23 - Phaydemand Shauchalay on Stilts



Step 1 – Foundation and Stilts

- For the four stilts, excavation up to 3' below the ground level (bgl) is done, and dimension for each of the excavation is 2.5' x 2.5'. The base of the stilt is of 2.5' (length) x 2.5' (width) x 0.5' (height). Thereafter, the dimension of stilt is 10" (length) x 10" (width) x 7.5' (height) = 2.5' bgl and 5' above the ground level (agl)). The distance between the four pillars is 8'2" (length) x 5'2" (width) centre-to-centre (c/c)

Step 2 – Beams and Cast

- They are constructed connecting all the four columns 5' agl, with the dimension of 10" (width) x 6"(thickness). Thereafter, a 3" thick Reinforced concrete (RC) slab is cast along with the beam, and the dimension is 10 ft (length) x 7 ft (width) x 3 inches (thickness) c/c. Reinforcement for the columns, beams and slab have to be calculated

Step 3 – Twin Excreta Collection Chamber

- Once the RC slab is cast, the excreta collection chamber is constructed within the dimension of 9' (length) x 6' (width) x 5" (thickness) x 2.5' (height) c/c. The chamber is made of bricks and it is divided into two for having two units of toilets within one structure. The excreta collection chamber should be plastered with cement from inside and outside preferably using a waterproofing compound. Both these units of the chamber have an opening for removal of humanure (human manure). Two excreta collection openings are made in the collection chamber of the dimension 1.5' (length) x 1.5' (width).

Step 4 – Pan and Upper Slab

- The chamber is closed from the top by casting another 3" thick RC slab in which the Phaydemand Shauchalay pan is integrated. The pan size to be included in the RC slab is 9' (length) x 2' (width) x 4' (thickness). There are toilet fixtures in the excreta collection chamber - three iron sockets in which pvc pipes are attached for diverting the backwash water and urine. One pvc vent pipe is also attached to the chamber of the dimension - 4" (diameter) x 5' ft (height). Plastering and cement coating of the pan is mandatory. There are two openings in the Phaydemand Shauchalay pan, for which tin cover (with handle) is to be made available for both the openings

Step 5 – Superstructure and Ventilation

- After the completion of the construction of the Phaydemand Shauchalay pan, the toilet walls (4.5" thick) are raised using brick and cement mortar masonry. With a door opening in the front side. The front wall is raised to the height of 6' and the back wall to the height of 5.5'. The top three-five courses of the masonry brick jali must be made for the ventilation to ensure proper ventilation. The superstructure is plastered from inside and outside. The toilet has a door of dimension 5'(length) x 2.5' (width). Galvanized iron (GI) sheets are used for the roof. Five ventilators of 3" (length) x 3"(width) is made to ensure proper ventilation. The super structure is plastered from inside and outside. The toilet has a door of the dimension 5' (length) x 2.5' (width)

Step 6 – Staircase and Railing

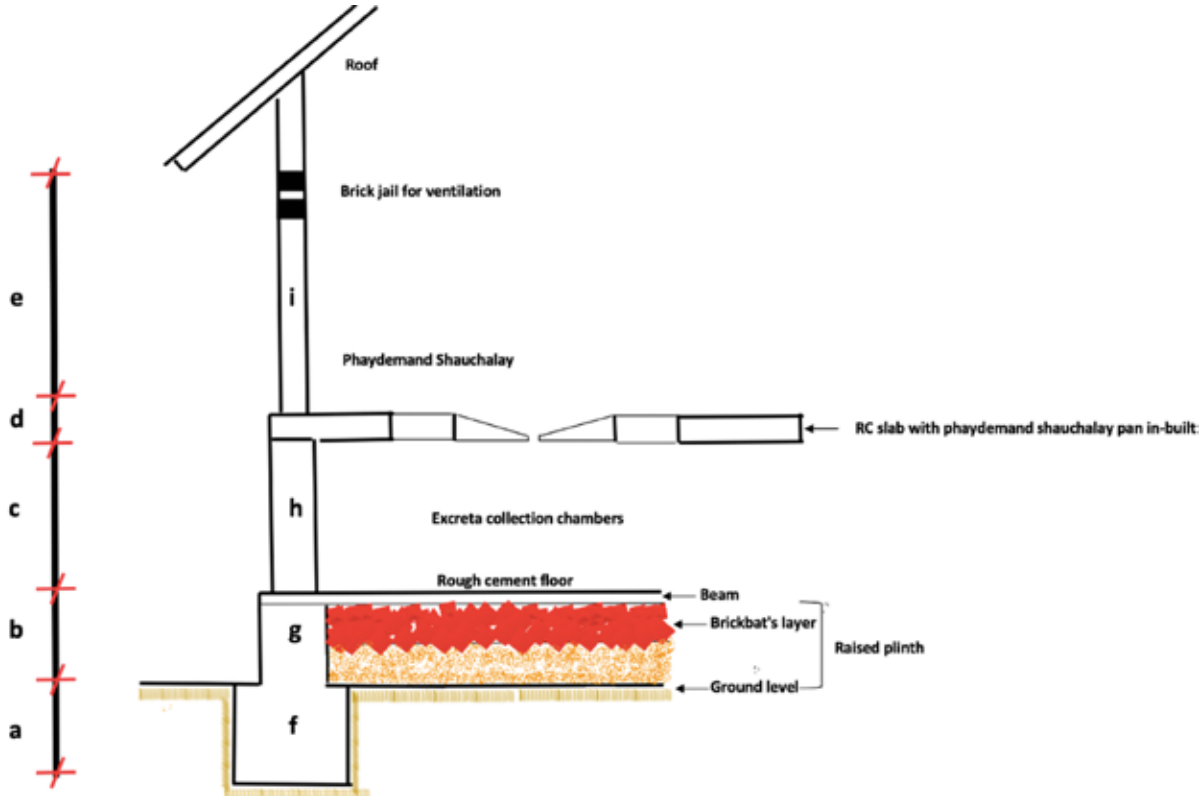
- For accessibility, the staircase is incorporated in the Phaydemand Shauchalay of the dimension 5' (length) x 2.5' (width), each step has a riser of 6" and approximately 12 steps are required. There is a railing along the staircase. Steps should be provided with adequate foundation

Table 21 - Estimated cost phaydemand shauchalay on stilts

Type of work	Costing (₹)
Foundation work	18,831
Sub-structure	10,273
Super-structure	14,436
Staircase and railing	4,477
Total	**48,017**

3.2.2. Construction Process: Phaydemand Shauchalay on Brick Plinth

Figure 24 - Phaydemand shauchalay on brick plinth



Step 1 – Foundation and Plinth

- For the construction of Phaydemand Shauchalay having dimensions of 9' (length) x 6' ft (width) c/c. The foundation trench should be dug having minimum 2' width and 2' depth. The depth could be more depending on the soil condition
- Soil compaction and addition of a layer of brickbats of 4" followed by yet another round of compaction. On top of this base, 14" thick brick masonry in cement mortar should be taken up, up to the ground level. This is followed by the construction of plinth walls with 9" thick brick masonry in cement mortar up to the height of minimum 2'. This height could be more if the flood levels are higher. This plinth can be filled with soil, and compacted

Step 2 – Excreta Chamber and Casting

- The construction of the excreta collection chamber is undertaken within the dimension of 9' (length) x 6' (width) x 5" (thickness) x 2.5' (height) and this chamber is divided into two for having two units of toilet within one structure. The chamber is made of bricks therefore it has to be waterproofed from inside and outside. There are toilet fixtures in the excreta collection chamber - three iron sockets in which pvc pipes are attached for diverting the backwash water and urine. One pvc vent pipe is also attached to the chamber of the dimension - 4" (diameter) x 5' (height). Two excreta collection openings are made in the collection chamber of the dimension 1.5' (length) x 1.5' (width). Casting is done on top of the excreta collection chamber in which the Phaydemand Shauchalay pan is integrated. The dimension of the casting is 9' (length) x 6' (width) x 3" (thickness) and that of the pan is 9' (length) x 2' (width) x 4" (thickness). Plastering and cement coating of the pan is mandatory. There are two openings in the Phaydemand Shauchalay pan, for which tin

Step 3 – Superstructure and Roofing

- After the completion of Phaydemand Shauchalay pan work, the super structure is constructed, and the dimension is 9' (length) x 6' (width) x 6' (height in the front) x 5.5' (height at the back) x 5" (thickness). GI sheets are used for the roof, and five ventilators of 3" (length) x 3"(width) is made to ensure proper ventilation. The super structure is plastered from inside and outside. The toilet has a door of the dimension 5 ft (length) x 2.5 (width).

Step 4 – Staircase and Access

- For accessibility, the staircase is incorporated in the Phaydemand Shauchalay of the dimension 5' (length) x 2.5' (width), each step has a riser of 6" and approximately 12 steps are required. There is a railing along the staircase. Steps should be provided with adequate foundation

Table 22 - Estimated cost phaydemand shauchalay on brick plinth

Type of work	Costing (₹)
Foundation work	20,367
Sub-structure	13,923
Super-structure	17,120
Staircase and railing	4,320
Total	**55,730**

3.3. Quality Control and Monitoring Mechanisms

Quality assurance involves soil testing, flood-level verification, and close supervision by trained masons under technical guidance. Periodic inspections, cross-household monitoring, and waterproofing verification are key to ensuring durability and user safety.

3.4. Operation, Maintenance, and Reuse Process

Each chamber is used alternately. Once full, it is sealed and left for 6-8 months to compost naturally. The decomposed humanure is pathogen-free and used as organic fertilizer. Urine, diluted in a 1:5 or 1:7 ratio, is applied as liquid fertilizer. Routine maintenance includes cleaning, vent inspection, and closure of unused pans.

3.5. Facilitation, Capacity Building, and Scaling Up

Implementation follows a participatory approach using MPA's exposure and enquiry method. Local masons and FHHs are trained as resource persons. Scaling up requires the inclusion of Phaydemand Shauchalay within state and national sanitation and disaster management programmes to ensure institutional recognition and replication.

3.6. Technical Justification for Flood Resilience

The above-ground design prevents excreta-soil interaction and contamination during floods. The height is based on the area's Highest Flood Level (HFL) to ensure safety from inundation. Waterproofed chambers and reinforced bases maintain functionality during prolonged flooding, making the model suitable for both riverine and flash flood conditions.

3.7. Operational Framework for Phaydemand Shauchalay

- State Government – Policy and Programme Enabler – The State Government, through SBMG and LSBA, can provide the policy framework and financial support to promote flood-resilient sanitation systems across Bihar
- Panchayat – Local Facilitator and Implementing Authority – The PRI representatives can coordinate between departments, households, CSOs and innovators to plan and oversee construction, ensuring inclusivity and accountability
- Civil Society Organizations – Community Mobilization and Social Facilitation – Organizations can mobilize communities, strengthen SHGs, and facilitate access to microcredit for household-level sanitation construction. It can build local capacity and ensure construction quality through participatory training
- Innovators – Technology Development and Knowledge Support – Innovators can lead the innovation, design, and engineering of Phaydemand Shauchalay for all flood typologies, ensuring ecological soundness and resilience

In conclusion, Phaydemand Shauchalay represents a comprehensive and adaptive sanitation solution that merges structural engineering, ecological principles, and community ownership. It stands as a model for resilient sanitation in flood-prone ecologies, capable of supporting long-term environmental and social sustainability.

4. Cross-Cutting Priorities Across Preparedness, Recovery, Response and Resilience

The recommendations presented in this chapter are the direct and necessary culmination of the assessment's empirical findings. Altogether, they lead to one unambiguous conclusion. Bihar's approach to flood management must undergo comprehensive and systemic transformation. The long standing reliance on fragmented, relief-driven responses has entrenched cycles of loss, repeatedly forcing the most vulnerable households to rebuild their lives from scratch. The deeper structural drivers of risk remain unresolved, while pre-existing inequities, rooted in social hierarchy, economic status, gender, disability, and geography, are persistently widened with each subsequent disaster.

Building true flood-resilient habitats is, consequently, no longer a strategic choice but an imperative necessity. This demands a fundamental paradigm shift, from perceiving preparedness, response, recovery, and resilience as distinct phases to embracing them as an integrated and continuous spectrum. Effective flood governance must therefore be mainstreamed into every facet of rural development, encompassing livelihoods, WASH, agriculture, housing, health, education, and social protection. The chapter lays out a clear blueprint for this transformation. There is no place for temporary measures, only the building blocks of secure, adaptive living environments.

Furthermore, the chapter underscores the necessity of addressing both large-impact sectors such as agriculture and housing, as well as the cumulative burden borne by smaller sectors including fisheries, poultry, and small trades. True

resilience cannot be achieved by protecting only a few dominant sectors while neglecting others that, collectively, form the backbone of rural economies. Holistic recovery requires a comprehensive strategy that uplifts every aspect of household and community survival.

Central to this vision is granular, household-level analysis and the sustained community participation in decision-making. Local collectives must lead processes such as early warning, evacuation planning, relief tracking, and feedback monitoring. Volunteer cadres trained in local languages, evacuation protocols, and disaster documentation can fill gaps left by top-down systems, ensuring Ward-level strategies are tailored to local realities. Equity is non-negotiable, as every intervention must actively dismantle the structural disadvantages that determine who is most affected and who recovers last.

Technology is a powerful enabler but cannot substitute for institutional reform. This chapter recommends tools such as GIS mapping for hazard and evacuation planning, digital hubs for pre-positioning supplies, mobile-based alert systems, and blockchain-enabled entitlement tracking to ensure transparency and accountability. These innovations can democratize information and feedback, but only when paired with coordinated governance and empowered Gram Sabhas. Integrated digital platforms must map vulnerable households, track land and asset losses, conduct inclusion audits, and identify service gaps, forming a participatory ecosystem for disaster risk reduction that is both transparent and adaptive.

The chapter emphasizes the need for convergence across all critical development pillars. Livelihoods, housing, education, health, and disaster management must no longer operate as silos. A state-community-CSO-innovator compact is essential. The government provides scale and resources, CSOs offer grassroots trust and innovation, and private actors contribute adaptive technology and financing. Accountability must be ensured through robust mechanisms such as social audits, multi-stakeholder reviews, and single-window grievance redressal systems. For those in the highest-risk zones, cluster-based relocation offers a solution that provides safety without fragmenting communities.

Moving forward, risk-informed development must be institutionalized at every level. This means embedding scientific risk assessments into all planning and financing decisions, scaling inclusive housing and health systems, and linking compensation and insurance to digital and physical safeguards. Social protection must become fast, rights-based, and flexible, designed to address diverse flood typologies and to reach the most vulnerable, including the landless, tenants, and smallholders, through direct cash transfers, accessible credit, and asset restoration programs. Relocation and rehabilitation must be designed as pathways to secure futures, supported by participatory mapping, legal aid, digital registries, and livelihood-linked resettlement models.

Ultimately, Bihar's chronic flood devastation can only be mitigated through coordinated, systemic transformation grounded in equity, strong institutions, technological innovation, and genuine community partnership. This is not simply about managing floods but about reimagining how Bihar lives with its rivers. Given the recurrent nature of flooding in Bihar, resilience must be built through systems that are feasible to operate repeatedly, cost-sustainable, and embedded within local administrative units such as Panchayats. Durable, reusable, and locally anchored mechanisms, not episodic efforts, are essential for any meaningful shift from crisis response to sustained preparedness.

By charting a unified course toward flood-resilient habitats and convergent governance, the state can replace cycles of coping and loss with systems of renewal, dignity, and opportunity. In doing so, it can set bold national and global standards for adaptation, inclusion, and resilience, ensuring that every at-risk voice shapes the future at every stage, and no household is left behind.

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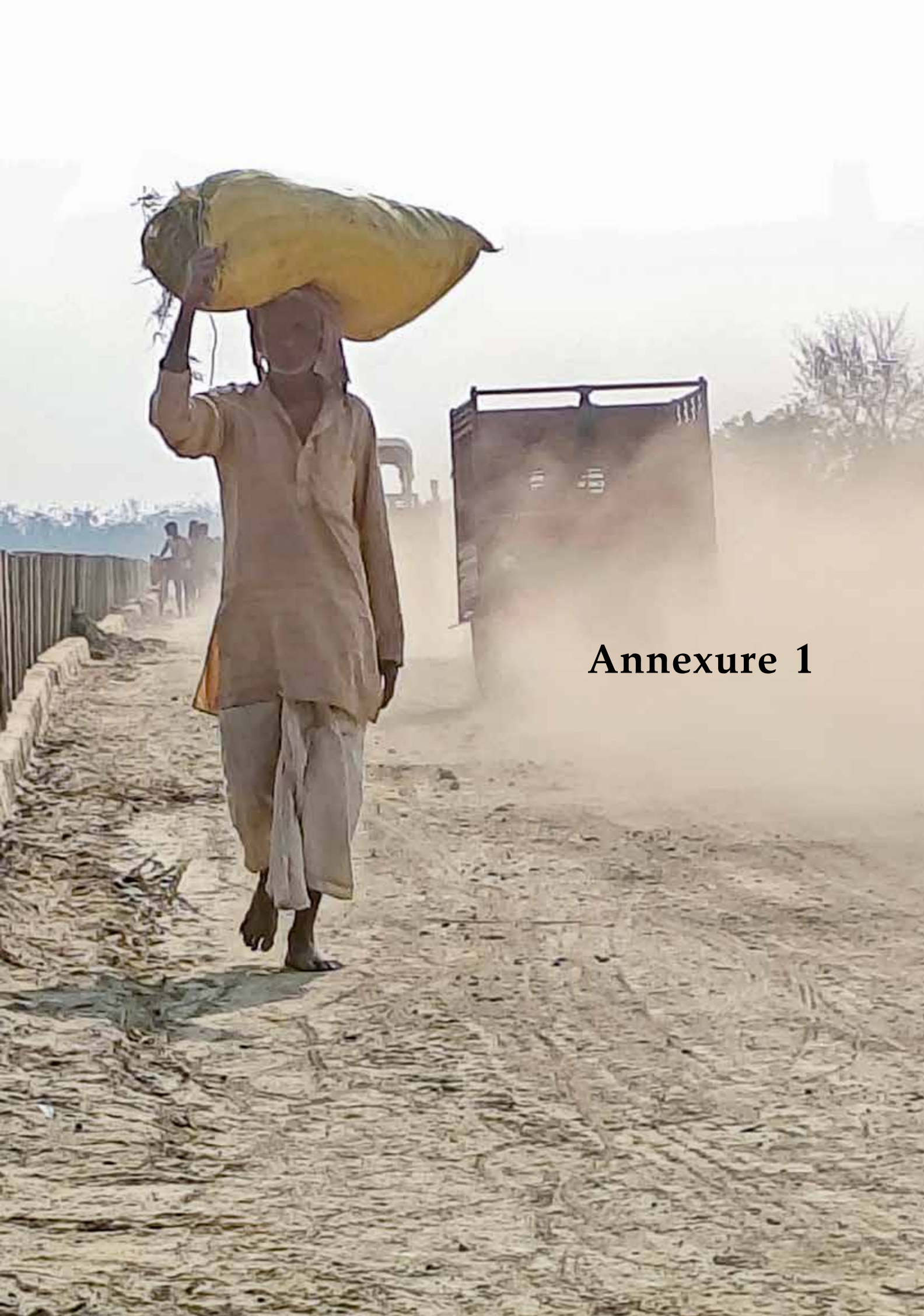

Annexure 1

2024 की बाढ़ में हुए नुकसान का आकलन

मूलभूत जानकारियां

सहमति फॉर्म और उत्तर देने वाले की तस्वीर क्लिक करें

स्थान निर्धारित करें

Name: नाम

Gender: लिंग

- ○ महिला
- ○ पुरुष
- ○ अन्य

Age: आयु

वैवाहिक स्थिति

- ○ विवाहित
- ○ अविवाहित
- ○ कानूनी रूप से अलग
- ○ अनौपचारिक रूप से अलग
- ○ विधवा/ विदुर
- ○ अन्य (स्पष्ट करें)

क्या आप घर के मुखिया हैं

- ○ हाँ
- ○ नहीं

If क्या आप घर के मुखिया हैं is नहीं

यदि नहीं, तो घर के मुखिया कौन हैं?

- ○ पति
- ○ पत्नी
- ○ माता
- ○ पिता
- ○ भाई
- ○ बहन
- ○ चाचा
- ○ चाची
- ○ दादा
- ○ दादी
- ○ अन्य (स्पष्ट करें)

आपने शिक्षा किस स्तर तक प्राप्त की है?

- ○ पढ़ना-लिखना नहीं जानते
- ○ पढ़ना-लिखना जानते हैं लेकिन कोई औपचारिक शिक्षा नहीं
- ○ आंगनवाड़ी
- ○ प्राथमिक शिक्षा
- ○ माध्यमिक शिक्षा
- ○ उच्च शिक्षा
- ○ सर्टिफिकेट/डिप्लोमा
- ○ अन्य (स्पष्ट करें)

आप किस समुदाय या जाति से हैं? (बिहार सरकार द्वारा जाति सूची के संदर्भ में)

- ○ अनुसूचित जाति (SC)
- ○ अनुसूचित जनजाति (ST)
- ○ अन्य पिछड़ा वर्ग (अति पिछड़ा वर्ग = सबसे पिछड़ा वर्ग = पिछड़ा वर्ग अनुबंध-1 = BC-1)
- ○ पिछड़ा वर्ग (पिछड़ा वर्ग अनुबंध-2=BC-2)
- ○ सामान्य श्रेणी
- ○ सामान्य श्रेणी (आर्थिक रूप से कमजोर वर्ग = EWS)

आप किस धर्म से हैं?

- ○ मुस्लिम
- ○ हिन्दू
- ○ सिख
- ○ ईसाई
- ○ बौद्ध
- ○ आदिवासी
- ○ अन्य (स्पष्ट करें)

घर का पता

जिला

प्रखंड

पंचायत

वार्ड

टोला

परिवार के सदस्यों की जानकारी

आयु

- ○ 0 - 6
- ○ 7 - 14
- ○ 15 - 45
- ○ 46 - 60
- ○ 60 से ऊपर

लिंग

- ○ पुरुष/लड़का
- ○ महिला/लड़की
- ○ अन्य

शिक्षा

- ○ कोई औपचारिक शिक्षा नहीं
- ○ प्राथमिक शिक्षा
- ○ माध्यमिक शिक्षा
- ○ उच्च शिक्षा
- ○ सर्टिफिकेट/डिप्लोमा
- ○ अन्य (स्पष्ट करें)

प्राथमिक भूमिका

- ☐ विद्यार्थी
- ☐ घरेलू काम-काज
- ☐ कमाऊ सदस्य
- ☐ अन्य (स्पष्ट करें)

Repeat above questions as many times as necessary

आपका घर कहाँ स्थित है?

- ○ तटबंध के अंदर
- ○ तटबंध के बाहर
- ○ तटबंध के ऊपर
- ○ दो अलग-अलग नदी प्रणालियों के तटबंधों के बीच
- ○ बिना तटबंध वाली नदी के समीप
- ○ अन्य (स्पष्ट करें)

साल 2024 में, आपके टोले में बाढ़ आने के क्या कारण थे?

- ○ भारी वर्षा
- ○ बांध टूटने के कारण
- ○ नदी में पानी का स्तर बढ़ जाने के कारण
- ○ अन्य (स्पष्ट करें)

आप कितने समय तक प्रत्यक्ष रूप से बाढ़ के संपर्क में थे?

घरेलु सामान व संपत्ति की जानकारी (बाढ़ से पहले और बाढ़ के बाद)

क्या आपका घर बाढ़ से प्रभावित हुआ था

- ○ हाँ
- ○ नहीं

बाढ़ से पहले घर/मकान किस प्रकार की थी?

- ○ टाट का घर
- ○ कच्चा घर
- ○ अर्ध कच्चा घर
- ○ पक्का मकान
- ○ पक्का मकान एक मंजिला
- ○ पक्का मकान दो मंजिला
- ○ पक्का मकान दो मंजिला से अधिक
- ○ अन्य (स्पष्ट करें)

आपके घर/ मकान में कितने कमरें हैं?

- ○ 1 से 2 कमरे
- ○ 3 से 4 कमरे
- ○ 5 और उससे अधिक कमरे

If क्या आपका घर बाढ़ से प्रभावित हुआ था is हाँ
नुकसान की अनुमानित कीमत (नुकसान मकान निर्माण की प्रारंभिक लागत के अनुसार होना चाहिए)

If क्या आपका घर बाढ़ से प्रभावित हुआ था is हाँ
घर/ मकान के पुनर्निर्माण में अनुमानित राशि कितनी होगी?

घर के फर्श का प्रकार क्या है/था?

- ○ मिटटी का फर्श
- ○ टाइल्स
- ○ कॉन्क्रीट
- ○ अन्य (स्पष्ट करें)

घर के फर्श की क्या कोई क्षति/हानि हुई?

- ○ कोई नुक्सान/क्षति नहीं
- ○ हाँ
- ○ अन्य (स्पष्ट करें)

If घर के फर्श की क्या कोई क्षति/हानि हुई? isn't कोई नुक्सान/क्षति नहीं
नुकसान की अनुमानित कीमत (नुकसान फर्श बनाने की प्रारंभिक लागत के अनुसार होना चाहिए)

If घर के फर्श की क्या कोई क्षति/हानि हुई? isn't कोई नुक्सान/क्षति नहीं
फर्श के नवीनीकरण की अनुमानित कीमत क्या होगी?

दस्तावेजों के संबंध में

बाढ़ से पहले घरेलू स्तर पर कौन-कौन से दस्तावेज उपलब्ध थे?

- ☐ आधार कार्ड
- ☐ राशन कार्ड
- ☐ PAN कार्ड
- ☐ बैंक से सम्बंधित दस्तावेज
- ☐ बच्चों के स्कूल से सम्बंधित दस्तावेज/ प्रमाण पत्र
- ☐ परिवार के सदस्यों के जन्म प्रमाण पत्र
- ☐ किसान कार्ड/कृषि से सम्बंधित दस्तावेज
- ☐ जमीन से सम्बंधित दस्तावेज
- ☐ लोन से सम्बंधित दस्तावेज
- ☐ जाति सम्बंधित प्रमाण पत्र
- ☐ अन्य (स्पष्ट करें)

बाढ़ के दौरान खोए या क्षतिग्रस्त हुए विभिन दस्तावेजों के प्रकार

बाढ़ के दौरान खोए या क्षतिग्रस्त हुए विभिन दस्तावेजों के प्रकार

- ○ कोई नुक्सान/क्षति नहीं
- ○ आधार कार्ड
- ○ राशन कार्ड
- ○ PAN कार्ड
- ○ बैंक से सम्बंधित दस्तावेज
- ○ बच्चों के स्कूल से सम्बंधित दस्तावेज/ प्रमाण पत्र
- ○ परिवार के सदस्यों के जन्म प्रमाण पत्र
- ○ किसान कार्ड/कृषि से सम्बंधित दस्तावेज
- ○ जमीन से सम्बंधित दस्तावेज
- ○ लोन से सम्बंधित दस्तावेज
- ○ जाति सम्बंधित प्रमाण पत्र
- ○ अन्य (स्पष्ट करें)

If बाढ़ के दौरान खोए या क्षतिग्रस्त हुए विभिन दस्तावेजों के प्रकार isn't कोई नुक्सान/क्षति नहीं
खोए या क्षतिग्रस्त दस्तावेजों की अनुमानित संख्या

If बाढ़ के दौरान खोए या क्षतिग्रस्त हुए विभिन दस्तावेजों के प्रकार isn't कोई नुक्सान/क्षति नहीं
नए दस्तावेज बनवाने की अनुमानित लागत

If बाढ़ के दौरान खोए या क्षतिग्रस्त हुए विभिन दस्तावेजों के प्रकार isn't कोई नुक्सान/क्षति नहीं
नए दस्तावेज बनवाने के लिए आपको कितनी बार संबंधित कार्यालय जाना पड़ा?

If बाढ़ के दौरान खोए या क्षतिग्रस्त हुए विभिन दस्तावेजों के प्रकार isn't कोई नुक्सान/क्षति नहीं
कार्यालय जाने का कुल खर्चा

Repeat above questions as many times as necessary

घरेलू स्तर पर निजी सामान को हुए नुकसान के संबंध में

बाढ़ से पहले घरेलू स्तर पर कौन सी निजी वस्तुएं उपलब्ध थीं?

- ☐ परिवार के सदस्यों के कपड़े
- ☐ अध्ययन सामग्री
- ☐ फोन/मोबाइल फोन
- ☐ लैपटॉप/कंप्यूटर, ब्लूटूथ डिवाइस
- ☐ नकद पैसा/रुपये
- ☐ गहने
- ☐ टेलीविजन
- ☐ रेडियो
- ☐ अन्य (स्पष्ट करें)

घर पर निजी सामान के नुकसान का विवरण

बाढ़ के दौरान खोई या क्षतिग्रस्त हुई विभिन्न निजी वस्तुएँ

- ○ कोई नुक्सान/क्षति नहीं
- ○ परिवार के सदस्यों के कपड़े
- ○ अध्ययन सामग्री
- ○ फोन/मोबाइल फोन
- ○ लैपटॉप/कंप्यूटर, ब्लूटूथ डिवाइस
- ○ नकद पैसा/रुपये
- ○ गहने
- ○ टेलीविजन
- ○ रेडियो
- ○ अन्य (स्पष्ट करें)

If बाढ़ के दौरान खोई या क्षतिग्रस्त हुई विभिन्न निजी वस्तुएँ isn't कोई नुक्सान/क्षति नहीं
खोए या क्षतिग्रस्त वस्तुओं की अनुमानित संख्या

If बाढ़ के दौरान खोई या क्षतिग्रस्त हुई विभिन्न निजी वस्तुएँ isn't कोई नुक्सान/क्षति नहीं
सामान जब लिया गया था उसके सन्दर्भ में नुकसान की अनुमानित लागत

If बाढ़ के दौरान खोई या क्षतिग्रस्त हुई विभिन्न निजी वस्तुएँ isn't कोई नुक्सान/क्षति नहीं
आज के सन्दर्भ में क्षतिग्रस्त सामान की अनुमानित लागत

Repeat above questions as many times as necessary

रसोई से संबंधित वस्तुएँ/ खाद्य सामग्री

बाढ़ से पहले घरेलू स्तर पर रसोई से संबंधित कौन-कौन सी वास्तुएं उपलब्ध थीं?

- ☐ बर्तन
- ☐ एलपीजी गैस सिलेंडर
- ☐ एलपीजी स्टोव
- ☐ चूल्हा (मिट्टी का चूल्हा)
- ☐ जलावन
- ☐ गोइठा
- ☐ खाद्य पदार्थों को संग्रहीत करने के लिए कंटेनर
- ☐ पानी कि टंकी
- ☐ मिक्सर/ मिक्सी
- ☐ सिलबट्टा
- ☐ अन्य (स्पष्ट करें)

क्षतिग्रस्त रसोई वस्तुओं का विवरण

बाढ़ के दौरान खोई या क्षतिग्रस्त हुए रसोई वस्तुओं का विवरण

बाढ़ के दौरान खोए या क्षतिग्रस्त हुए विभिन रसोई से संबंधित वस्तुएँ

- ○ कोई नुक्सान/क्षति नहीं
- ○ बर्तन
- ○ एलपीजी गैस सिलेंडर
- ○ एलपीजी स्टोव
- ○ चूल्हा (मिट्टी का चूल्हा)
- ○ जलावन
- ○ गोइठा
- ○ खाद्य पदार्थों को संग्रहीत करने के लिए कंटेनर
- ○ पानी कि टंकी
- ○ मिक्सर/ मिक्सी
- ○ सिलबट्टा
- ○ अन्य (स्पष्ट करें)

If बाढ़ के दौरान खोए या क्षतिग्रस्त हुए विभिन रसोई से संबंधित वस्तुएँ isn't कोई नुक्सान/क्षति नहीं
खोए या क्षतिग्रस्त वस्तुओं की अनुमानित संख्या

Comments...

If बाढ़ के दौरान खोए या क्षतिग्रस्त हुए विभिन रसोई से संबंधित वस्तुएँ isn't कोई नुक्सान/क्षति नहीं
सामान जब लिया गया था उसके सन्दर्भ में नुकसान की अनुमानित लागत

If बाढ़ के दौरान खोए या क्षतिग्रस्त हुए विभिन रसोई से संबंधित वस्तुएँ isn't कोई नुक्सान/क्षति नहीं
आज के सन्दर्भ में क्षतिग्रस्त सामान की अनुमानित लागत

Repeat above questions as many times as necessary

बाढ़ से पहले घरेलू स्तर पर रसोई में कौन-कौन सी खाद्य सामग्री मौजूद थी?

- ☐ आटा (गेहूं/मक्का/चना)
- ☐ चावल
- ☐ मक्का
- ☐ दालें
- ☐ नमक
- ☐ चीनी
- ☐ मसाले
- ☐ तेल
- ☐ अचार
- ☐ तिलोरी/ पापड़
- ☐ अन्य (स्पष्ट करें)

क्षतिग्रस्त खाद्य पदार्थों का विवरण

बाढ़ के दौरान खोए या क्षतिग्रस्त हुए विभिन रसोई में मौजूद खाद्य सामग्री

- ○ कोई नुक्सान/क्षति नहीं
- ○ आटा (गेहूं/मक्का/चना)
- ○ चावल
- ○ मक्का
- ○ दालें
- ○ नमक
- ○ चीनी
- ○ मसाले
- ○ तेल
- ○ अचार
- ○ तिलोरी/ पापड़
- ○ अन्य (स्पष्ट करें)

If बाढ़ के दौरान खोए या क्षतिग्रस्त हुए विभिन रसोई में मौजूद खाद्य सामग्री isn't one of कोई नुक्सान/क्षति नहीं
खोए या क्षतिग्रस्त सामान की अनुमानित मात्रा

If बाढ़ के दौरान खोए या क्षतिग्रस्त हुए विभिन रसोई में मौजूद खाद्य सामग्री isn't one of कोई नुक्सान/क्षति नहीं
सामान जब लिया गया था उसके सन्दर्भ में नुकसान की अनुमानित कीमत

If बाढ़ के दौरान खोए या क्षतिग्रस्त हुए विभिन रसोई में मौजूद खाद्य सामग्री isn't one of कोई नुक्सान/क्षति नहीं
आज के सन्दर्भ में क्षतिग्रस्त सामान की अनुमानित कीमत

Repeat above questions as many times as necessary

बिछौना से सम्बंधित सामान की जानकारी

बाढ़ से पहले घर में बिछौना से संबंधित कौन-कौन सी सामान उपलब्ध थीं?

☐ गद्दे
☐ कंबल/ रजाई
☐ मच्छरदानी
☐ चादर
☐ तकिया
☐ अन्य (स्पष्ट करें)

बिछौना से संबंधित क्षतिग्रस्त वस्तुओं का विवरण

बाढ़ के दौरान खोई या क्षतिग्रस्त हुई विभिन्न बिछौना सम्बंधित सामान

○ कोई नुक्सान/क्षति नहीं
○ गद्दे
○ कंबल/ रजाई
○ मच्छरदानी
○ चादर
○ तकिया
○ अन्य (स्पष्ट करें)

If बाढ़ के दौरान खोई या क्षतिग्रस्त हुई विभिन्न बिछौना सम्बंधित सामान isn't कोई नुक्सान/क्षति नहीं
खोए या क्षतिग्रस्त सामान की अनुमानित संख्या

If बाढ़ के दौरान खोई या क्षतिग्रस्त हुई विभिन्न बिछौना सम्बंधित सामान isn't कोई नुक्सान/क्षति नहीं
सामान जब लिया गया था उसके सन्दर्भ में नुकसान की अनुमानित कीमत

If बाढ़ के दौरान खोई या क्षतिग्रस्त हुई विभिन्न बिछौना सम्बंधित सामान isn't कोई नुक्सान/क्षति नहीं
आज के सन्दर्भ में क्षतिग्रस्त सामान की अनुमानित कीमत

Repeat above questions as many times as necessary

फर्नीचर और घर के संग्रहण की वस्तुएँ सम्बन्धी जानकारी

बाढ़ से पहले घर में कौन-कौन से फर्नीचर/भंडारण सामान उपलब्ध थे?

☐ बेड
☐ चौकी
☐ पलंग
☐ सोफा सेट
☐ टेबल
☐ कुर्सियाँ
☐ सामान रखने का ट्रंक- स्टील/लोहे/एल्यूमीनियम
☐ सूटकेस
☐ अलमारी (लकड़ी/स्टील)
☐ अन्य (स्पष्ट करें)

क्षतिग्रस्त फर्नीचर और भंडारण वस्तुओं का विवरण

बाढ़ के दौरान खोए या क्षतिग्रस्त हुए विभिन्न फर्नीचर / घर के संग्रहण की वस्तुएँ

○ कोई नुक्सान/क्षति नहीं
○ बेड
○ चौकी
○ पलंग
○ सोफा सेट
○ टेबल
○ कुर्सियाँ
○ सामान रखने का ट्रंक- स्टील/लोहे/एल्यूमीनियम
○ सूटकेस
○ अलमारी (लकड़ी/स्टील)
○ अन्य (स्पष्ट करें)

If बाढ़ के दौरान खोए या क्षतिग्रस्त हुए विभिन्न फर्नीचर / घर के संग्रहण की वस्तुएँ isn't कोई नुक्सान/क्षति नहीं
खोए या क्षतिग्रस्त सामान की अनुमानित संख्या

If बाढ़ के दौरान खोए या क्षतिग्रस्त हुए विभिन्न फर्नीचर / घर के संग्रहण की वस्तुएँ isn't कोई नुक्सान/क्षति नहीं
सामान जब लिया गया था उसके सन्दर्भ में नुकसान की अनुमानित कीमत

If बाढ़ के दौरान खोए या क्षतिग्रस्त हुए विभिन्न फर्नीचर / घर के संग्रहण की वस्तुएँ isn't कोई नुक्सान/क्षति नहीं
आज के सन्दर्भ में क्षतिग्रस्त सामान की अनुमानित कीमत

Repeat above questions as many times as necessary

रोशनी - बिजली और अन्य संबंधित वस्तुएँ

बाढ़ से पहले घरेलू स्तर पर कौन-कौन सी रोशनी, बिजली और अन्य संबंधित वस्तुएं उपलब्ध थीं?

☐ मिट्टी के तेल के लैंप और लालटेन
☐ बैटरी से चलने वाली आपातकालीन लाइटें
☐ पंखे (छत वाले व् अन्य कोई भी)
☐ बल्ब
☐ इन्वर्टर (बैटरी के साथ)
☐ कूलर
☐ इस्त्री
☐ कपडे धोने की मशीन
☐ बिजली – वायरिंग
☐ स्विच बोर्ड
☐ बिजली मीटर
☐ अन्य (स्पष्ट करें)

क्षतिग्रस्त रोशनी - बिजली और अन्य संबंधित वस्तुओं का विवरण

बाढ़ के दौरान खोई या क्षतिग्रस्त हुई विभिन बिजली और अन्य संबंधित वस्तुएँ

○ कोई नुक्सान/क्षति नहीं
○ मिट्टी के तेल के लैंप और लालटेन
○ बैटरी से चलने वाली आपातकालीन लाइटें
○ पंखे (छत वाले व् अन्य कोई भी)
○ बल्ब
○ इन्वर्टर (बैटरी के साथ)
○ कूलर
○ इस्त्री
○ कपडे धोने की मशीन
○ बिजली – वायरिंग
○ स्विच बोर्ड
○ बिजली मीटर
○ अन्य (स्पष्ट करें)

If बाढ़ के दौरान खोई या क्षतिग्रस्त हुई विभिन बिजली और अन्य संबंधित वस्तुएँ isn't कोई नुक्सान/क्षति नहीं
खोए या क्षतिग्रस्त सामान की अनुमानित संख्या

If बाढ़ के दौरान खोई या क्षतिग्रस्त हुई विभिन बिजली और अन्य संबंधित वस्तुएँ isn't कोई नुक्सान/क्षति नहीं
सामान जब लिया गया था उसके सन्दर्भ में नुकसान की अनुमानित कीमत

If बाढ़ के दौरान खोई या क्षतिग्रस्त हुई विभिन बिजली और अन्य संबंधित वस्तुएँ isn't कोई नुक्सान/क्षति नहीं
आज के सन्दर्भ में क्षतिग्रस्त सामान की अनुमानित कीमत

Repeat above questions as many times as necessary

परिवहन के साधनों से संबंधित जानकारी

बाढ़ से पहले घरेलू स्तर पर कौन से परिवहन के साधन उपलब्ध थे?

☐ कोई नहीं
☐ साइकिल
☐ दो पहिया वाहन
☐ तीन पहिया वाहन
☐ चार पहिया वाहन
☐ नाव
☐ जुगाड़ गाड़ी/ ठेला
☐ अन्य (स्पष्ट करें)

If बाढ़ से पहले घरेलू स्तर पर कौन से परिवहन के साधन उपलब्ध थे? isn't one of कोई नहीं

क्षतिग्रस्त परिवहन साधनों का विवरण

बाढ़ के दौरान खोए या क्षतिग्रस्त हुए विभिन परिवहन के साधनों से संबंधित जानकारी

○ कोई निजी व्यवस्था नहीं
○ कोई नुक्सान/क्षति नहीं
○ साइकिल
○ दो पहिया वाहन
○ तीन पहिया वाहन
○ चार पहिया वाहन
○ नाव
○ जुगाड़ गाड़ी/ ठेला
○ अन्य (स्पष्ट करें)

If बाढ़ के दौरान खोए या क्षतिग्रस्त हुए विभिन परिवहन के साधनों से संबंधित जानकारी isn't one of कोई निजी व्यवस्था नहीं, कोई नुक्सान/क्षति नहीं

खोए या क्षतिग्रस्त सामान की अनुमानित संख्या

If बाढ़ के दौरान खोए या क्षतिग्रस्त हुए विभिन परिवहन के साधनों से संबंधित जानकारी isn't one of कोई निजी व्यवस्था नहीं, कोई नुक्सान/क्षति नहीं

सामान जब लिया गया था उसके सन्दर्भ में नुकसान की अनुमानित कीमत

If बाढ़ के दौरान खोए या क्षतिग्रस्त हुए विभिन परिवहन के साधनों से संबंधित जानकारी isn't one of कोई निजी व्यवस्था नहीं, कोई नुक्सान/क्षति नहीं

आज के सन्दर्भ में क्षतिग्रस्त सामान की अनुमानित कीमत

Repeat above questions as many times as necessary

स्वच्छता सम्बन्धित जानकारी

बाढ़ से पहले घरेलू स्तर पर कौन से जल एवं स्वच्छता सम्बन्धित सुविधाएं उपलब्ध थीं?

☐ बाथरूम/स्नानघर
☐ घर में शौचालय
☐ हैंडपंप
☐ बोरवेल/ सबमर्सिबल पंप
☐ सैनिटरी पैड
☐ नाली
☐ सोख्ता
☐ अन्य (स्पष्ट करें)

क्षतिग्रस्त जल एवं स्वछता सम्बन्धित सुविधाओं का विवरण

बाढ़ के दौरान नष्ट या क्षतिग्रस्त हुई विभिन्न जल एवं स्वच्छता सुविधाएं

○ कोई नुक्सान/क्षति नहीं
○ बाथरूम/स्नानघर
○ घर में शौचालय
○ हैंडपंप
○ बोरवेल/ सबमर्सिबल पंप
○ सैनिटरी पैड
○ नाली
○ सोख्ता
○ अन्य (स्पष्ट करें)

If बाढ़ के दौरान नष्ट या क्षतिग्रस्त हुई विभिन्न जल एवं स्वच्छता सुविधाएं isn't कोई नुक्सान/क्षति नहीं

क्षतिग्रस्त सुविधा की अनुमानित संख्या

If बाढ़ के दौरान नष्ट या क्षतिग्रस्त हुई विभिन्न जल एवं स्वच्छता सुविधाएं isn't कोई नुक्सान/क्षति नहीं

सुविधा जब बनाई गई थी उसके सन्दर्भ में नुकसान की अनुमानित लागत

If बाढ़ के दौरान नष्ट या क्षतिग्रस्त हुई विभिन्न जल एवं स्वच्छता सुविधाएं isn't कोई नुक्सान/क्षति नहीं

आज के सन्दर्भ में क्षतिग्रस्त सुविधा की अनुमानित कीमत

Repeat above questions as many times as necessary

कोठी / बेरी / बोरी / ड्रम में भण्डारित अनाज, बीज, चारा आदि की जानकारी

बाढ़ से पहले घरेलू स्तर पर किस प्रकार के अनाज, बीज, चारा उपलब्ध थे?

☐ घरेलू स्तर पर भंडारण की कोई सुविधा नहीं है
☐ धान
☐ चावल
☐ गेहूं
☐ मक्का
☐ दाल
☐ बीज
☐ सुखाई हुई सब्जियाँ
☐ चारा
☐ अन्य (स्पष्ट करें)

If बाढ़ से पहले घरेलू स्तर पर किस प्रकार के अनाज, बीज, चारा उपलब्ध थे? isn't one of घरेलू स्तर पर भंडारण की कोई सुविधा नहीं है

क्षतिग्रस्त अनाज, बीज, चारा का विवरण

बाढ़ के दौरान ख़राब हुए विभिन प्रकार के भण्डारित अनाज, बीज, चारा

○ कोई नुक्सान/क्षति नहीं
○ धान
○ चावल
○ गेहूं
○ मक्का
○ दाल
○ बीज
○ सुखाई हुई सब्जियाँ
○ चारा
○ अन्य (स्पष्ट करें)

If बाढ़ के दौरान ख़राब हुए विभिन प्रकार के भण्डारित अनाज, बीज, चारा isn't कोई नुक्सान/क्षति नहीं

अनुमानित कुल मात्रा

If बाढ़ के दौरान ख़राब हुए विभिन प्रकार के भण्डारित अनाज, बीज, चारा isn't कोई नुक्सान/क्षति नहीं

ख़राब हुए अनाज, बीज, चारा की अनुमानित मात्रा

If बाढ़ के दौरान ख़राब हुए विभिन प्रकार के भण्डारित अनाज, बीज, चारा isn't कोई नुक्सान/क्षति नहीं

अनाज, बीज, चारा आदि जब जमा किये थे उसके सन्दर्भ में नुकसान की अनुमानित लागत

If बाढ़ के दौरान ख़राब हुए विभिन प्रकार के भण्डारित अनाज, बीज, चारा isn't कोई नुक्सान/क्षति नहीं

आज के सन्दर्भ में नुकसान की अनुमानित कीमत

Repeat above questions as many times as necessary

ज़मीन से सम्बंधित जानकारी (बाढ़ से पहले और बाढ़ के बाद)

भूमि की उपलब्धता

- ☐ निजी ज़मीन नहीं है
- ☐ किसी की ज़मीन बटाई पर ली है
- ☐ आवासीय ज़मीन /बासडीह
- ☐ दुकान/ व्यवसाय के लिए खुद कि ज़मीन
- ☐ दुकान/ व्यवसाय के लिए लीज पर दी गई ज़मीन
- ☐ निजी खेतिहर ज़मीन
- ☐ बटाई पर दी गई खेतिहर ज़मीन
- ☐ बाग-बगीचा कि ज़मीन
- ☐ बंजर ज़मीन
- ☐ निजी तालाब
- ☐ अन्य (स्पष्ट करें)

If भूमि की उपलब्धता isn't one of निजी ज़मीन नहीं है

2024 की बाढ़ के दौरान ज़मीन को हुए नुकसान के बारे में जानकारी

ज़मीन के प्रकार

- ○ किसी की ज़मीन बटाई पर ली है
- ○ आवासीय ज़मीन /बासडीह
- ○ दुकान/ व्यवसाय के लिए खुद कि ज़मीन
- ○ दुकान/ व्यवसाय के लिए लीज पर दी गई ज़मीन
- ○ निजी खेतिहर ज़मीन
- ○ बटाई पर दी गई खेतिहर ज़मीन
- ○ बाग-बगीचा कि ज़मीन
- ○ बंजर ज़मीन
- ○ निजी तालाब
- ○ अन्य (स्पष्ट करें)

बाढ़ से पहले की कुल ज़मीन

कटाव के कारण खोई ज़मीन

ज़मीन जिसके ऊपर से नदी बह रही है

आज के सन्दर्भ में क्षति हुई ज़मीन की कुल कीमत

Repeat above questions as many times as necessary

आजीविका के साधनों की जानकारी (बाढ़ से पहले और बाढ़ के बाद)

बाढ़ से पहले आपके पास कौन-कौन से बड़े पशु थे?

- ☐ कोइ पशु नहि थे
- ☐ दूध देने वाली गाय
- ☐ सुखी गाय
- ☐ गाय का बछड़ा
- ☐ दूध देने वाली भैंस
- ☐ सुखी भैंस
- ☐ भैंस का बच्चा
- ☐ बैल
- ☐ अन्य (स्पष्ट करें)

If बाढ़ से पहले आपके पास कौन-कौन से बड़े पशु थे? isn't one of कोइ पशु नहि थे

2024 की बाढ़ के दौरान प्रभावित हुए बड़े पशुओं की जानकारी

बड़े पशु

- ○ कोइ पशु नहि थे
- ○ दूध देने वाली गाय
- ○ सुखी गाय
- ○ गाय का बछड़ा
- ○ दूध देने वाली भैंस
- ○ सुखी भैंस
- ○ भैंस का बच्चा
- ○ बैल
- ○ अन्य (स्पष्ट करें)

If बड़े पशु isn't कोइ पशु नहि थे

2024 की बाढ़ के पहले की अनुमानित कुल संख्या

If बड़े पशु isn't कोइ पशु नहि थे

खोए हुए की अनुमानित संख्या

If बड़े पशु isn't कोइ पशु नहि थे

जख्मी की अनुमानित संख्या

If बड़े पशु isn't कोइ पशु नहि थे
and खोए हुए की अनुमानित संख्या is greater than 0

आज के संदर्भ में खोए हुए की अनुमानित कीमत

If बड़े पशु isn't कोइ पशु नहि थे
and जख्मी की अनुमानित संख्या is greater than 0

2024 की बाढ़ के दौरान जख्मी के उपचार की अनुमानित लागत

Repeat above questions as many times as necessary

बाढ़ से पहले आपके पास कौन-कौन से छोटे पशु थे?

- ☐ कोई पशु नहीं थे
- ☐ बकरी
- ☐ बकरी का बच्चा
- ☐ भेड़
- ☐ भेड़ के बच्चे
- ☐ सूअर
- ☐ सूअर के बच्चे
- ☐ अन्य (स्पष्ट करें)

If बाढ़ से पहले आपके पास कौन-कौन से छोटे पशु थे? isn't one of कोई पशु नहीं थे

2024 की बाढ़ के दौरान प्रभावित हुए छोटे पशुओं की जानकारी

छोटे पशु

- ○ कोई पशु नहीं थे
- ○ बकरी
- ○ बकरी का बच्चा
- ○ भेड़
- ○ भेड़ के बच्चे
- ○ सूअर
- ○ सूअर के बच्चे
- ○ अन्य (स्पष्ट करें)

If छोटे पशु isn't कोई पशु नहीं थे

2024 की बाढ़ के पहले की अनुमानित कुल संख्या

If छोटे पशु isn't कोई पशु नहीं थे

खोए हुए कि अनुमानित संख्या

If छोटे पशु isn't कोई पशु नहीं थे

जख्मी की अनुमानित संख्या

If छोटे पशु isn't कोई पशु नहीं थे
and खोए हुए कि अनुमानित संख्या is greater than 0

आज के संदर्भ में खोए हुए की अनुमानित कीमत

If छोटे पशु isn't कोई पशु नहीं थे
and जख्मी की अनुमानित संख्या is greater than 0

2024 की बाढ़ के दौरान जख्मी के उपचार की अनुमानित लागत

Repeat above questions as many times as necessary

बाढ़ से पहले आपके पास कौन-कौन से पोल्ट्री थे?

- ☐ कोई पोल्ट्री नहीं है
- ☐ मुर्गी/ मुर्गा
- ☐ मुर्गी के बच्चे
- ☐ बत्तख
- ☐ बत्तख के बच्चे
- ☐ कबूतर
- ☐ अन्य (स्पष्ट करें)

If बाढ़ से पहले आपके पास कौन-कौन से पोल्ट्री थे? isn't one of कोई पोल्ट्री नहीं है

2024 की बाढ़ से प्रभावित पोल्ट्री की जानकारी

पोल्ट्री - मुर्गी/ बत्तख/ कबूतर

- ○ कोई पोल्ट्री नहीं है
- ○ मुर्गी/ मुर्गा
- ○ मुर्गी के बच्चे
- ○ बत्तख
- ○ बत्तख के बच्चे
- ○ कबूतर
- ○ अन्य (स्पष्ट करें)

If पोल्ट्री - मुर्गी/ बत्तख/ कबूतर isn't कोई पोल्ट्री नहीं है

2024 की बाढ़ के पहले की अनुमानित कुल संख्या

If पोल्ट्री - मुर्गी/ बत्तख/ कबूतर isn't कोई पोल्ट्री नहीं है

खोए हुए की अनुमानित संख्या

If पोल्ट्री - मुर्गी/ बत्तख/ कबूतर isn't कोई पोल्ट्री नहीं है and खोए हुए की अनुमानित संख्या is greater than 0

आज के संदर्भ में खोए हुए की अनुमानित कीमत

Repeat above questions as many times as necessary

क्या आपने बाढ़ से पहले मछली पालन किया था?

- ○ हाँ
- ○ नहीं

If क्या आपने बाढ़ से पहले मछली पालन किया था? is हाँ

क्षतिग्रस्त मछली पालन का विवरण

2024 बाढ़ से पहले की अनुमानित कुल मूल्य

आज के संदर्भ में, 2024 की बाढ़ के दौरान कुल नुकसान

Repeat above questions as many times as necessary

2024 की बाढ़ के दौरान प्रभावित फसलों की जानकारी

बाढ़ से पहले आपके पास कौन-कौन से फसल थे?

- ☐ कोई नहीं
- ☐ धान
- ☐ मक्का
- ☐ दाल
- ☐ गन्ना
- ☐ अनानास
- ☐ आम
- ☐ केला
- ☐ सब्जियां
- ☐ बाँस
- ☐ चाय
- ☐ अन्य (स्पष्ट करें)

If 2024 की बाढ़ के दौरान ज़मीन को हुए नुकसान के बारे में जानकारी > नवीनतम ज़मीन के प्रकार आवासीय ज़मीन /बासडीह, दुकान/ व्यवसाय के लिए खुद कि ज़मीन, दुकान/ व्यवसाय के लिए लीज पर दी गई ज़मीन, निजी खेतिहर ज़मीन, बटाई पर दी गई खेतिहर ज़मीन, बाग-बगीचा कि ज़मीन, बंजर ज़मीन, निजी तालाब, अन्य (स्पष्ट करें), किसी की ज़मीन बटाई पर ली है में से कोई भी है and बाढ़ से पहले आपके पास कौन-कौन से फसल थे? में धान, मक्का, दाल, गन्ना, अनानास, आम, केला, सब्जियां, बाँस, चाय में से कोई भी शामिल है

2024 की बाढ़ के दौरान क्षतिग्रस्त फसल का विवरण

प्रभावित फसल के प्रकार

- ○ कोई नुक्सान/क्षति नहीं
- ○ धान
- ○ मक्का
- ○ दाल
- ○ गन्ना
- ○ अनानास
- ○ आम
- ○ केला
- ○ सब्जियां
- ○ बाँस
- ○ चाय
- ○ अन्य (स्पष्ट करें)

If प्रभावित फसल के प्रकार isn't कोई नुक्सान/क्षति नहीं

बाढ़ के पहले खड़ी फसल

If प्रभावित फसल के प्रकार isn't कोई नुक्सान/क्षति नहीं

क्षतिग्रस्त फसल की अनुमानित मात्रा

If प्रभावित फसल के प्रकार isn't कोई नुक्सान/क्षति नहीं

सामान्य वर्षों में फसल का उत्पादन कितना था?

If प्रभावित फसल के प्रकार isn't कोई नुक्सान/क्षति नहीं

2024 में बाढ़ के बाद उत्पादन की अनुमानित मात्रा

If प्रभावित फसल के प्रकार isn't कोई नुक्सान/क्षति नहीं

2024 की बाढ़ के कारण फसल को होने वाले नुकसान की अनुमानित कुल कीमत

If प्रभावित फसल के प्रकार isn't कोई नुक्सान/क्षति नहीं

फसल लगाने का महीना

- ○ जनवरी
- ○ फ़रवरी
- ○ मार्च
- ○ अप्रैल
- ○ मई
- ○ जून
- ○ जुलाई
- ○ अगस्त
- ○ सितम्बर
- ○ अक्टूबर
- ○ नवंबर
- ○ दिसंबर

If प्रभावित फसल के प्रकार isn't कोई नुक्सान/क्षति नहीं

फसल की कटाई का महीना

- ○ जनवरी
- ○ फ़रवरी
- ○ मार्च
- ○ अप्रैल
- ○ मई
- ○ जून
- ○ जुलाई
- ○ अगस्त
- ○ सितम्बर
- ○ अक्टूबर
- ○ नवंबर
- ○ दिसंबर

Repeat above questions as many times as necessary

2024 की बाढ़ के दौरान नदी से आने वाली गाद और जलभराव के कारण प्रभावित होने वाली आगामी फसल

क्या आपने बाढ़ से पहले अगले सीजन के लिए फसलों की योजना बनाई थी?

☐ कोई फसल नहीं
☐ धान
☐ गेहूं
☐ मक्का
☐ दाल
☐ गन्ना
☐ अनानास
☐ आम
☐ केला
☐ सब्जियां
☐ बाँस
☐ चाय
☐ अन्य (स्पष्ट करें)

If 2024 की बाढ़ के दौरान ज़मीन को हुए नुकसान के बारे में जानकारी > नवीनतम ज़मीन के प्रकार आवासीय ज़मीन /बासडीह, दुकान/ व्यवसाय के लिए खुद कि ज़मीन, दुकान/ व्यवसाय के लिए लीज पर दी गई ज़मीन, निजी खेतिहर ज़मीन, बटाई पर दी गई खेतिहर ज़मीन, बाग-बगीचा कि ज़मीन, बंजर ज़मीन, निजी तालाब, अन्य (स्पष्ट करें) में से कोई भी है

2024 की बाढ़ के समय नदी से आई गाद व् जल जमाव के कारण प्रभावित होने वाली आगामी फसलें

प्रभावित फसल के प्रकार

○ कोई नुक्सान/क्षति नहीं
○ धान
○ गेहूं
○ मक्का
○ दाल
○ गन्ना
○ अनानास
○ आम
○ केला
○ सब्जियां
○ बाँस
○ चाय
○ अन्य (स्पष्ट करें)

If प्रभावित फसल के प्रकार isn't कोई नुक्सान/क्षति नहीं
फसल की कटाई का महीना

○ जनवरी
○ फ़रवरी
○ मार्च
○ अप्रैल
○ मई
○ जून
○ जुलाई
○ अगस्त
○ सितम्बर
○ अक्टूबर
○ नवंबर
○ दिसंबर

Repeat above questions as many times as necessary

2024 की बाढ़ के दौरान प्रभावित होने वाले कृषि यंत्रों के बारे में जानकारी

बाढ़ से पहले आपके पास कौन-कौन से कृषि यंत्र थे?

☐ कोई कृषि यंत्र नहीं थे
☐ कुदाल, खुरपी, हसुआ, कोडारी
☐ बेचा/ बेलचा
☐ दौली/ दौरी/ टोकरी
☐ मैनुअल स्प्रेयर
☐ सीड ड्रिल
☐ हल – लकड़ी या लोहे की
☐ पावर टिलर
☐ पंप सेट
☐ ट्रैक्टर
☐ बैलगाड़ी
☐ थ्रेशर
☐ चारा कटाई मशीन
☐ अन्य (स्पष्ट करें)

If बाढ़ से पहले आपके पास कौन-कौन से कृषि यंत्र थे? isn't one of कोई कृषि यंत्र नहीं थे

2024 की बाढ़ के दौरान प्रभावित हुए कृषि यंत्रों की जानकारी

If प्रभावित फसल के प्रकार isn't कोई नुक्सान/क्षति नहीं
गाद के कारण प्रभावित खेतिहर जमीन

If प्रभावित फसल के प्रकार isn't कोई नुक्सान/क्षति नहीं
जल जमाव के कारण

If प्रभावित फसल के प्रकार isn't कोई नुक्सान/क्षति नहीं
आगामी फसल की अनुमानित उपज मात्रा

If प्रभावित फसल के प्रकार isn't कोई नुक्सान/क्षति नहीं
फसल की क्षति की अनुमानित कीमत

If प्रभावित फसल के प्रकार isn't कोई नुक्सान/क्षति नहीं
फसल लगाने का महीना

○ जनवरी
○ फ़रवरी
○ मार्च
○ अप्रैल
○ मई
○ जून
○ जुलाई
○ अगस्त
○ सितम्बर
○ अक्टूबर
○ नवंबर
○ दिसंबर

प्रभावित कृषि यंत्रों के प्रकार

○ कोई नुक्सान/क्षति नहीं
○ कुदाल, खुरपी, हसुआ, कोडारी
○ बेचा/ बेलचा
○ दौली/ दौरी/ टोकरी
○ मैनुअल स्प्रेयर
○ सीड ड्रिल
○ हल – लकड़ी या लोहे की
○ पावर टिलर
○ पंप सेट
○ ट्रैक्टर
○ बैलगाड़ी
○ थ्रेशर
○ चारा कटाई मशीन
○ अन्य (स्पष्ट करें)

If प्रभावित कृषि यंत्रों के प्रकार isn't कोई नुक्सान/क्षति नहीं
बाढ़ से पहले की कुल संख्या

If प्रभावित कृषि यंत्रों के प्रकार isn't कोई नुक्सान/क्षति नहीं
बाढ़ से खोए या क्षतिग्रस्त की अनुमानित संख्या

If प्रभावित कृषि यंत्रों के प्रकार isn't कोई नुक्सान/क्षति नहीं
बाढ़ के दौरान नष्ट हुए यंत्रों के स्थान पर नए उपकरणों की वर्तमान कीमत

If प्रभावित कृषि यंत्रों के प्रकार isn't कोई नुक्सान/क्षति नहीं
बाढ़ के दौरान क्षतिग्रस्त यंत्रों की मरम्मत की वर्तमान लागत

Repeat above questions as many times as necessary

बाढ़ से पहले व्यवसाय और आय के स्रोतों से संबंधित जानकारी

2024 की बाढ़ से पहले की व्यवसायिक स्थिति

आजीविका/ व्यवसाय

- ○ दैनिक मजदूरी
- ○ स्वरोजगार
- ○ नियमित तनख्वाह/वेतन
- ○ अन्य (स्पष्ट करें)

If आजीविका/ व्यवसाय is one of दैनिक मजदूरी, स्वरोजगार

बाढ़ से पहले की व्यवसायिक स्थिति का विवरण

- ○ कृषि आधारित
- ○ गैर-कृषि आधारित

If आजीविका/ व्यवसाय is नियमित तनख्वाह/वेतन

बाढ़ से पहले की व्यवसायिक स्थिति का विवरण

- ○ केंद्र सरकार के अधीन
- ○ राज्य सरकार के अधीन
- ○ प्राइवेट सेक्टर/ या गैर-सरकारी क्षेत्र
- ○ अन्य (स्पष्ट करें)

व्यवसाय का स्थान

- ○ अपने गांव में
- ○ अपने ब्लॉक में
- ○ अपने जिला में
- ○ अपने राज्य में
- ○ दूसरे राज्यों में
- ○ विदेश में

If आजीविका/ व्यवसाय is one of दैनिक मजदूरी, अन्य (स्पष्ट करें)

दैनिक आय

If आजीविका/ व्यवसाय is one of स्वरोजगार, नियमित तनख्वाह/वेतन, अन्य (स्पष्ट करें)

प्रति माह आय

If आजीविका/ व्यवसाय is one of स्वरोजगार, नियमित तनख्वाह/वेतन, अन्य (स्पष्ट करें) and प्रति माह आय was not answered

प्रति वर्ष आय

Repeat above questions as many times as necessary

बाढ़ के बाद व्यवसाय और आय के स्रोतों से संबंधित जानकारी

2024 की बाढ़ के बाद प्रभावित हुए व्यावसायिक व आमदनी के साधनों से सम्बंधित जानकारी

बाढ़ के बाद की व्यवसायिक स्थिति

- ○ दैनिक मजदूरी
- ○ स्वरोजगार
- ○ नियमित तनख्वाह/वेतन
- ○ अन्य (स्पष्ट करें)

If बाढ़ के बाद की व्यवसायिक स्थिति isn't one of नियमित तनख्वाह/वेतन

बाढ़ के बाद की व्यवसायिक स्थिति का विवरण

- ○ कृषि आधारित
- ○ गैर-कृषि आधारित

If बाढ़ के बाद की व्यवसायिक स्थिति is नियमित तनख्वाह/वेतन

बाढ़ के बाद की व्यवसायिक स्थिति का विवरण

- ○ केंद्र सरकार के अधीन
- ○ राज्य सरकार के अधीन
- ○ प्राइवेट सेक्टर/ या गैर-सरकारी क्षेत्र
- ○ अन्य (स्पष्ट करें)

व्यवसाय का स्थान

- ○ अपने गांव में
- ○ अपने ब्लॉक में
- ○ अपने जिला में
- ○ अपने राज्य में
- ○ दूसरे राज्यों में
- ○ विदेश में

If बाढ़ के बाद की व्यवसायिक स्थिति is one of दैनिक मजदूरी, अन्य (स्पष्ट करें)

दैनिक आय

If बाढ़ के बाद की व्यवसायिक स्थिति is one of स्वरोजगार, नियमित तनख्वाह/वेतन, अन्य (स्पष्ट करें)

प्रति माह आय

If बाढ़ के बाद की व्यवसायिक स्थिति is one of स्वरोजगार, नियमित तनख्वाह/वेतन, अन्य (स्पष्ट करें) and प्रति माह आय was not answered

प्रति वर्ष आय

Repeat above questions as many times as necessary

घरेलू स्तर पर विभिन्न बीमा योजनाओं के बारे में जानकारी

क्या आप जानते हैं कि ऐसी बीमा योजनाएं हो सकती हैं जो बाढ़ से होने वाले नुकसान की भरपाई कर सकती हैं?

- ○ हाँ
- ○ नहीं

बीमा योजनाओं से संबंधित

क्या आपने कोई बीमा लिया है?

- ○ हाँ
- ○ नहीं

If क्या आपने कोई बीमा लिया है? is हाँ

आपने किस तरह का बीमा चुना है?

- ○ घर/ मकान
- ○ कृषि
- ○ पशु
- ○ परिवार के सदस्यों का स्वास्थ्य
- ○ बुजुर्ग
- ○ अन्य (कृपया स्पष्ट करें)

If क्या आपने कोई बीमा लिया है? is हाँ

वार्षिक प्रीमियम कितना दिया जाता है?

If क्या आपने कोई बीमा लिया है? is हाँ

हाल का वह वर्ष जिसके लिए वार्षिक प्रीमियम दिया गया है

Repeat above questions as many times as necessary

बच्चों, महिलाओं, दिव्यांग और बुजुर्गों पर बाढ़ के असर से जुड़े कुछ प्रश्न

बच्चों पर प्रभाव

क्या बाढ़ के दौरान घर पर कोई बच्चे थे ?

- ○ हाँ
- ○ नहीं

If क्या बाढ़ के दौरान घर पर कोई बच्चे थे ? is हाँ

क्या बाढ़ के दौरान आपके बच्चे स्कूल जाते थे?

- ○ हाँ
- ○ नहीं

If क्या बाढ़ के दौरान घर पर कोई बच्चे थे? is हाँ
and क्या बाढ़ के दौरान आपके बच्चे स्कूल जाते थे? is नहीं
अगर नहीं, तो आमतौर पर कितने दिनों तक स्कूल बाधित रहता था?

- ○ 1 सप्ताह
- ○ 1 - 2 सप्ताह
- ○ एक महीना या अधिक

If क्या बाढ़ के दौरान घर पर कोई बच्चे थे? is हाँ
क्या स्कूल भवन भी बाढ़ में क्षतिग्रस्त हुआ था?

- ○ हाँ
- ○ नहीं
- ○ कभी-कभी

If क्या बाढ़ के दौरान घर पर कोई बच्चे थे? is हाँ
and क्या बाढ़ के दौरान आपके बच्चे स्कूल जाते थे? is नहीं
बाढ़ के समय बच्चे कहाँ पढ़ाई करते थे?

- ○ घर पर
- ○ अस्थायी आश्रय
- ○ नहीं पढ़ पाते

If क्या बाढ़ के दौरान घर पर कोई बच्चे थे? is हाँ
क्या बाढ़ के समय बच्चों को पर्याप्त खाना मिल पाता था?

- ○ हाँ
- ○ नहीं
- ○ कभी-कभी

If क्या बाढ़ के दौरान घर पर कोई बच्चे थे? is हाँ
क्या बच्चों ने स्वास्थ्य संबंधी समस्याओं की शिकायत की?

- ☐ डायरिया
- ☐ त्वचा रोग
- ☐ सर्दी-खांसी
- ☐ अन्य (स्पष्ट करें)

If क्या बाढ़ के दौरान घर पर कोई बच्चे थे? is हाँ
क्या उन्हें समय पर इलाज मिल पाता था?

- ○ हाँ
- ○ नहीं
- ○ कभी-कभी

If क्या बाढ़ के दौरान घर पर कोई बच्चे थे? is हाँ
क्या बच्चों को बाढ़ के समय सुरक्षित स्थान पर ले जाना पड़ता था?

- ○ हाँ
- ○ नहीं
- ○ कभी-कभी

If क्या बाढ़ के दौरान घर पर कोई बच्चे थे? is हाँ
क्या बाढ़ के दौरान बच्चे डरे हुए या मानसिक रूप से परेशान रहते थे?

- ○ हाँ
- ○ नहीं
- ○ कभी-कभी

If क्या बाढ़ के दौरान घर पर कोई बच्चे थे? is हाँ
क्या बच्चे बाढ़ के समय घरेलू या बाहरी कामों में हाथ बंटाते थे?

- ○ हाँ
- ○ नहीं
- ○ कभी-कभी

If क्या बाढ़ के दौरान घर पर कोई बच्चे थे? is हाँ
and क्या बच्चे बाढ़ के समय घरेलू या बाहरी कामों में हाथ बंटाते थे? isn't नहीं
अगर हाँ, तो किस प्रकार का काम करते थे?

- ☐ पानी निकालना
- ☐ सामान उठाना/शिफ्ट करना
- ☐ पशु संभालना
- ☐ नाव चलाना/मदद करना
- ☐ अन्य (स्पष्ट करें)

बुजुर्गों पर प्रभाव

क्या बाढ़ के दौरान घर पर कोई बुजुर्ग थे?

- ○ हाँ
- ○ नहीं

If क्या बाढ़ के दौरान घर पर कोई बुजुर्ग थे? is हाँ
क्या बाढ़ के दौरान बुजुर्गों की देखभाल करना मुश्किल होता था?

- ○ हाँ
- ○ नहीं
- ○ कभी-कभी

If क्या बाढ़ के दौरान घर पर कोई बुजुर्ग थे? is हाँ
बाढ़ के समय बुजुर्गों को कौन-कौन सी बीमारियाँ होती थी?

- ☐ जोड़ों में दर्द
- ☐ बुखार
- ☐ सांस की तकलीफ
- ☐ तनाव/चिंता
- ☐ अन्य (स्पष्ट करें)

If क्या बाढ़ के दौरान घर पर कोई बुजुर्ग थे? is हाँ
क्या उन्हें इलाज के लिए डॉक्टर या स्वास्थ्य सेवाएं मिल पाती थी?

- ○ हाँ
- ○ नहीं
- ○ कभी-कभी

If क्या बाढ़ के दौरान घर पर कोई बुजुर्ग थे? is हाँ
and क्या उन्हें इलाज के लिए डॉक्टर या स्वास्थ्य सेवाएं मिल पाती थी? isn't हाँ
यदि नहीं, तो उनको किस प्रकार की समस्या का सामना करना पड़ा?

- ☐ बुखार
- ☐ हृदय रोग
- ☐ अस्थमा
- ☐ मधुमेह
- ☐ त्वचा के रोग
- ☐ मृत्यु
- ☐ अन्य (स्पष्ट करें)

If क्या बाढ़ के दौरान घर पर कोई बुजुर्ग थे? is हाँ
क्या बुजुर्गों को सुरक्षित स्थान पर ले जाना मुश्किल होता था?

- ○ हाँ
- ○ नहीं
- ○ कभी-कभी

If क्या बाढ़ के दौरान घर पर कोई बुजुर्ग थे? is हाँ
बाढ़ के समय बुजुर्ग कहाँ रहते थे?

- ○ घर में ही
- ○ अस्थायी शरण स्थल में
- ○ रिश्तेदारों के यहाँ
- ○ अन्य (स्पष्ट करें)

If क्या बाढ़ के दौरान घर पर कोई बुजुर्ग थे? is हाँ
क्या बाढ़ के कारण बुजुर्ग मानसिक तनाव या अकेलेपन का अनुभव करते थे?

- ○ हाँ
- ○ नहीं
- ○ कभी-कभी

किशोरियों और महिलाओं पर प्रभाव

बाढ़ के समय क्या आपके घर में कोई गर्भवती महिला थी

- ○ हाँ
- ○ नहीं

If बाढ़ के समय क्या आपके घर में कोई गर्भवती महिला थी is हाँ
गर्भवती महिलाओं को समय पर देखभाल मिली?

- ○ हाँ
- ○ नहीं
- ○ बहुत कम

If बाढ़ के समय क्या आपके घर में कोई गर्भवती महिला थी हाँ है and गर्भवती महिलाओं को समय पर देखभाल मिली? हाँ नहीं है

यदि नहीं, तो उनको किस प्रकार की समस्या का सामना करना पड़ा?

- ☐ गर्भवती माँ की तबीयत ख़राब हुई
- ☐ गर्भपात हुआ
- ☐ समय से पहले प्रसव हुआ
- ☐ शिशु की तबीयत बिगड़ी और जटिलता हुई
- ☐ गर्भवती माँ की मृत्यु हुई
- ☐ शिशु की मृत्यु हुई
- ☐ अन्य (स्पष्ट करें)

बाढ़ में मासिक धर्म के समय महिलाओं और किशोरियों को किस प्रकार की समस्याओं का सामना करना पड़ता था?

- ☐ सैनिटरी नैपकिन/ पैड नहीं मिला
- ☐ सुरक्षित जगह नहीं थी
- ☐ साफ पानी नहीं था
- ☐ अन्य (स्पष्ट करें)

दिव्यांग लोगों पर प्रभाव

क्या आपके घर में कोई दिव्यांग थे?

- ○ हाँ
- ○ नहीं

If क्या आपके घर में कोई दिव्यांग थे? is हाँ

यदि हाँ, तो क्या बाढ़ के दौरान उन्हें सुरक्षित स्थान पर ले जाया गया?

- ○ हाँ
- ○ नहीं
- ○ ले जाया गया पर सुरक्षित स्थान नहीं था
- ○ अन्य (स्पष्ट करें)

If क्या आपके घर में कोई दिव्यांग थे? is हाँ

बाढ़ के दौरान उन्हें किस तरह की समस्याओं का सामना करना पड़ा?

- ☐ परिवार के दूसरे सदस्यों पर निर्भर रहना पड़ा
- ☐ आपातकालीन चेतावनी तथा अन्य घोषणाएं सुनने में परेशानी होती थी
- ☐ घर की वस्तुओं के बिखर जाने से उन लोगों के लिए जगह का अनुमान लगाना और भी मुश्किल हो गया जो आँखों से नहीं देख सकते थे
- ☐ दूसरों पर निर्भर होने के कारण घबरात रहती थी
- ☐ अन्य (स्पष्ट करें)

बाढ़ के दौरान अपनाई गई रणनीतियां और दैनिक जीवन में किये गए बदलाव

बाढ़ के दौरान अपनाई गई बचाव रणनीतियाँ

	हाँ या नहीं में उत्तर दीजिये
बाढ़ के दौरान भोजन की मात्रा कम कर दी गई थी	
बाढ़ के दौरान अस्थायी आश्रय में जाना पड़ा	
खेती नहीं हो पाती, इसलिए भंडारित भोजन पर निर्भर रहना पड़ा	
रिश्तेदारों से खाना लेना पड़ा	
साहूकार से पैसे उधार लेने पड़ा	
जेवरात गिरवी रखने पड़े	
पशु गिरवी रखना पड़ा	
जेवरात बेचने पड़े	
पशु बेचना पड़ा	
ज़मीन गिरवी रखनी पड़ी	
ज़मीन बेचनी पड़ी	
बाढ़ के दौरान खर्च चलाने के लिए बाहर गए सदस्य द्वारा भेजे गए पैसे पर निर्भर रहना पड़ा	
बाढ़ के बाद पलायन में वृद्धि हुई	
अन्य (स्पष्ट करें)	

If बाढ़ के दौरान अपनाई गई बचाव रणनीतियाँ: अन्य (स्पष्ट करें) - हाँ या नहीं में उत्तर दीजिये हाँ है

अन्य (स्पष्ट करें)

भविष्य में घरेलू स्तर पर बाढ़ के प्रभाव को कैसे कम किया जा सकता है, इस पर साक्षात्कारकर्ता के सुझाव

घर को बाढ़ से बचाने के उपाय

- ☐ खंभों पर या ऊँचे प्लेटफॉर्म पर घर बनाना
- ☐ घर के निर्माण में बाढ़ प्रतिरोधी सामग्री का उपयोग करना
- ☐ यदि संभव हो तो घर को ऊँचे स्थान पर स्थानांतरित करना
- ☐ भविष्य में संभावित बाढ़ को ध्यान में रखते हुए घर की मरम्मत और मजबूती का कार्य करना
- ☐ सरकारी योजनाओं के लिए आवेदन करना जो बाढ़ से सुरक्षा में मदद करें
- ☐ अन्य (स्पष्ट करें)

घरेलू सामान की सुरक्षा के उपाय

- ☐ खाद्य और आवश्यक वस्तुओं को ऊँचाई पर रखे गए शेल्फ या प्लेटफॉर्म पर संग्रहित करना
- ☐ जल प्रतिरोधी कंटेनरों का उपयोग करना
- ☐ सामुदायिक भंडारण सुविधाओं का निर्माण और उपयोग
- ☐ अन्य (स्पष्ट करें)

कृषि की सुरक्षा के उपाय

- ☐ मौसम के अनुसार फसल विविधीकरण और नियोजन अपनाना
- ☐ बाढ़ प्रतिरोधी और जलवायु-अनुकूल बीजों का उपयोग करना
- ☐ नदी कटाव रोकने के लिए उपयुक्त तकनीकों का प्रयोग करना
- ☐ मौसम संबंधी जानकारी और चेतावनियाँ नियमित रूप से प्रदान करना
- ☐ सब्सिडी वाले उपकरणों की उपलब्धता सुनिश्चित करना
- ☐ बाढ़ के समय और बाद में अनुकूल ऋण प्रणाली विकसित करना
- ☐ अन्य (स्पष्ट करें)

आय के स्रोत बनाए रखने के सुझाव

- ☐ स्थानीय स्तर पर घर-आधारित कार्य और कौशल-आधारित रोजगार सुनिश्चित करना
- ☐ छोटे व्यवसाय शुरू करने में सहायता प्रदान करना
- ☐ मनरेगा जैसे कार्यों को सक्रिय करना
- ☐ पलायन को विकल्प के रूप में देखना
- ☐ अन्य (स्पष्ट करें)

आय में विविधीकरण की स्थिति

- ○ कोई बदलाव नहीं हुआ है
- ○ अब पलायन करना पड़ता है
- ○ कृषि पर ही निर्भर हैं
- ○ कृषि के साथ पशुपालन और मुर्गी पालन
- ○ श्रम कार्य के साथ पशुपालन और मुर्गी पालन
- ○ आय स्रोतों में विविधता के लिए सहायता की आवश्यकता
- ○ अन्य (स्पष्ट करें)

सार्वजनिक सुविधाओं की तैयारी

- ☐ ऊँचाई पर शौचालय और स्वच्छ जल की व्यवस्था
- ☐ सौर या बैटरी चालित लाइट्स
- ☐ मोबाइल पानी टैंक की सुविधा
- ☐ अन्य (स्पष्ट करें)

स्वास्थ्य सुविधाओं की तैयारी

- ☐ मोबाइल मेडिकल यूनिट और अस्थायी स्वास्थ्य जांच केंद्र
- ☐ आपातकालीन दवा किट और परिवहन सुविधा
- ☐ नियमित टीकाकरण और साफ-सफाई की व्यवस्था
- ☐ पोषण सामग्री की उपलब्धता (विशेषकर गर्भवती, बुजुर्ग, दिव्यांग)
- ☐ अन्य (स्पष्ट करें)

किशोरियों और महिलाओं की स्वास्थ्य सुरक्षा

☐ निःशुल्क सैनिटरी पैड और स्वच्छता सामग्री
☐ बाढ़-रोधी शौचालयों का निर्माण
☐ स्वच्छता और व्यक्तिगत सुरक्षा पर प्रशिक्षण
☐ गर्भवती और स्तनपान कराने वाली महिलाओं के लिए नियमित स्वास्थ्य जांच और पोषण सहायता
☐ मातृत्व और नवजात स्वास्थ्य सेवाएं
☐ अन्य (स्पष्ट करें)

चेतावनी देने के प्रभावी तरीके

☐ व्हाट्सएप/ एसएमएस-आधारित अलर्ट
☐ लाउडस्पीकर द्वारा सूचना प्रसारण
☐ घर-घर जाकर जानकारी देना
☐ सामुदायिक चेतावनी प्रणाली
☐ अन्य (स्पष्ट करें)

सामुदायिक जीवन सुरक्षा उपाय

☐ आपातकालीन नावें और राहत सामग्री
☐ पशुओं के लिए चारा और स्वच्छ जल
☐ खाना पकाने के लिए के लिए ईंधन सामग्री
☐ कमज़ोर व्यक्तियों की पहचान और सहायता
☐ खोज व बचाव कार्य हेतु स्थानीय स्वयंसेवक नेटवर्क
☐ अन्य (स्पष्ट करें)

पशुओं की सुरक्षा के उपाय

☐ ऊँचे स्थानों पर सुरक्षित पशु आश्रय और चारा व्यवस्था
☐ मानसून पूर्व पशुओं का टीकाकरण और सूखा चारा संग्रहण
☐ आपातकालीन चारा और स्वास्थ्य शिविरों की स्थापना
☐ पशु हानि मुआवज़ा योजना की व्यवस्था
☐ अन्य (स्पष्ट करें)

आय सुरक्षा के सामुदायिक उपाय

☐ आय स्रोतों में विविधता लाना (कृषि, मजदूरी, व्यवसाय)
☐ आपातकालीन कोष या ऋण सुविधा
☐ मौसमी प्रवास के लिए कौशल विकास
☐ SHG या रोटेशन फंड से वित्तीय सहयोग
☐ अन्य (स्पष्ट करें)