When Warnings Fall Short: Community Knowledge and Early Action in the 2022 Bangladesh Flash Floods

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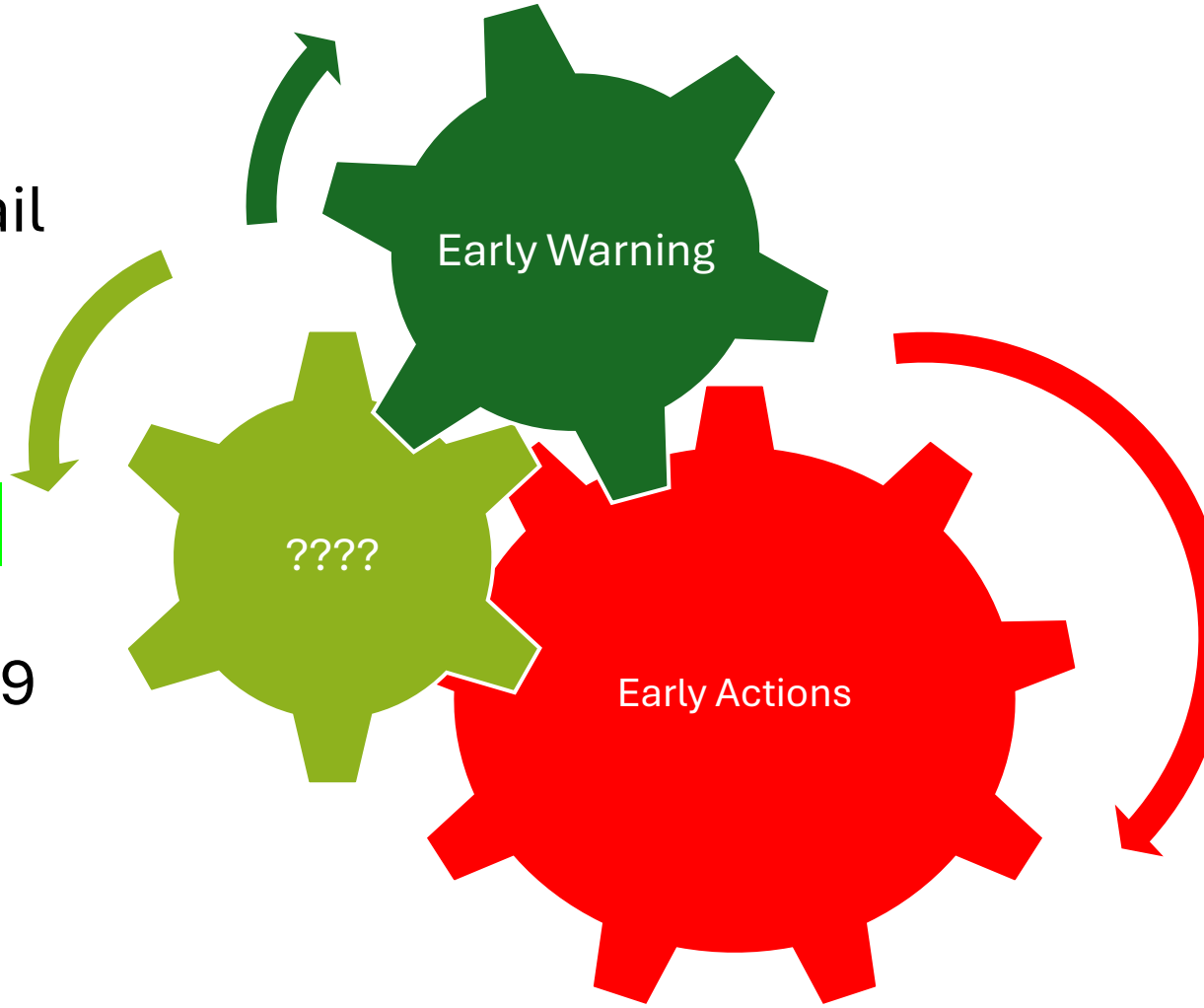
The Early Warning Gap

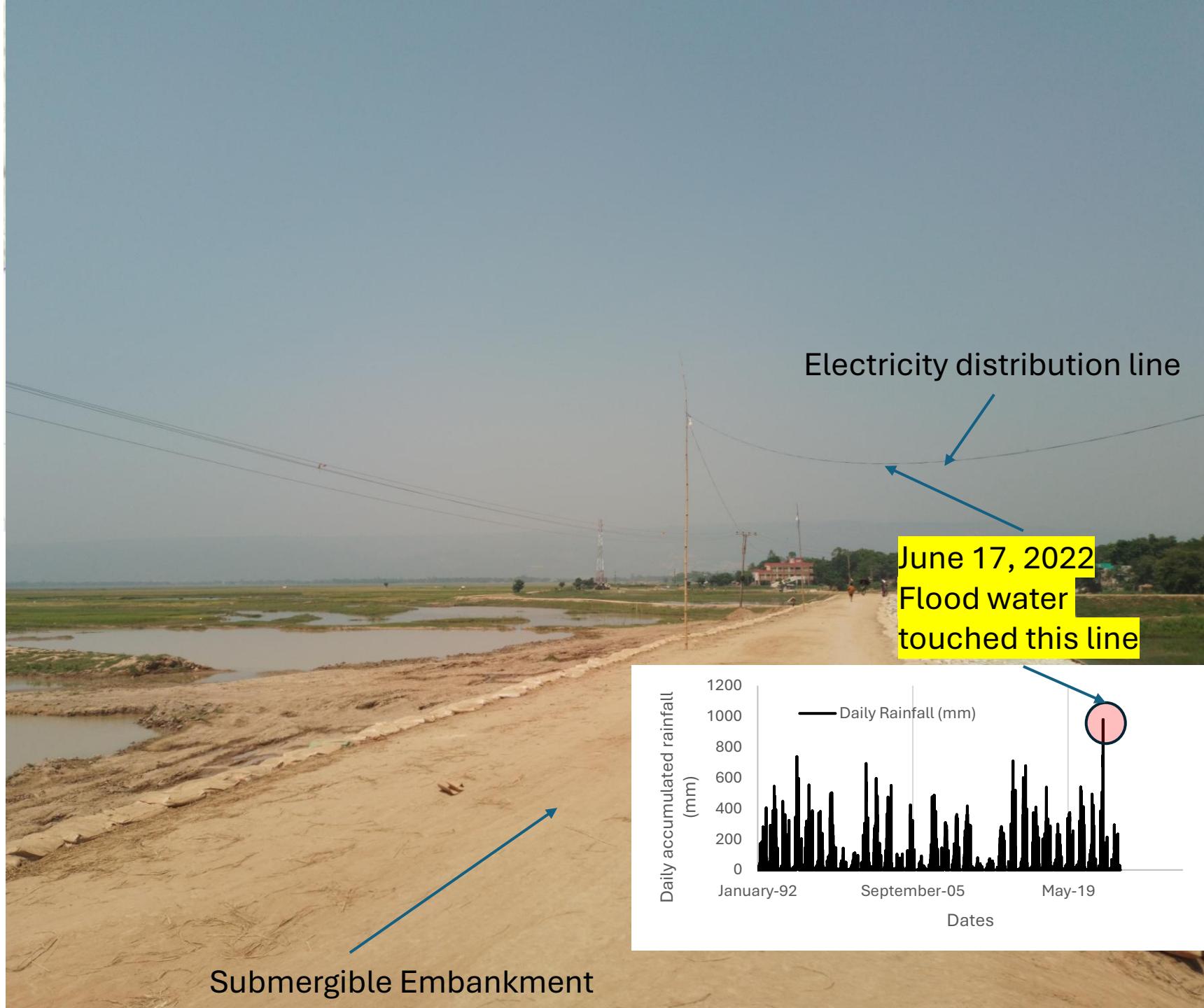
- Flash floods have the highest fatality rates per event.
- Forecasts exist, but warnings often fail to reach "last-mile" communities.
- Even when received, warnings don't always trigger early action.
- What fills the gap when warnings fall short?
- Forecast-based financing requires 7-9 days for activation—but flash floods evolve in hours.



Test Case: Extreme Floods in NE Bangladesh in 2022

Context & Urgency

- In June 2022, North-Eastern Bangladesh experienced **one of the most extreme flash floods** in over a century.
- Sylhet and Sunamganj districts had to drain **972 mm of rainfall in 24 hours**, displacing **4.8 million people**.



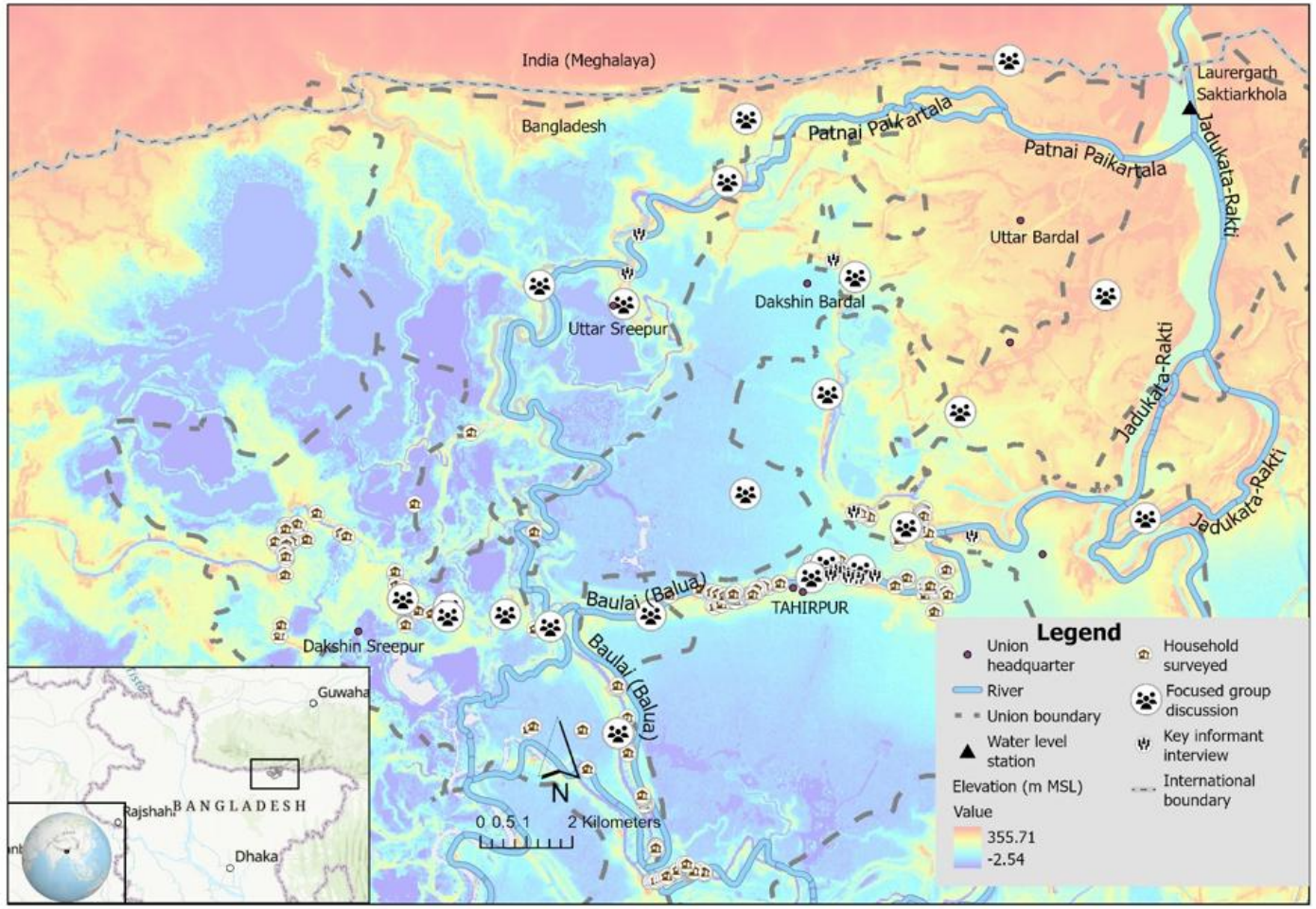
Objectives

- To evaluate the prevalence of early warning and early action (EWEA) and its association with household-level impacts during the extreme flash flood of 2022.
- Specifically, it aims to:
  - examine the flood dynamics and early warning message (EWM) dissemination mechanisms,
  - explore how communities contextualized EWM at the household level and responded with EAs, and
  - assess the association of these actions with flood damage reduction.

Methods

Qualitative and Quantitative methods

- ✓425 HH surveys, 22 FGDs, 21 KIIs, 10 case studies
- ✓Satellite (Sentinel-1), Time series rainfall , and flood level data analysis

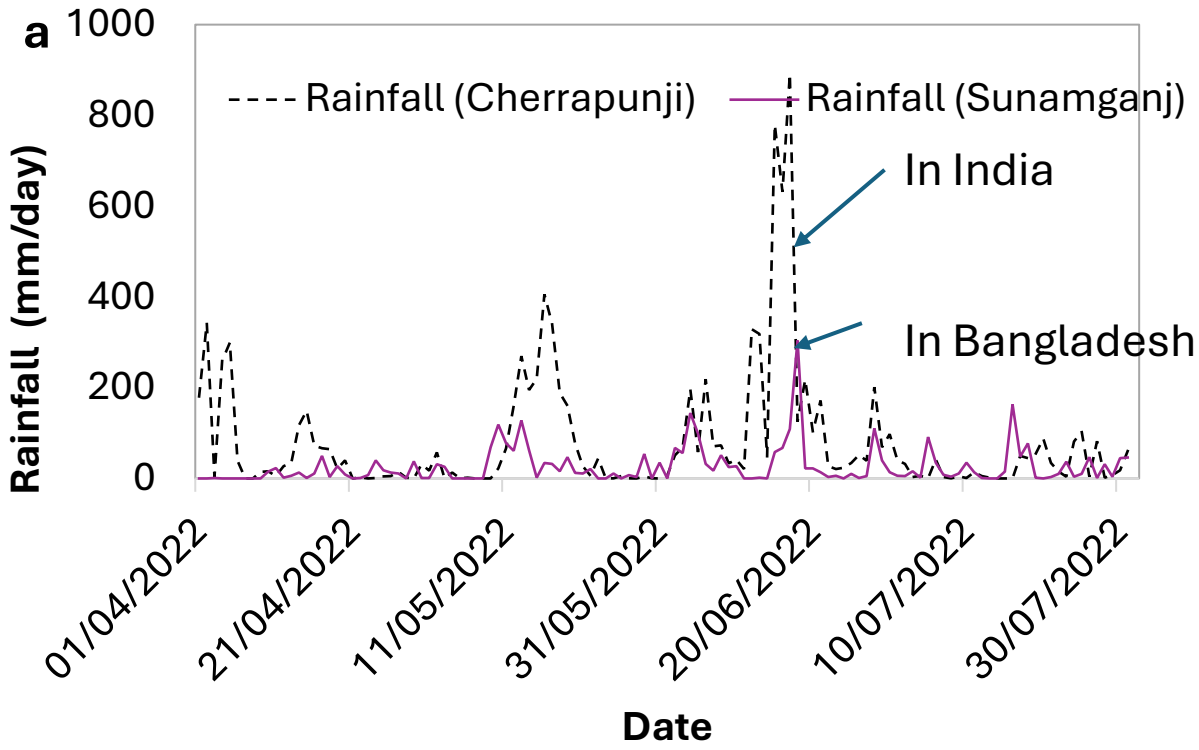


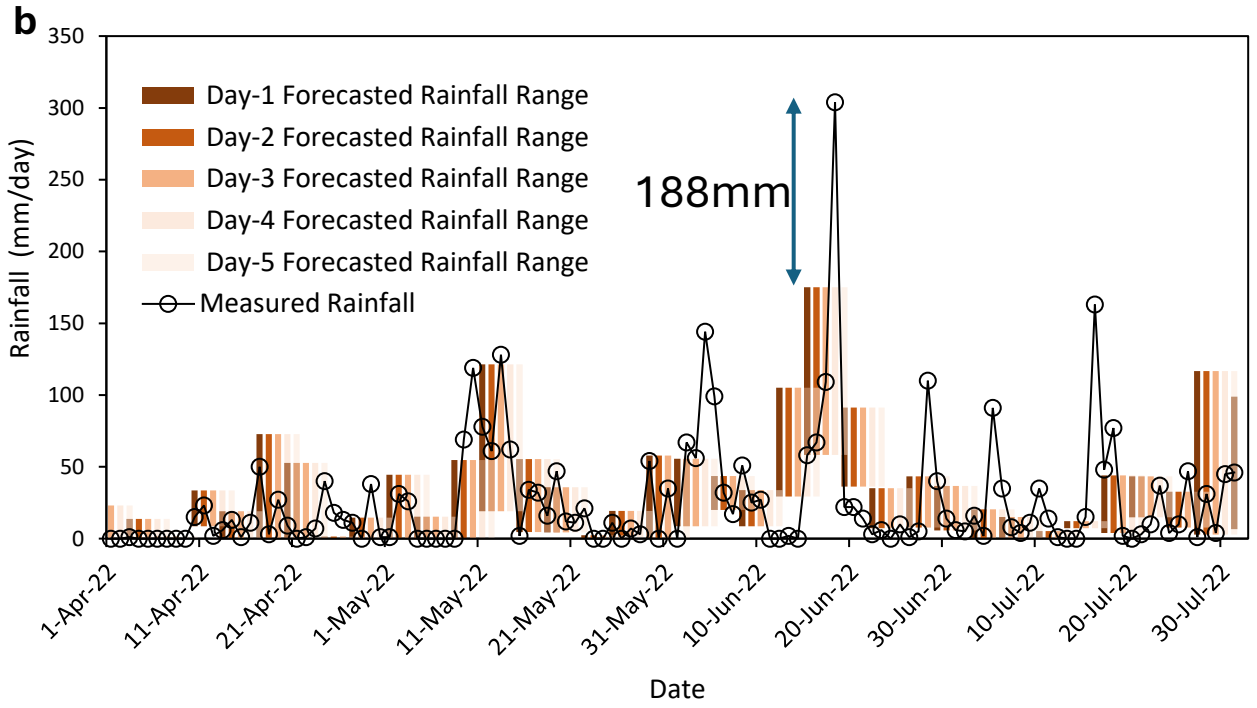
Results

1. Forecast Accuracy
2. Early Warning Information and Contextualization
3. Early Actions (EA) taken by Community and Individual
4. Impacts of Early Actions on Flash Flood Damage Reduction

Why Forecasts Failed

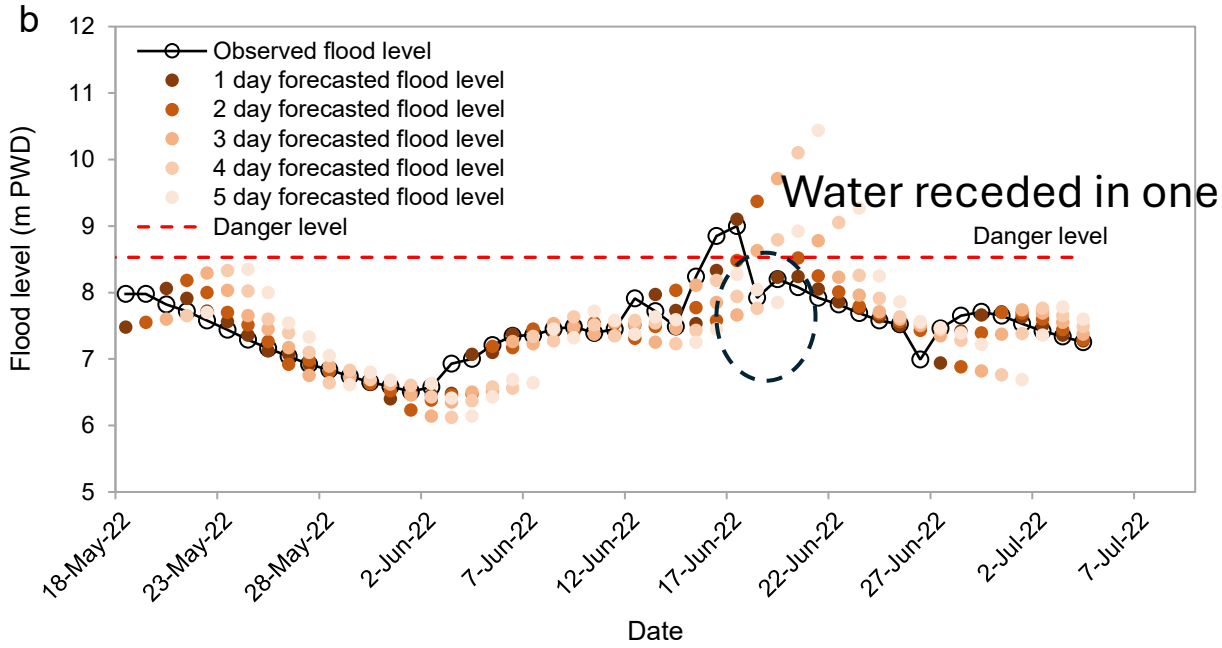
Flood Timeline & Forecast Comparison



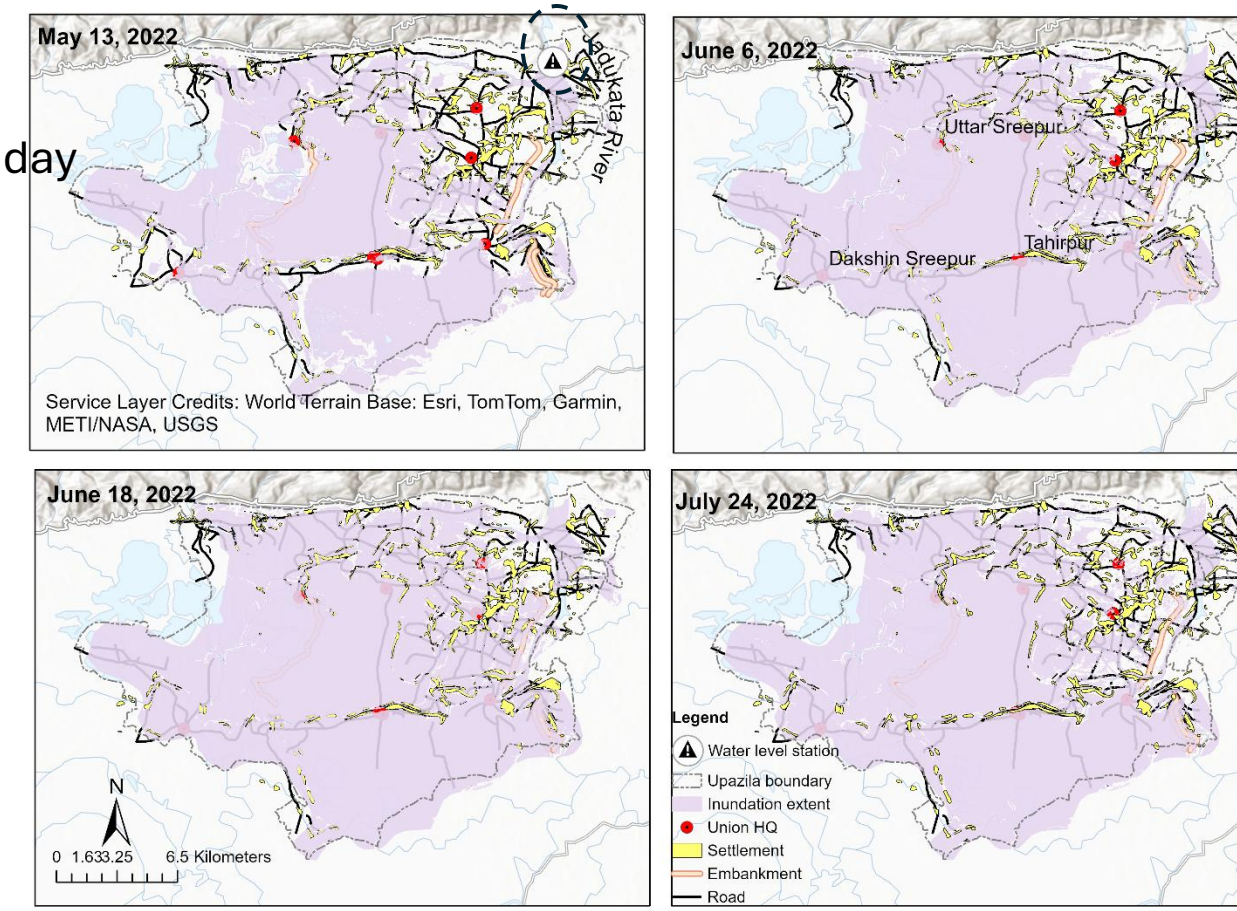


(a)The measured rainfall during the flood event. (b) The observed and forecasted Rainfall

Flood Timeline & Forecast Comparison



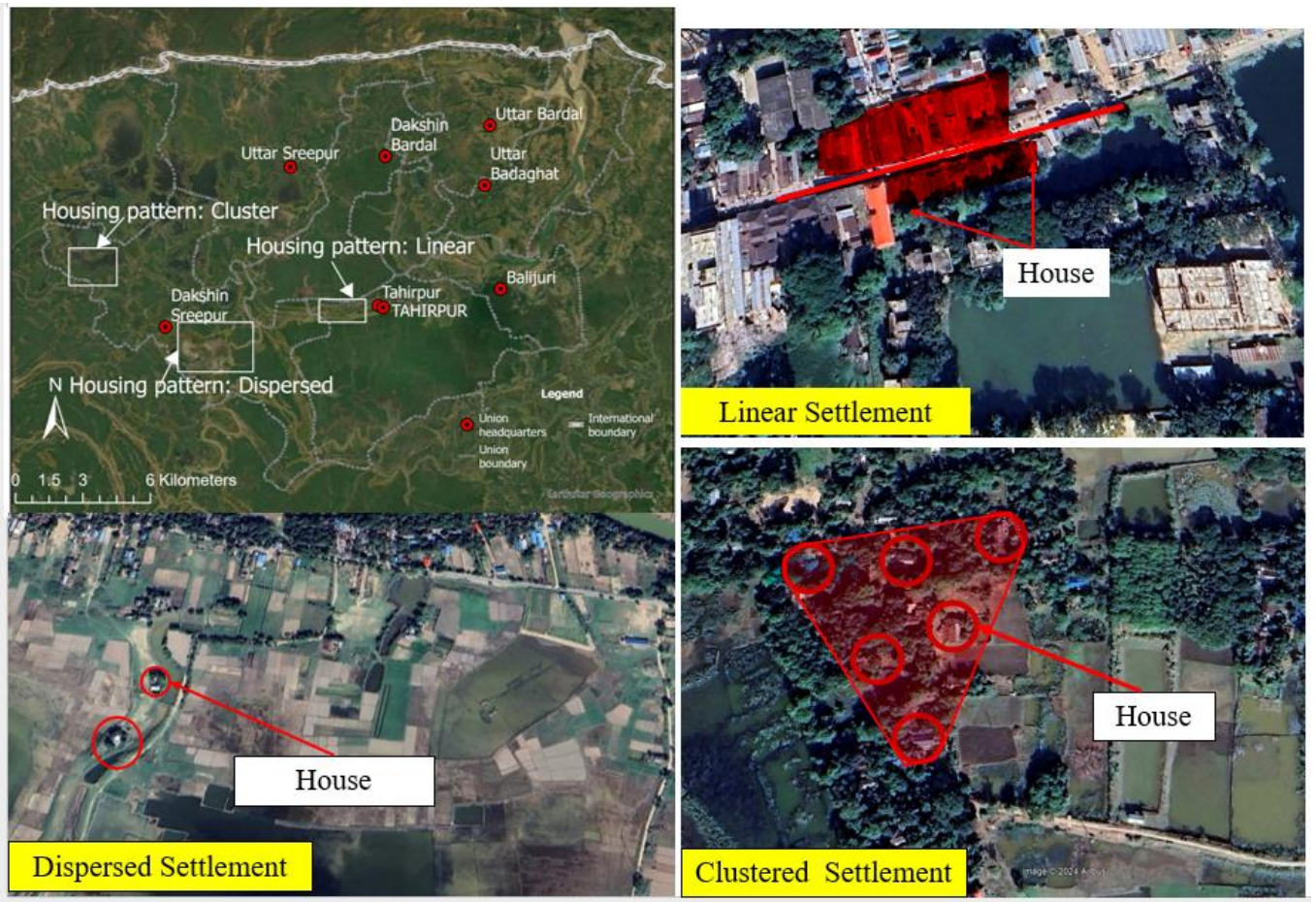
- Forecast station is far away from the affected community, situated in elevated land
- Short-term forecasts better; 3 to 5-day overestimated or misaligned
- **Not Just Rainfall—It Was Antecedent Saturation of Haor**
- Forecasts under-estimated local flood duration and depth



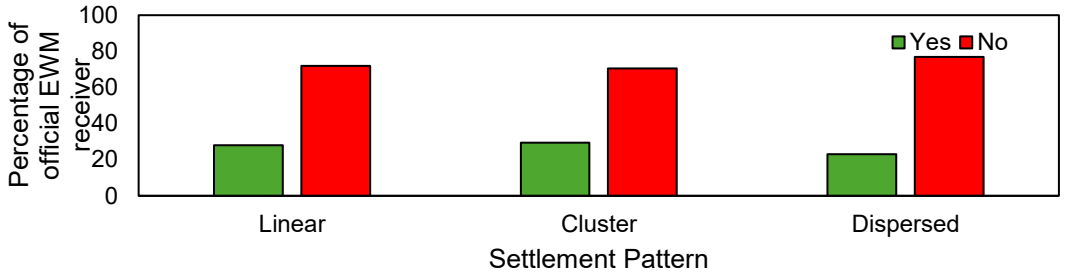
Flood propagation derived from SAR image analysis

Who Received Warnings?

Settlement Typology & EWM Reception

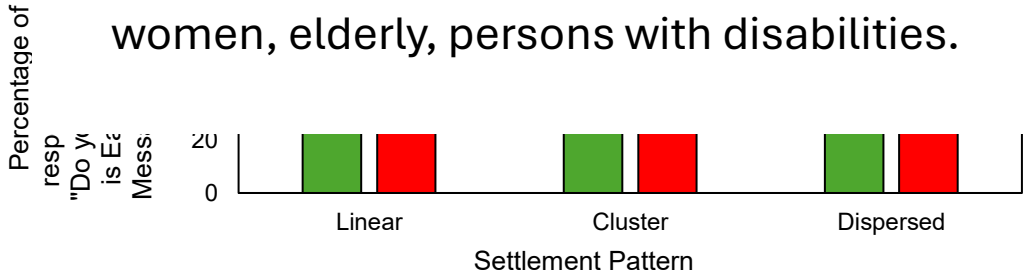


Study area and the settlement patterns



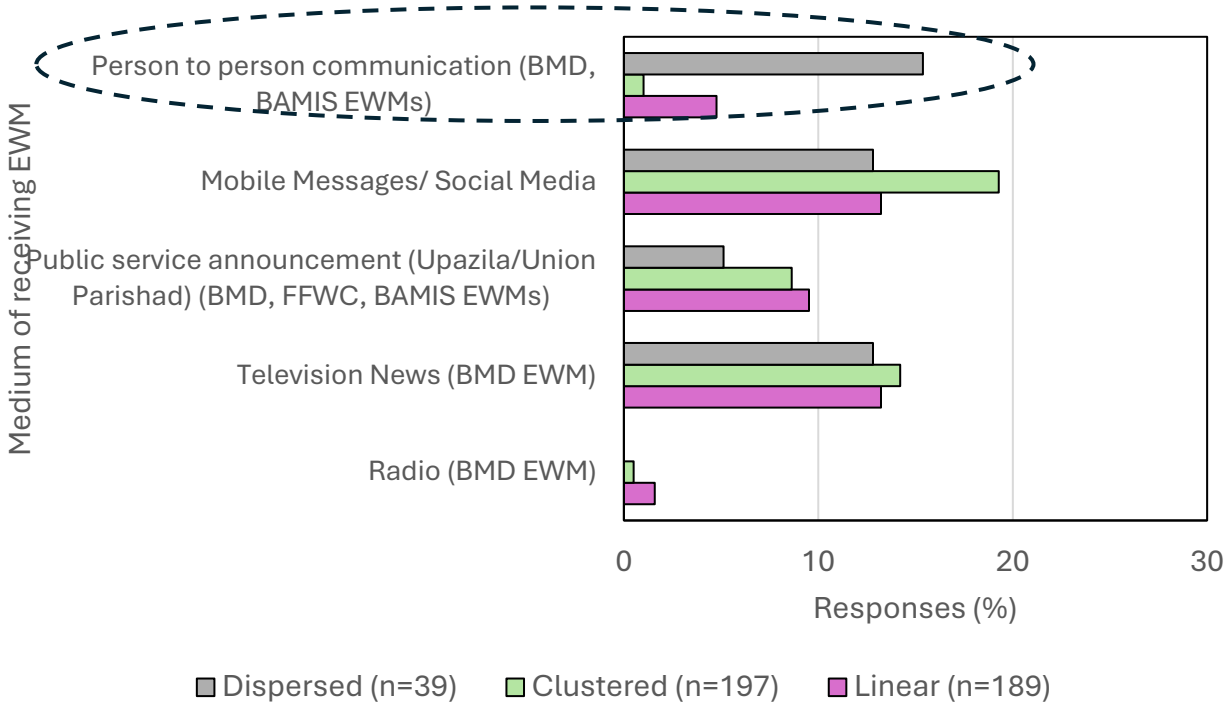
Percentages of those who received the official EWM among different settlement types

- Only 25% people receive the official EWM
- Scattered settlement or house pattern were identified as the last mile community (only 23% of them receive the EWS)
- Dispersed households are often: Pregnant women, elderly, persons with disabilities.

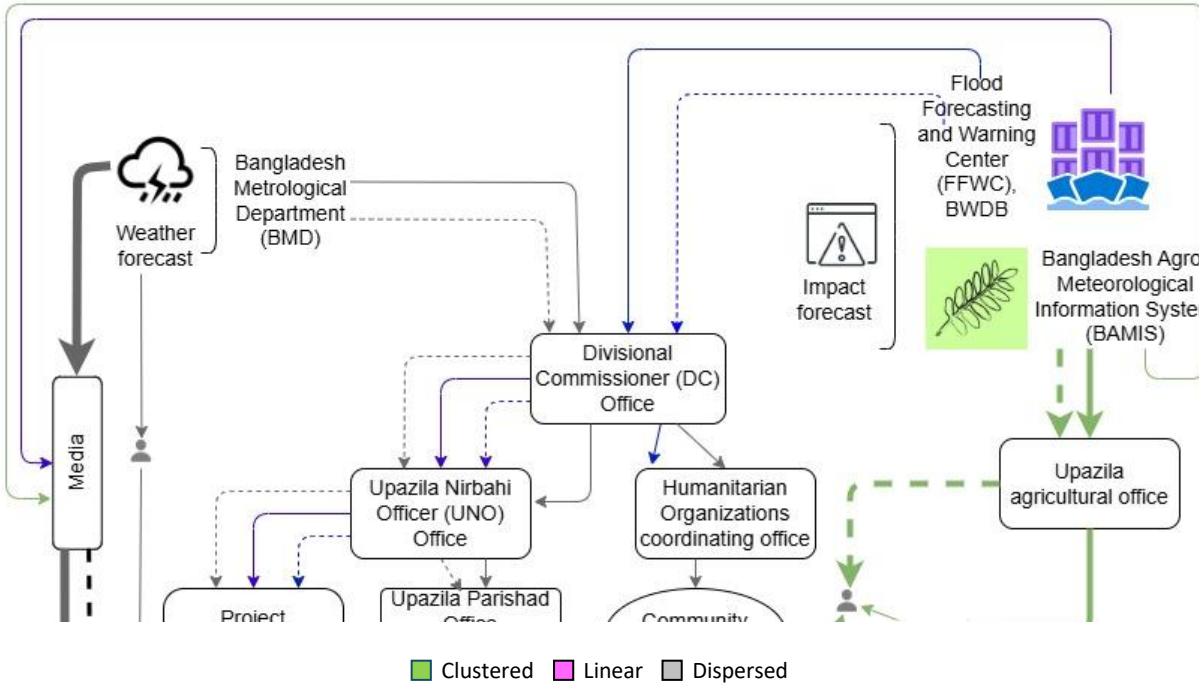


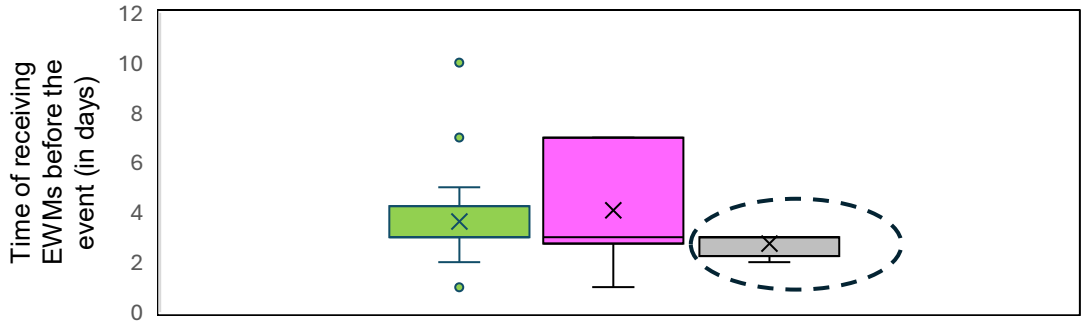
Official EWM and its perception among the people

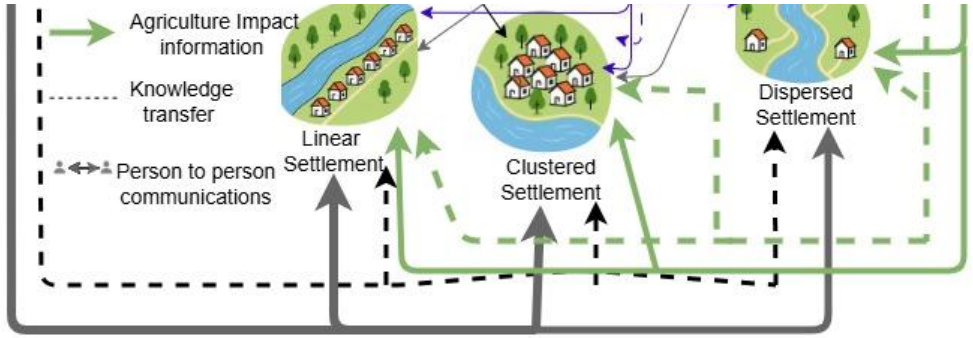
How Communities Got Information



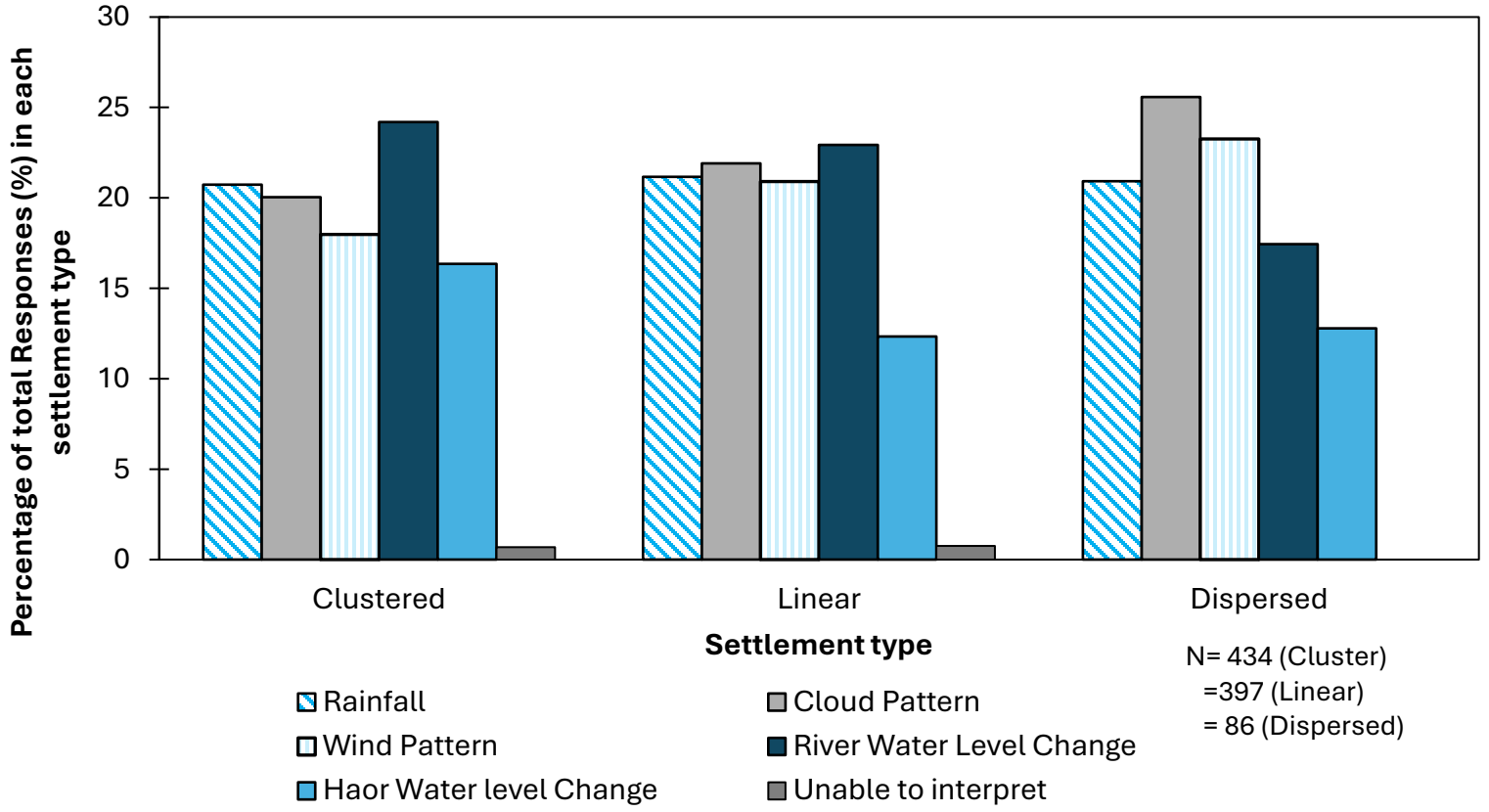
- For "last-mile" communities, Person to person communication remains the mos effective channel







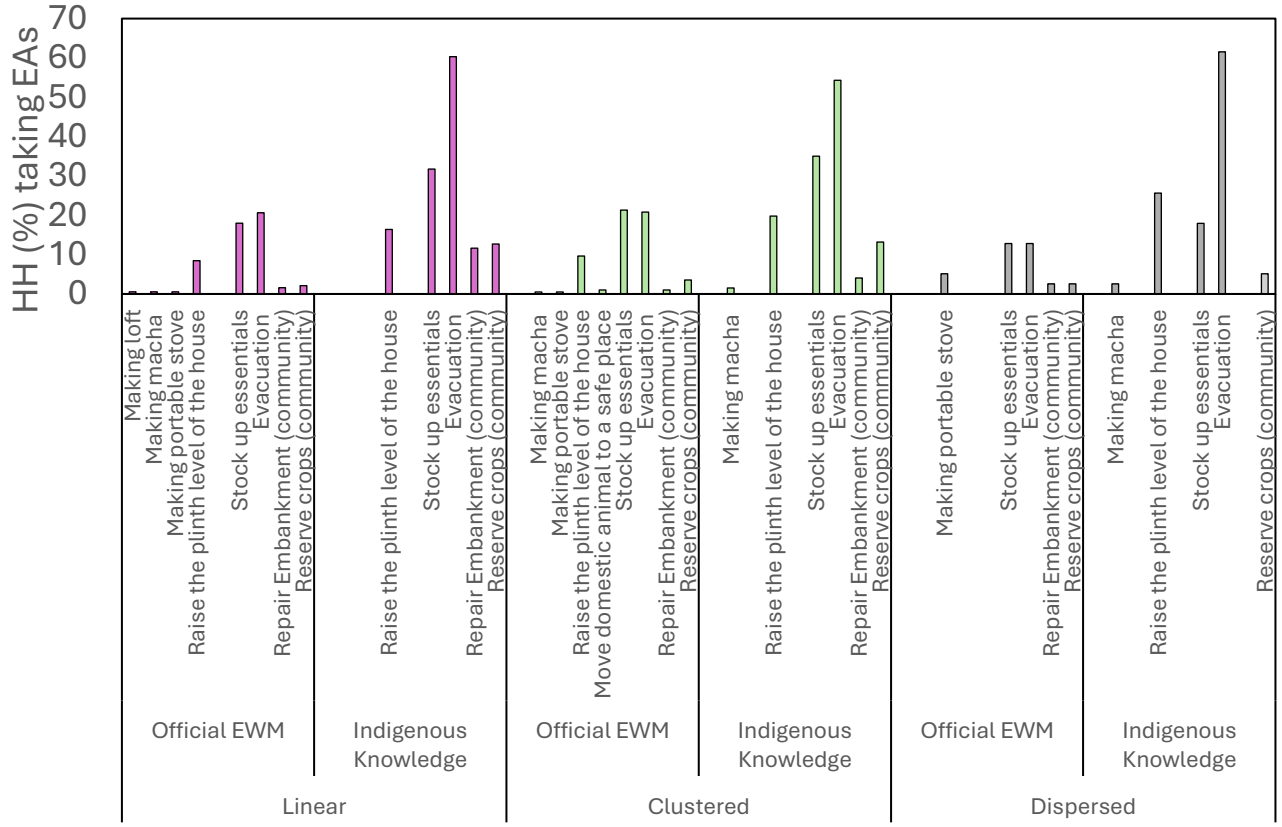
What Communities Knew—Indigenous Knowledge



- River water level (24% linear, 24% clustered)
- Cloud patterns (25% dispersed)
- More than 50% of households relied on indigenous indicators—not official EWM

What Communities Did—Early Actions

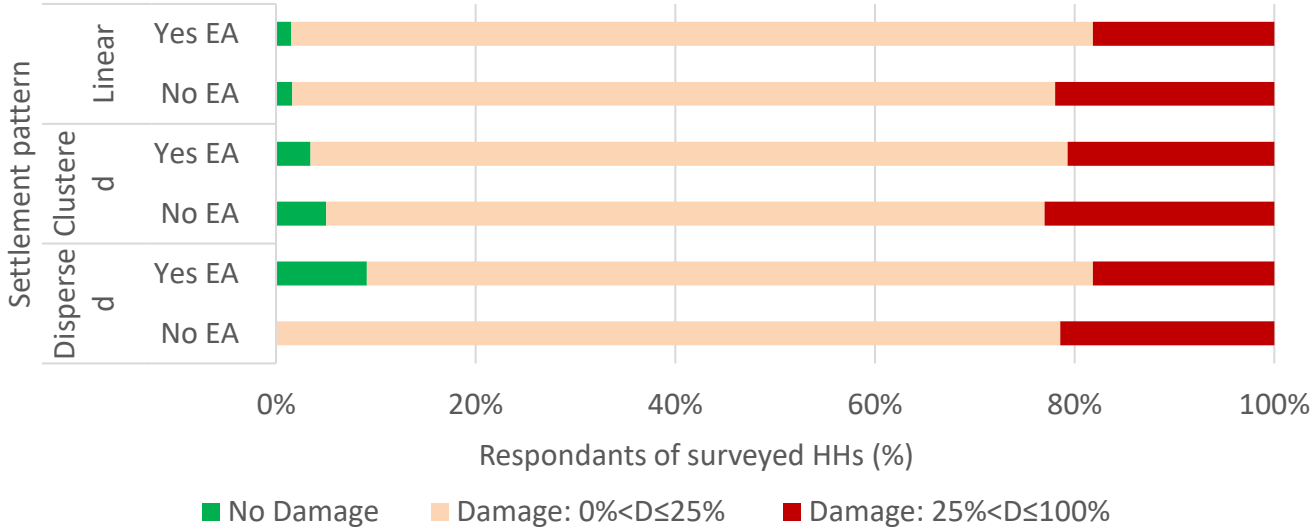
- Community-Level EAs
  - Reserve Boro crops on *macha* (1-2 hrs)
  - Repair embankments (24 hrs)
- Household-Level EAs
  - Evacuation** (0.25-3 hrs)
  - Raise plinth level** (3-4 hrs)
  - Build *macha*/lofts** (1 hr)
  - Prepare portable stoves (0.5 hr)
  - Prepare boats (2-3 hrs)
  - Sandbag homestead protection (1 hr)
- 60%+ of households took EAs—even without official warnings.
- 7.5% did NOT take EAs—because they had long-term adaptations already in place (raised plinths, macha, trees).



Settle pattern, EWM & EAs

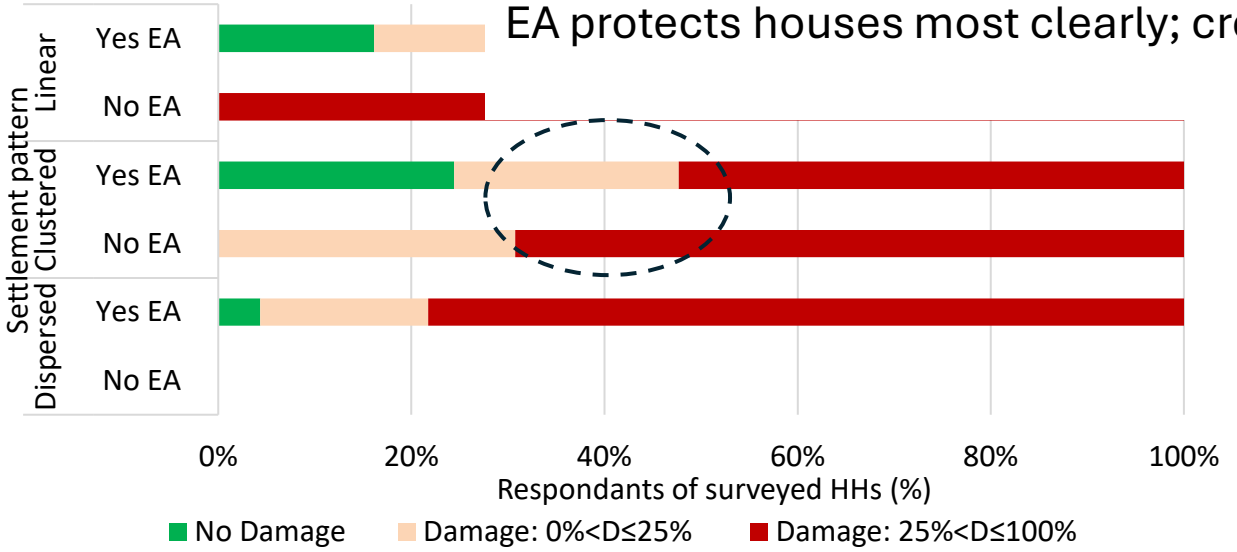
Did Early Actions Reduce Damage?

- Housing Damage-
  - "Yes EA" = lower % of 25%-100% damage
  - "No EA" = 21-23% severe damage
  - "Yes EA" = 17-21% severe damage
- Crop Damage-Mixed results—some with "No EA" had no crop loss (long-term adaptations?)
- Livestock Damage- EA showed little association with livestock protection

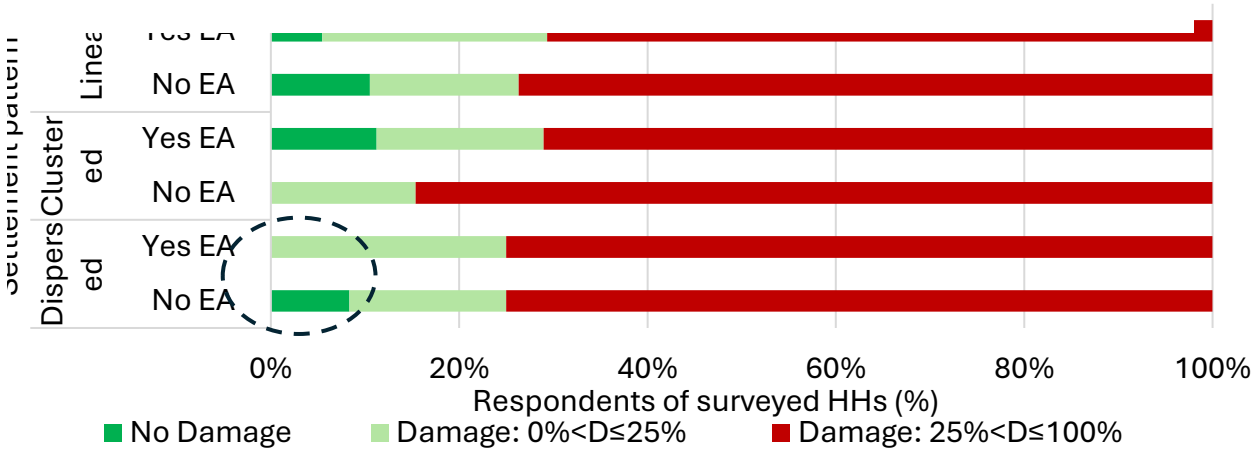


N = 217

EA protects houses most clearly; crops and livestock need targeted interventions.



Livestock damage in different types of settlements



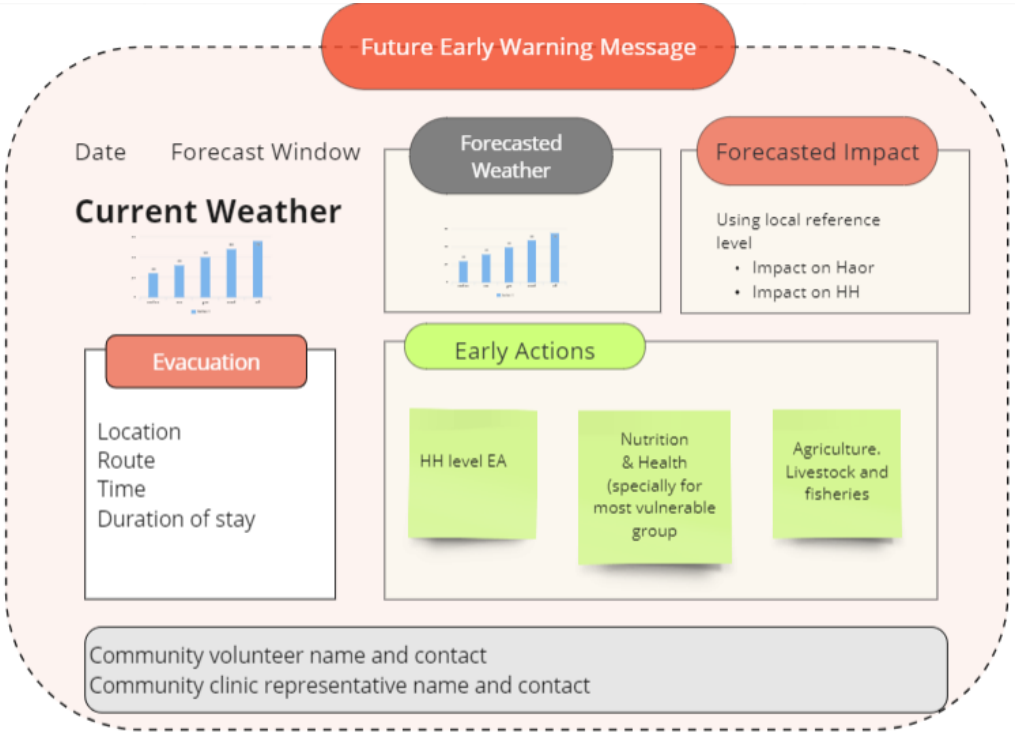
Reserved Crop damage in different types of settlements

Key Takeaways for Inclusive EWS

- Integrate Indigenous Knowledge—Formal systems must acknowledge and build on local environmental cues.
- Make Warnings Actionable—Include evacuation routes, shelter info, guidance for vulnerable groups.
- Strengthen Social Networks—Volunteer networks can reach "last-mile" communities.
- Pre-Position Resources—People need materials (sand, bamboo) for rapid EAs.
- Target Livestock Protection—Current EAs don't help livestock; build shelters and evacuation support.

Conclusion

- Warnings don't equal action**—only 25% received EWM, but 60%+ took EAs.
- Indigenous knowledge fills the gap-people read their environment.
- Who Acts? -Communities themselves—driven by indigenous knowledge and informal networks—Need to strengthen it.
- How to Improve?-Leverage existing knowledge; design locally-calibrated, actionable warnings; invest in community networks.
- Translating warnings into micro-scale early actions is the critical bridge between forecasts and resilience.



Proposed outline of the EWM.

Acknowledgements & Contact

Funded by Global Disaster Preparedness Center (GDPC)

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Thank you!