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Evaluation of resilience-building interventions according to measurement frameworks:

Empirical findings from the Flood Resilience Alliance communities

Jung Hee Hyun¹, Stefan Velev¹, Naomi Rubenstein¹, Magdalena Richter², Reinhard Mechlar¹

¹International Institute of Applied Systems Analysis

²Concern International

Overview

- **Introduction**

- *Background:* Zurich Flood Resilience Alliance (ZFRA)'s Flood Resilience Measurement for Communities (FRMC) framework to resilience-building interventions
- *Literature:* Capturing resilience-building interventions in community-level development contexts

- **ZFRA communities' interventions**

- **Empirical evaluations**

- Descriptive analysis
- Causal links between interventions selected and community type

- **Key insights**

Resilience is...

the ability of a system, community, or society to pursue its social, ecological, and economic development and **growth objectives**, while managing its disaster risk over time in a mutually reinforcing way.

Why floods?

- Floods affect more people globally than any other type of natural hazard.
- Increasing population, urbanization worsen the risk; flood risk is increasingly interconnected and interdependent

Why measure?

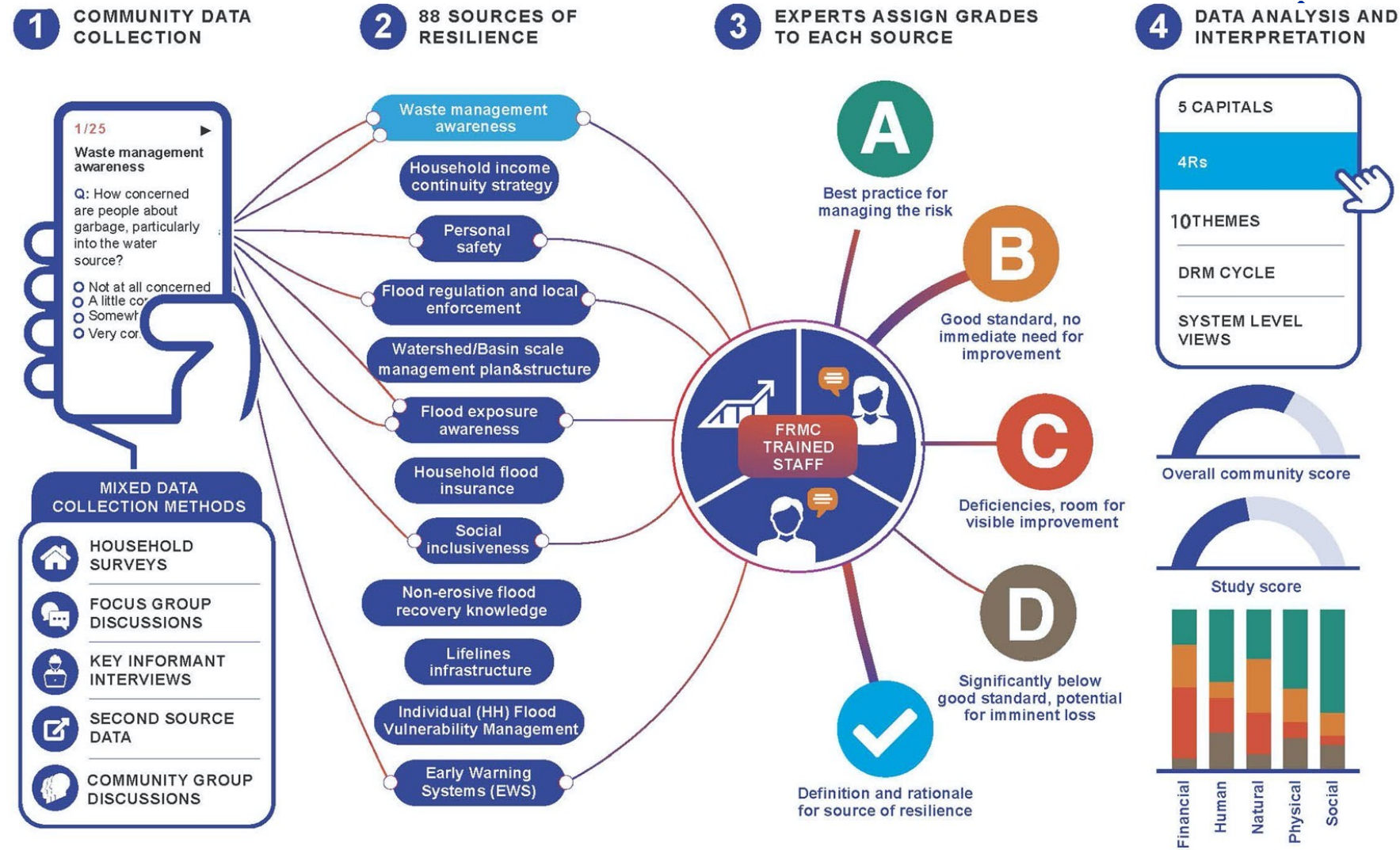
- Measurement enables us to assess and demonstrate the real impact of improvements
- Flood Resilience Measurement Framework and user-friendly tools developed

Why focus on communities?

- Level where flood impacts are felt most immediately and where much action on flood resilience can be taken
- Demonstrate a tangible impact on people's lives, creating best practices in the field

FRMC tool & framework

- Measure community level resilience to flooding in a reliable and useful way
- Evaluation metric implemented in ~300 flood prone communities across the world
- Ideally, empowers communities to take ownership of their flood resilience path by identifying goals and actions



Resilience-building Interventions

- An activity or group of activities that builds community flood resilience
- Not every interaction that the practitioner has with the community (e.g., a workshop, a meeting, or a training session)
 - If trainings are delivered as part of a long-term strategy, this can be considered an intervention
- Examples:
 - piece of hardware (e.g., a platform for poultry to take refuge on)
 - technique (e.g., digital risk mapping)
 - tool (e.g., an online app)
 - method or approach (e.g., developing community disaster management committees)
 - system (e.g., an early warning system)
 - infrastructure (e.g., a multi- purpose shelter or bio-dyke)

Research Questions

1. Does intervention selection correspond to *communities' needs* (lower grades in sources of resilience), prior flood experience, relation to feasibility, etc.?
 - *Decision-making process*
2. What parts of the FRMC approach and process are key to facilitating *resilience-building* interventions and thinking?
 - *Typology of interventions*
 - ✓ *Assess and report progress*
 - ✓ *Causal links*

FRMC to intervention implementation process

Decision-making stage	FRMC framework	Other frameworks
Problem definition (needs/gap assessment)	<ul style="list-style-type: none"> Resilience assessment (FRMC) VCAs, risk mapping 	<ul style="list-style-type: none"> Risk assessment SDG Adaptation
Intervention identification, selection, implementation	<ul style="list-style-type: none"> Practitioner team, community members, relevant stakeholders discussion 	<ul style="list-style-type: none"> Cost-benefit MCDA Robust DM



Interventions typology

Review of academic literature and grey literature on **resilience-building / climate adaptation / risk management** intervention **typology / category / inventory / taxonomy**



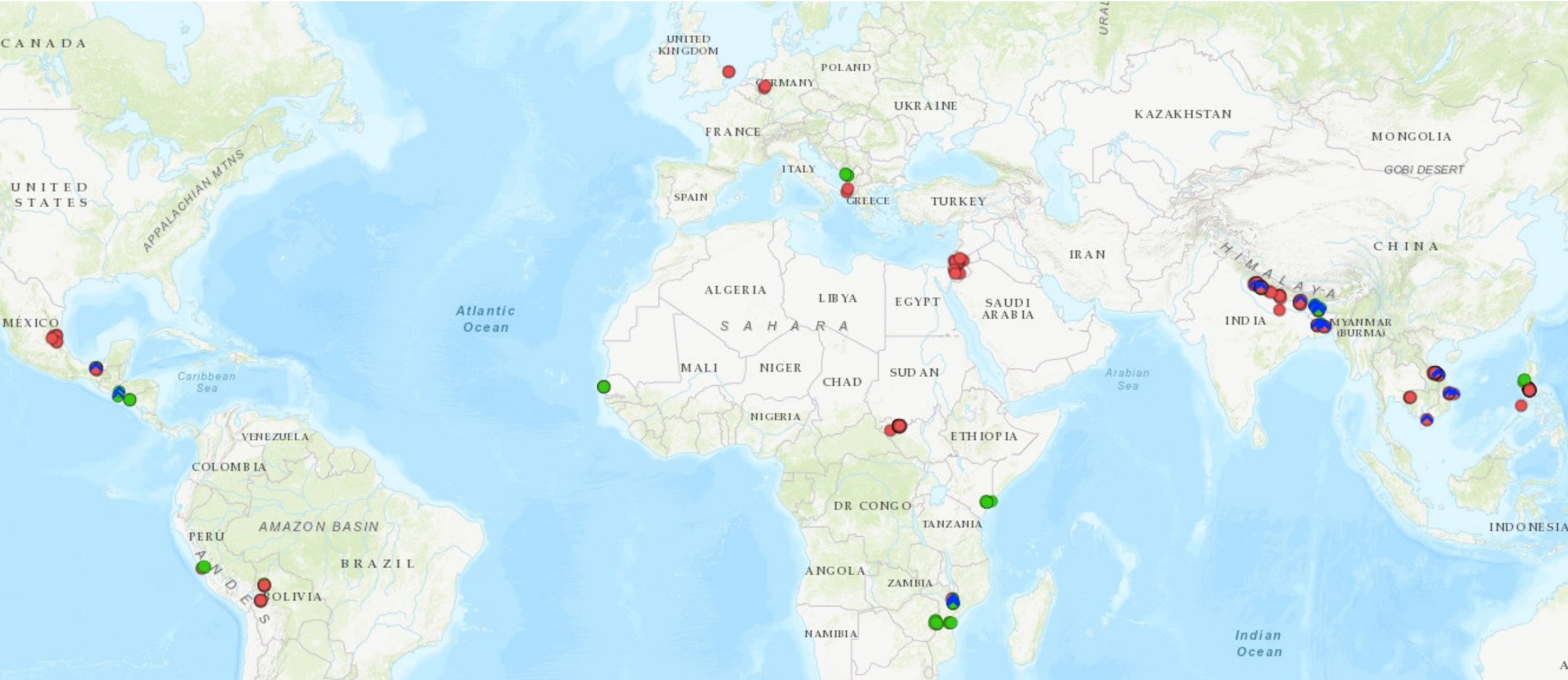
Resilience Component/Mechanism-based Typology (Mimura et al., 2014)

Social	Structural/Physical	Institutional
Behavioral change	Engineered, built environment	Economic
Informational	Technological	Policies
Educational	Nature-based (NBS)	Laws and Regulations

Resilience-building Result/Objective-based Typology (Power et al., 2020)

Enabling environment	Hazard reduction and avoidance	Coping during crisis
Vulnerability reduction	Preparing to respond	Preparing for recovery

ZFRA Interventions



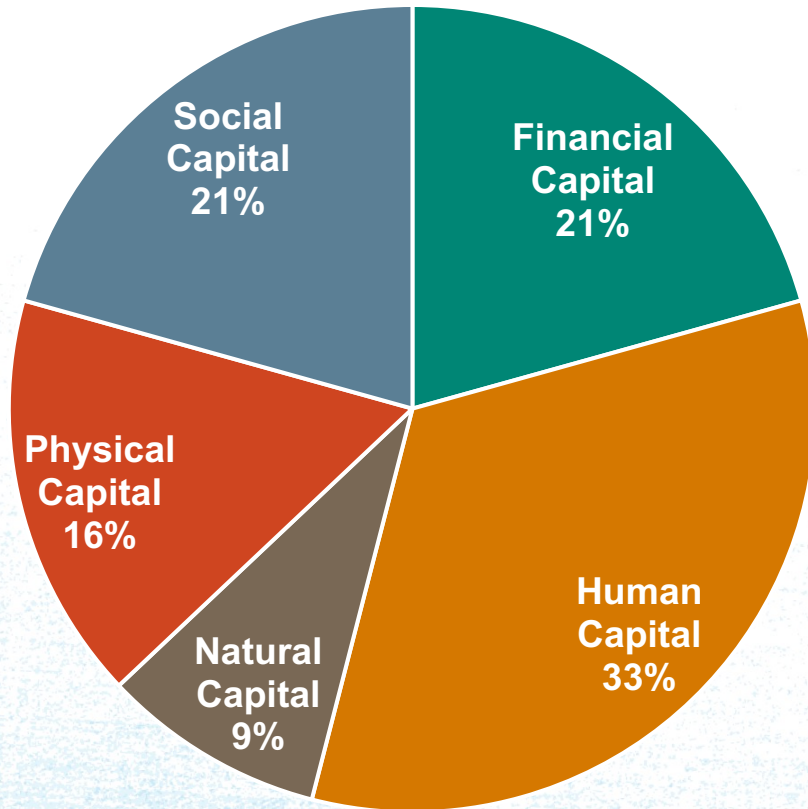
● Intervention documented

● No intervention documented

▲ Flood event documented

Targeted source of resilience

Type of capital intended to enhance with intervention



The five capitals (5Cs):



Human (education, skills, health).



Social (social relationships and networks, bonds that promote cooperation, links facilitating exchange of and access to ideas and resources).



Physical (things produced by economic activity from other capital, such as infrastructure, equipment, improvements in crops, livestock).



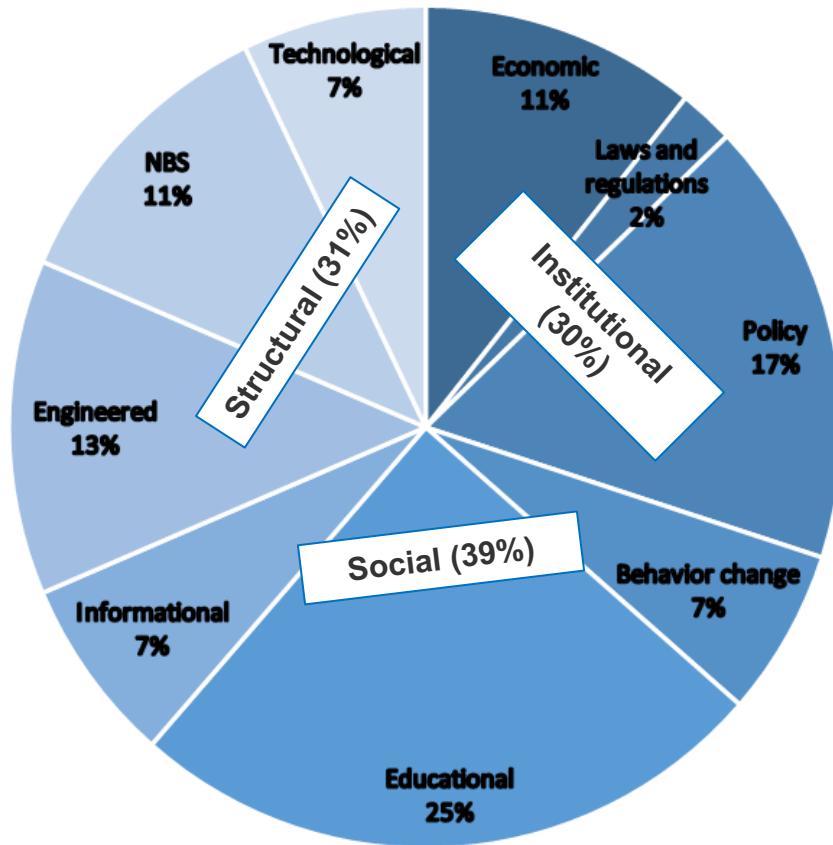
Natural (natural resource base, including land productivity and actions to sustain it, as well as water and other resources that sustain livelihoods).



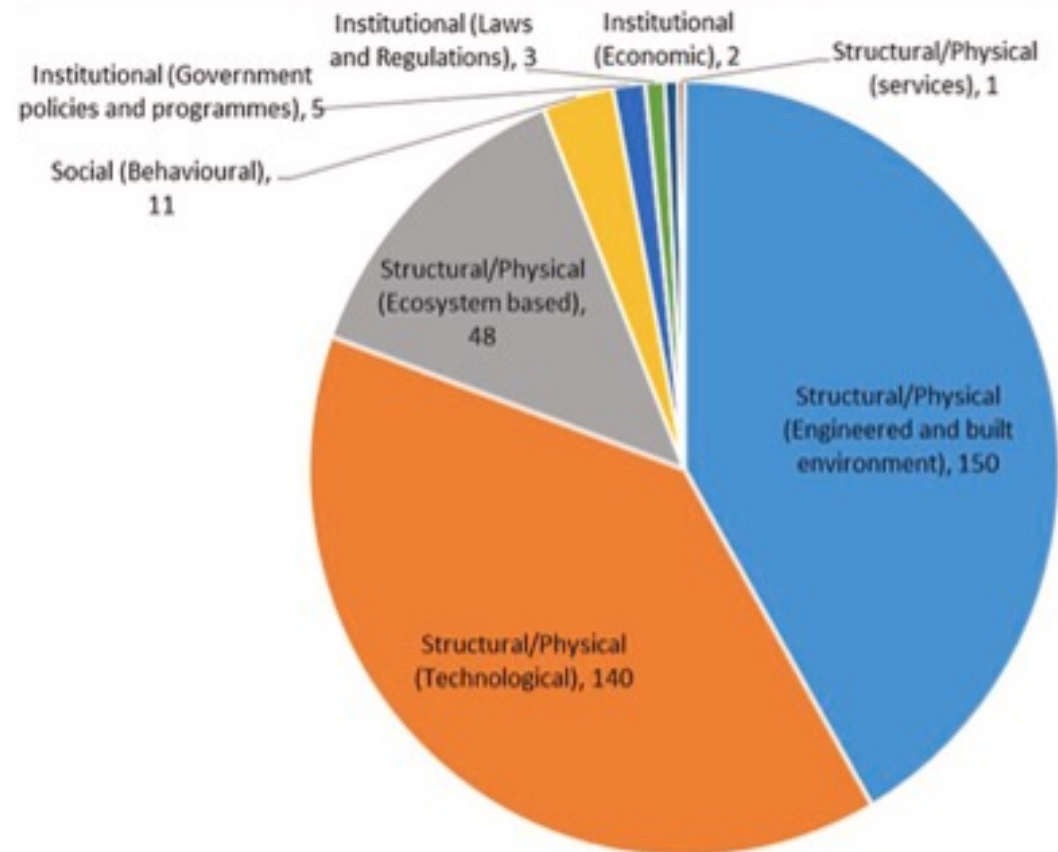
Financial (level, variability and diversity of income sources and access to other financial resources that contribute to wealth).

Component / Mechanism-based Typology

ZFRA Interventions by component / mechanism

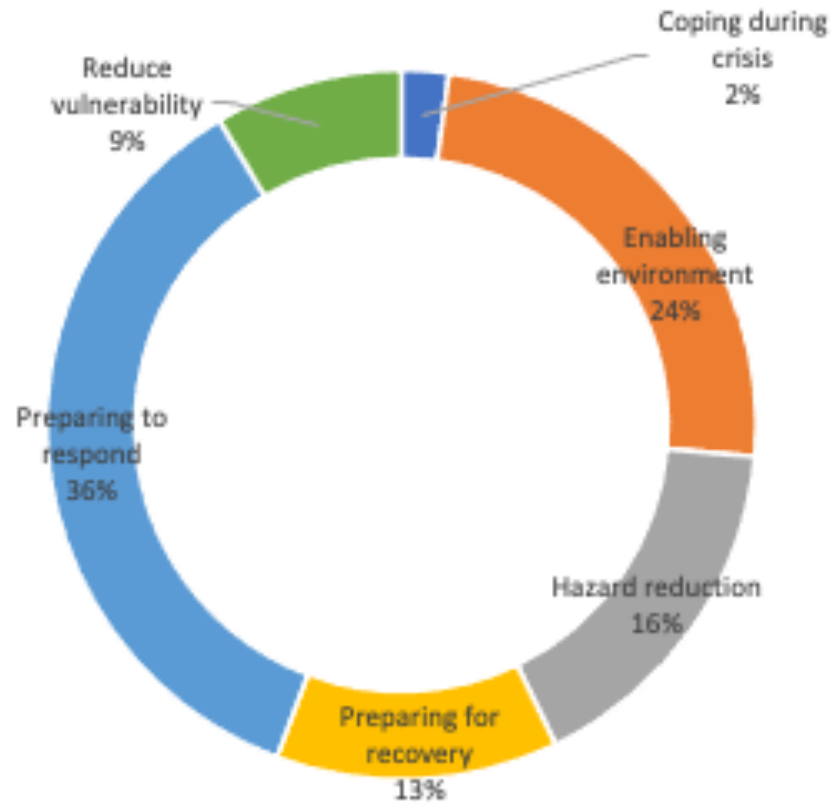


UK adaptation Inventory by mechanism type (Jenkins et al., 2022)

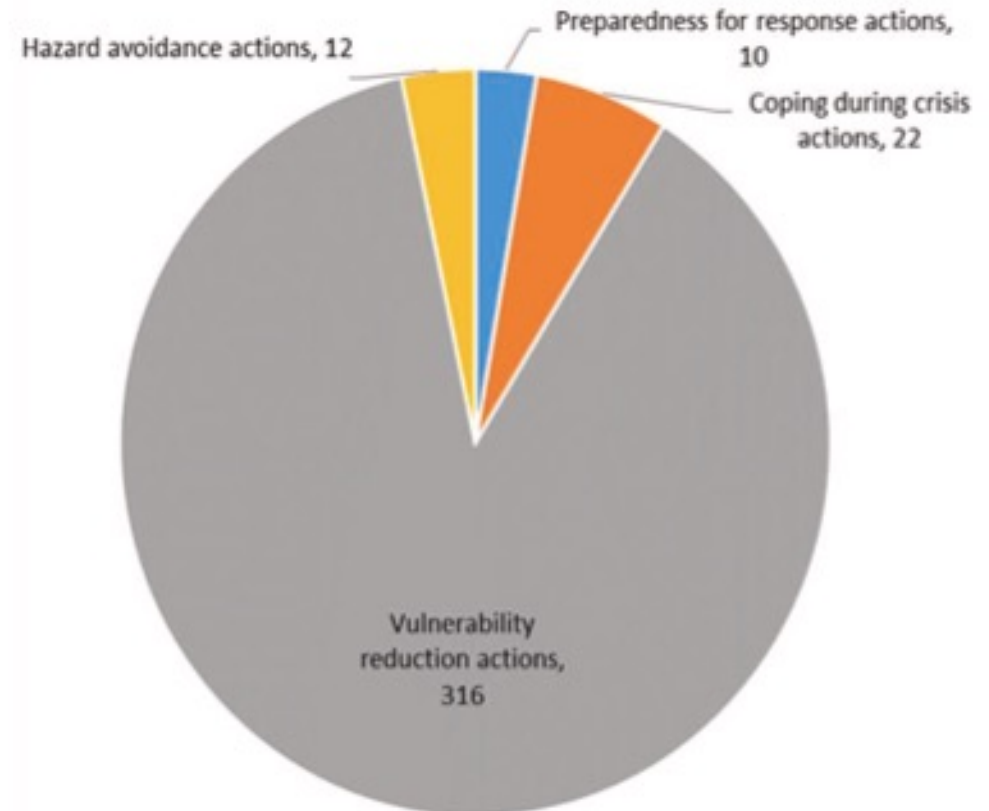


Result / Objective-based Typology

ZFRA Interventions by result / objective

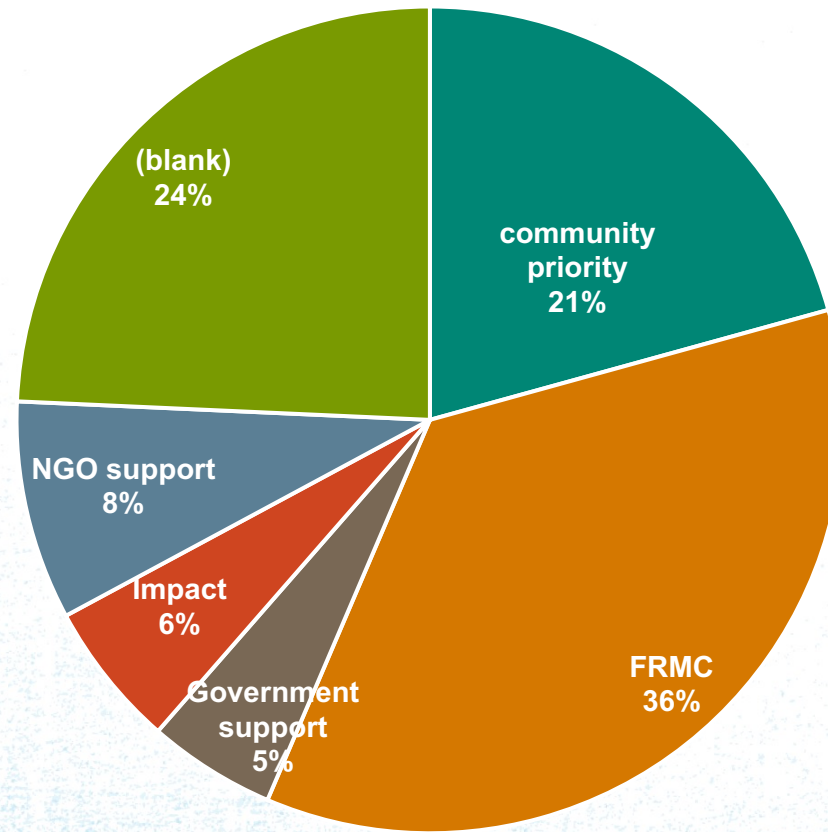


UK adaptation Inventory by objective (Jenkins et al., 2022)



Decision-making criteria in selecting intervention

- A guided question within the survey (FRMC as the highest criteria considered)
- nonetheless other criteria noted as prioritized criteria for intervention selection is important to note

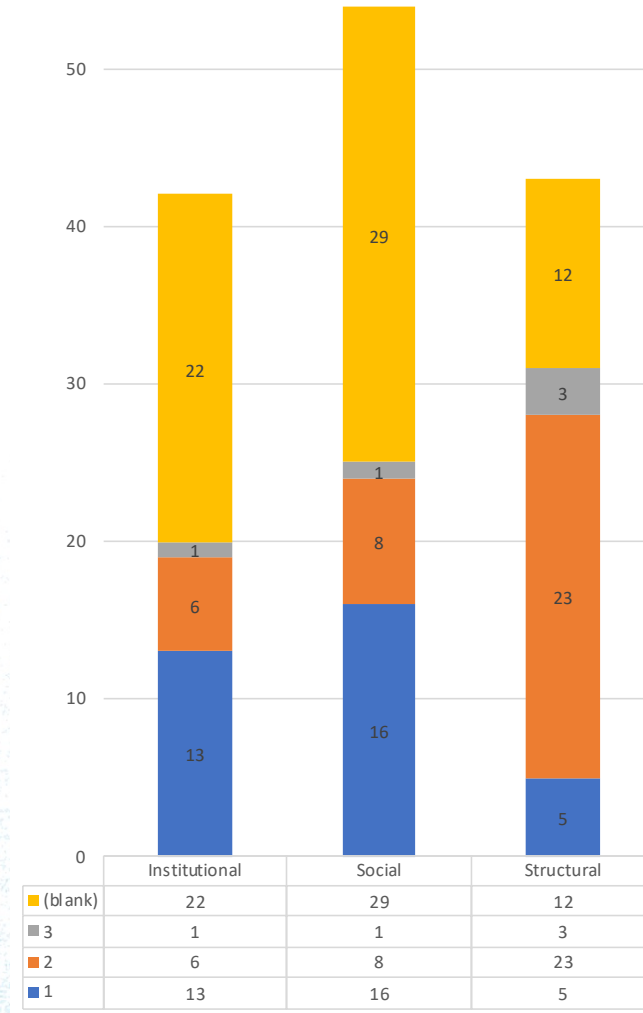


Selection criteria prioritized for ZFRA interventions

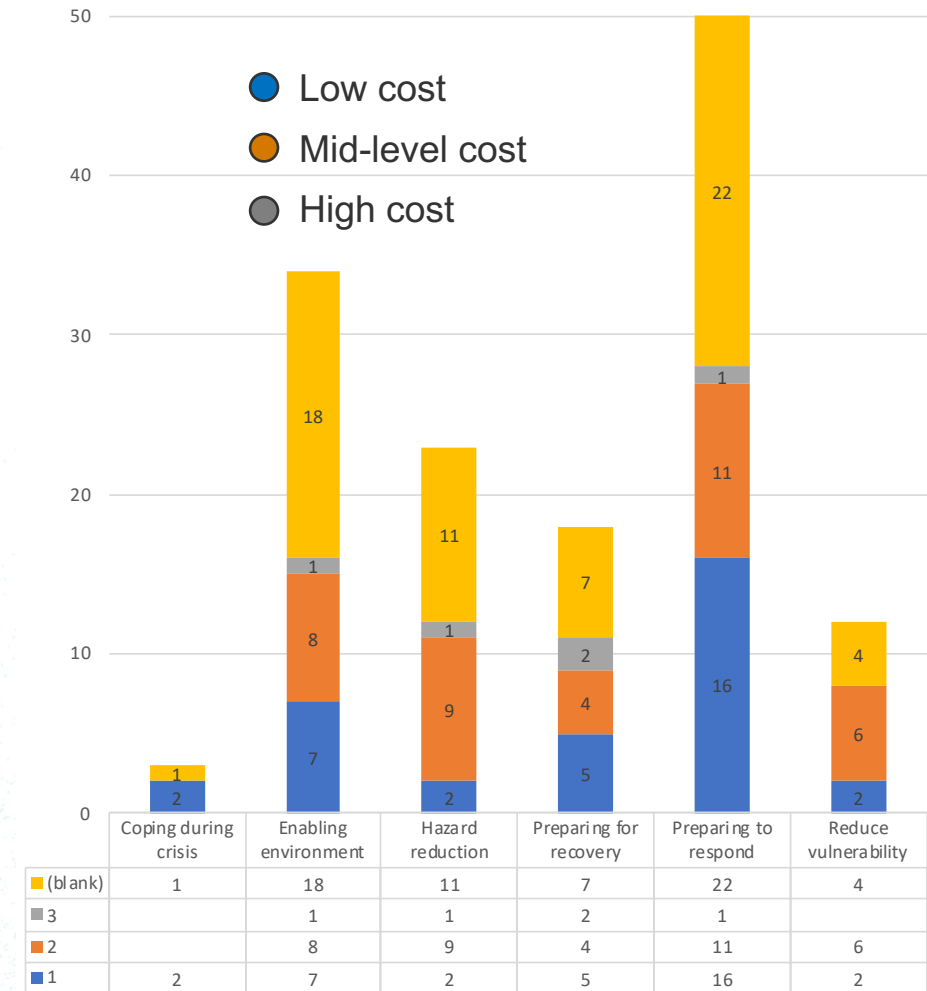
Cost of intervention by type

Costly: Structural, Hazard and vulnerability reducing interventions

Less costly: Social, institutional interventions



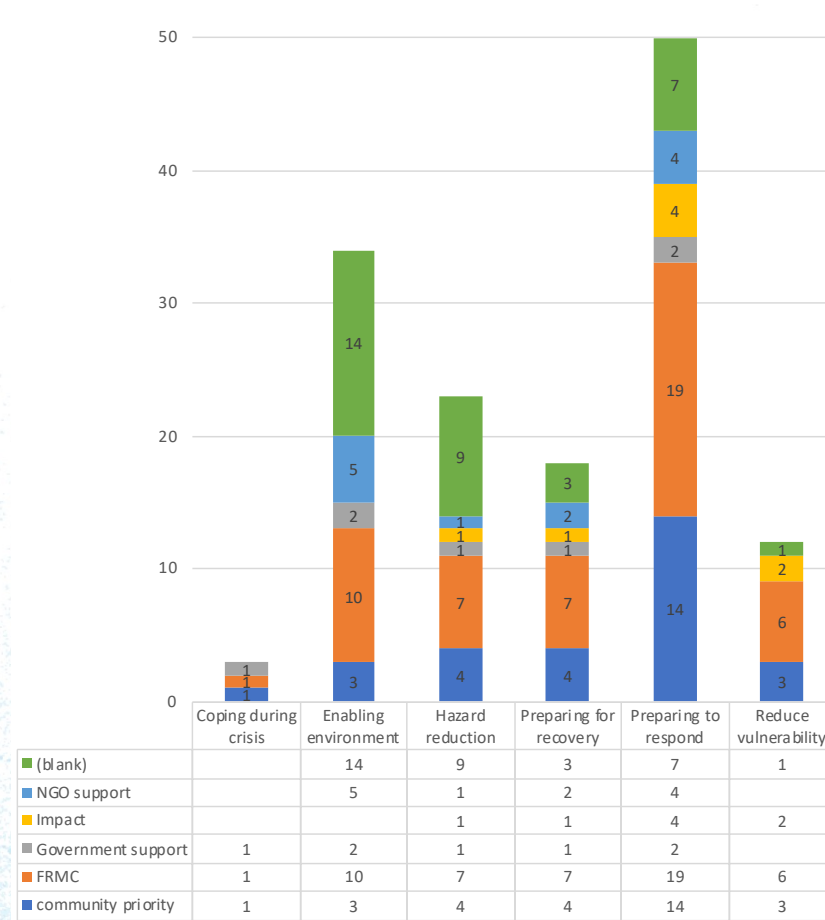
Interventions cost by type



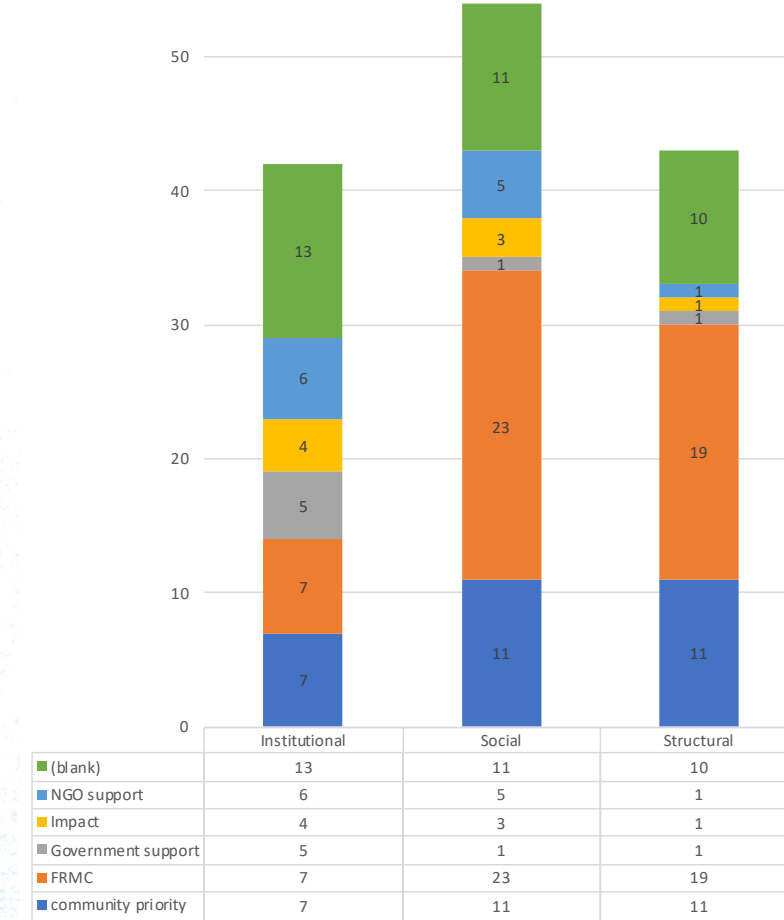
Interventions cost by result / objective

Decision-making criteria by intervention type

- Enabling environment interventions: **NGO support**
- Vulnerability reducing interventions: **FRMC**
- Institutional interventions: **government support**

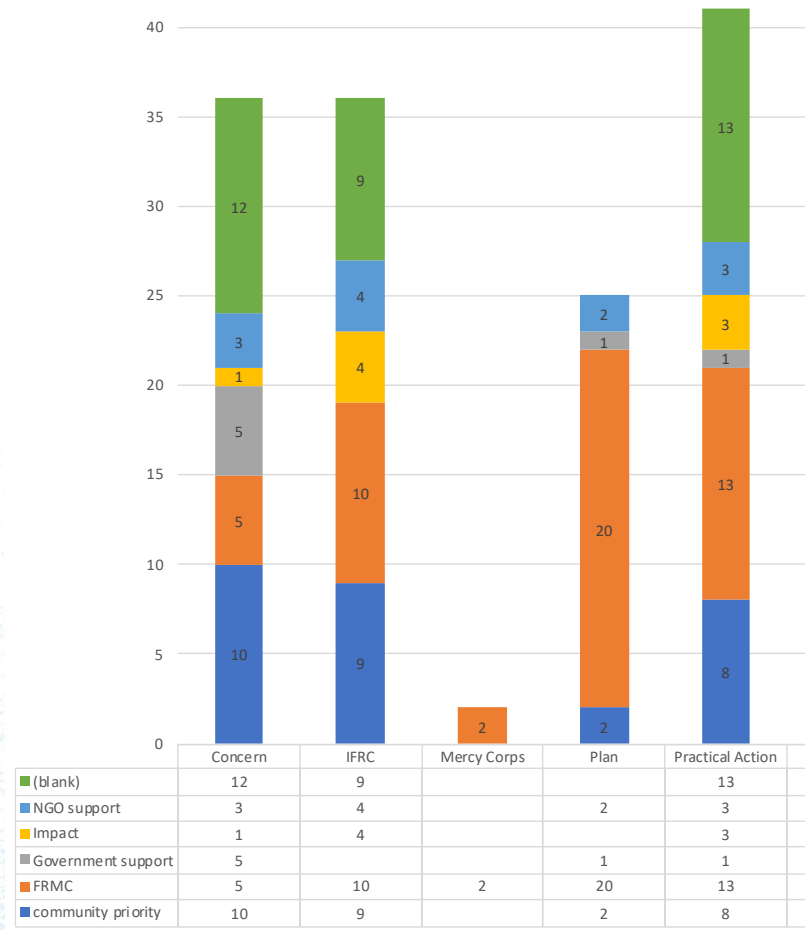


DM criteria by interventions' intended result

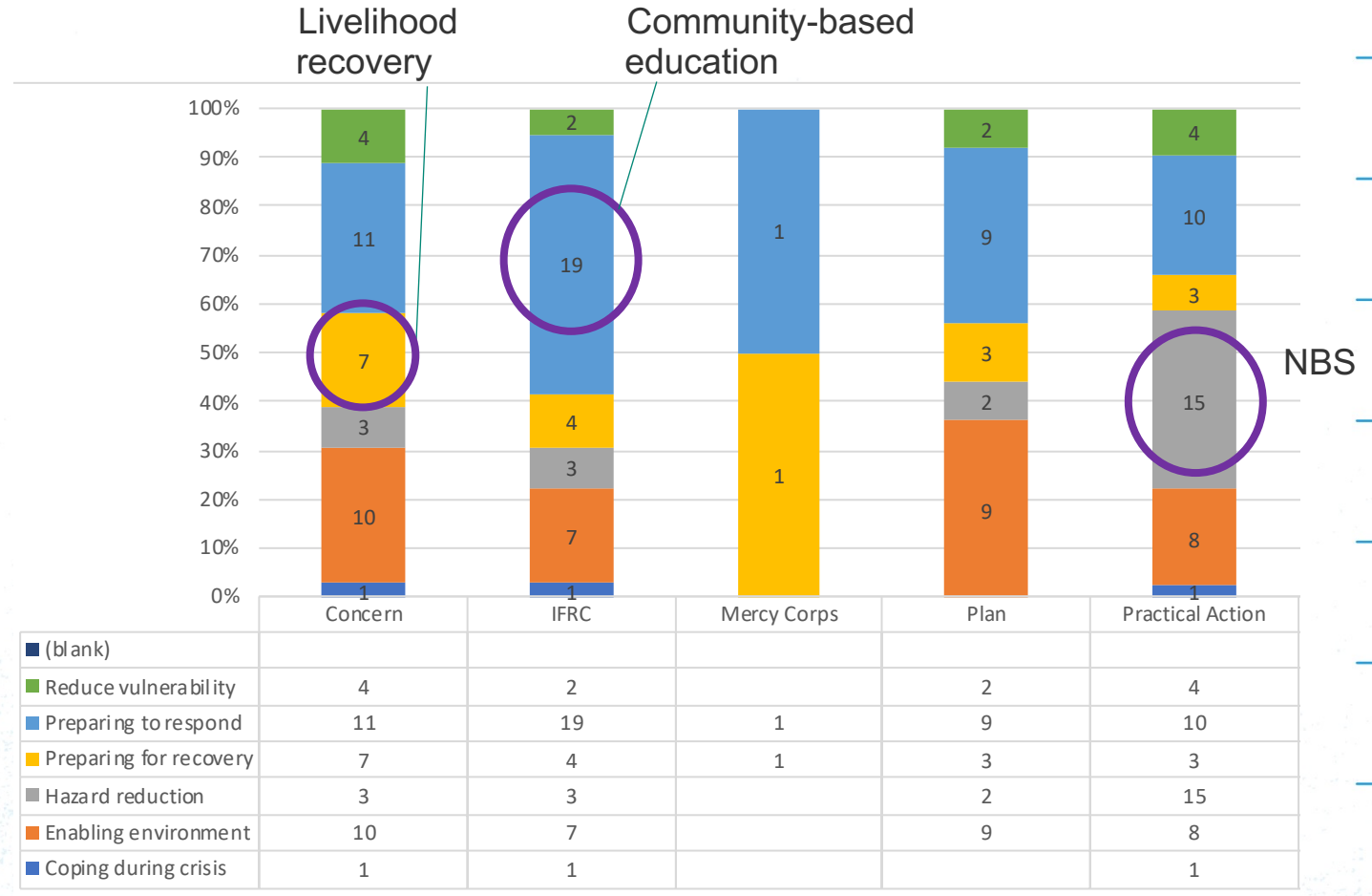


DM criteria by interventions' type

Intervention type by partner organization



DM criteria prioritized by partner org.



Interventions' intended result by partner org.

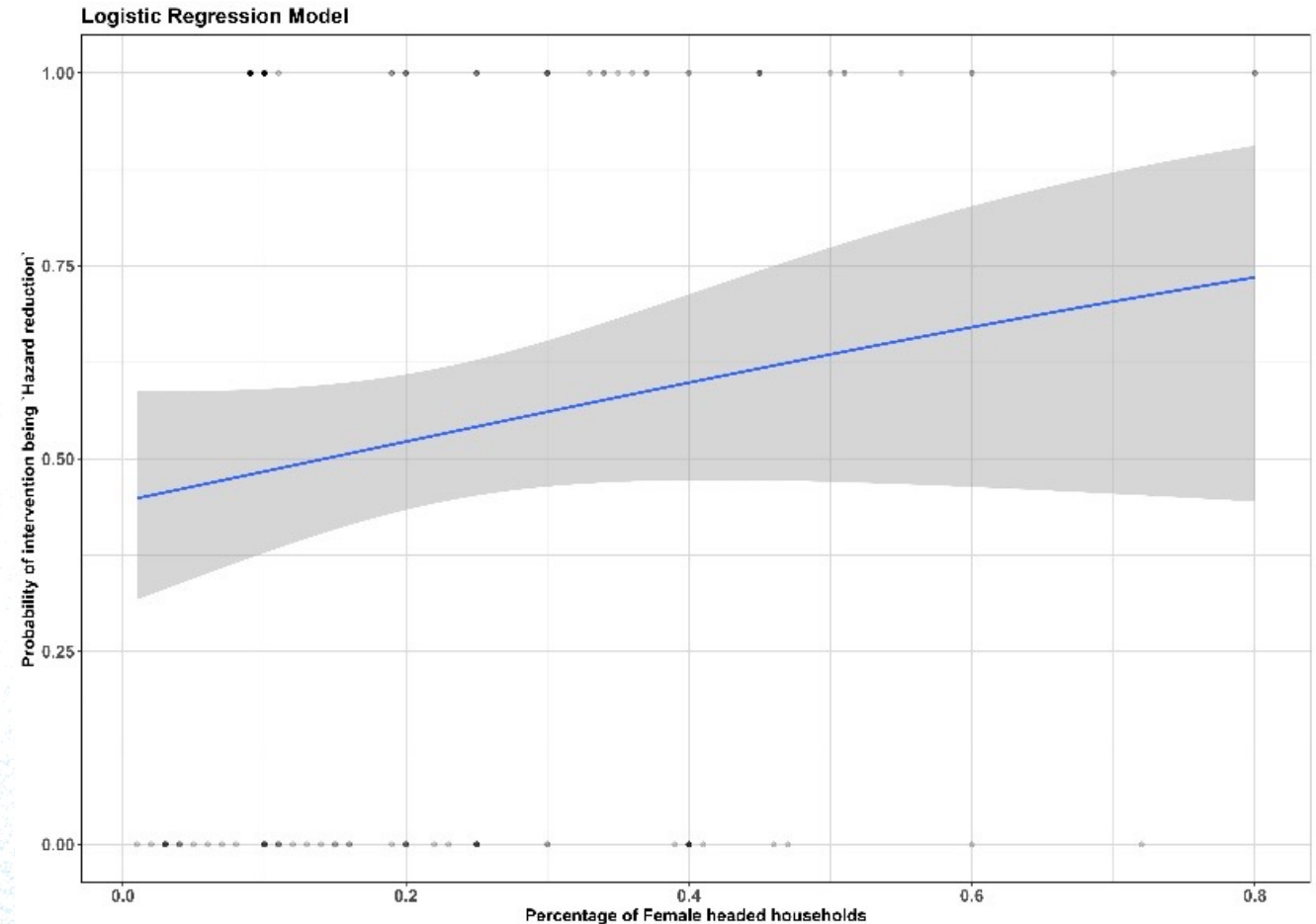
Type of interventions selected by community characteristics : result / objective

The community characteristic most influencing the likelihood of interventions, *‘Preparing for recovery’*, *‘Coping during crisis’*, *‘Preparing to respond’*: **previous flood experience**

- *‘Preparing for recovery’*: 3.42 times more likely
- *‘Coping during crisis’*: 2.34 times more likely
- Probability of intervention classified as *‘Coping during crisis’* were selected in communities with slightly lower average Physical and Human capital (*significant at 0.078 and 0.064 level).
- Probability of intervention classified as *‘Preparing to respond’* were selected in poorer rural communities with experiences in flash floods and regular substantial floods (between 40% and 80% of houses flooded)

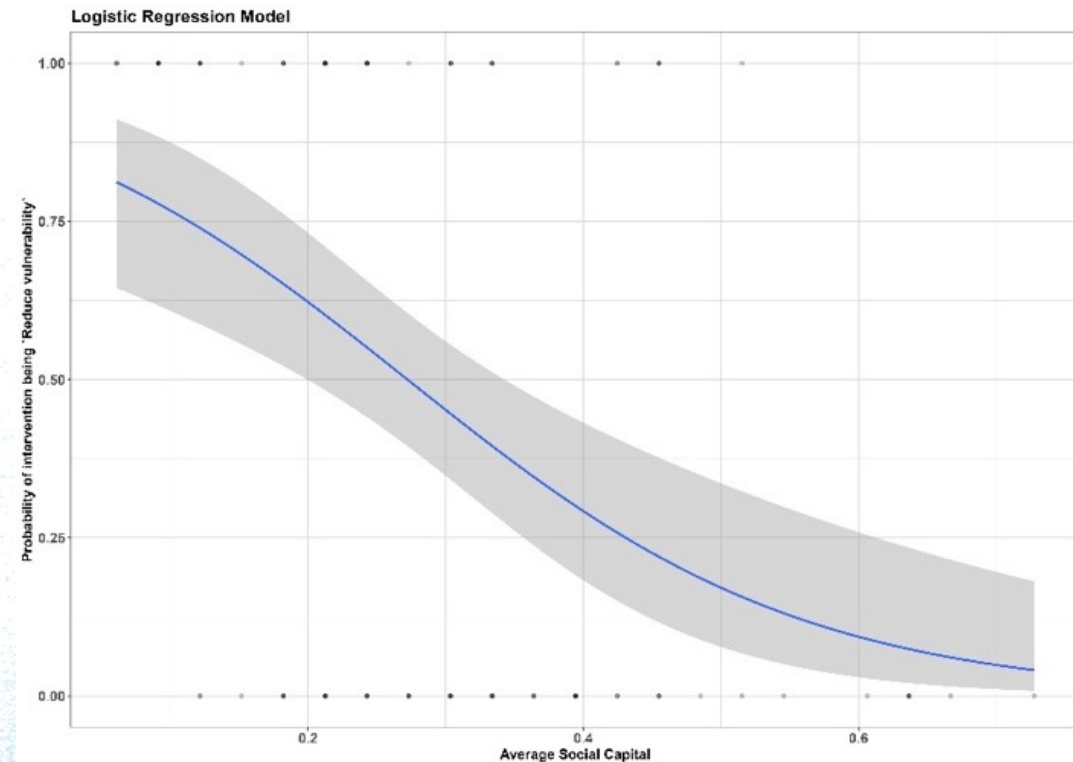
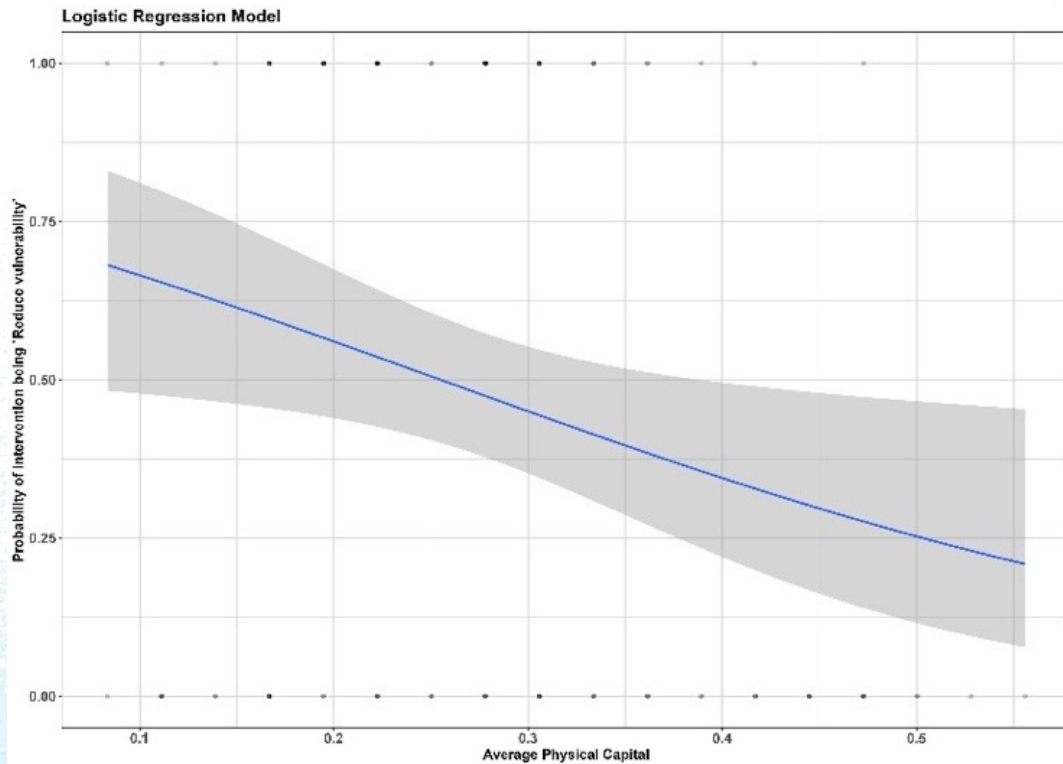
Type of interventions selected by community characteristics : result / objective

- `Hazard Reduction` interventions were selected in all urban and peri-urban communities while ~55% of rural communities
- Female headed households were more likely to select such interventions



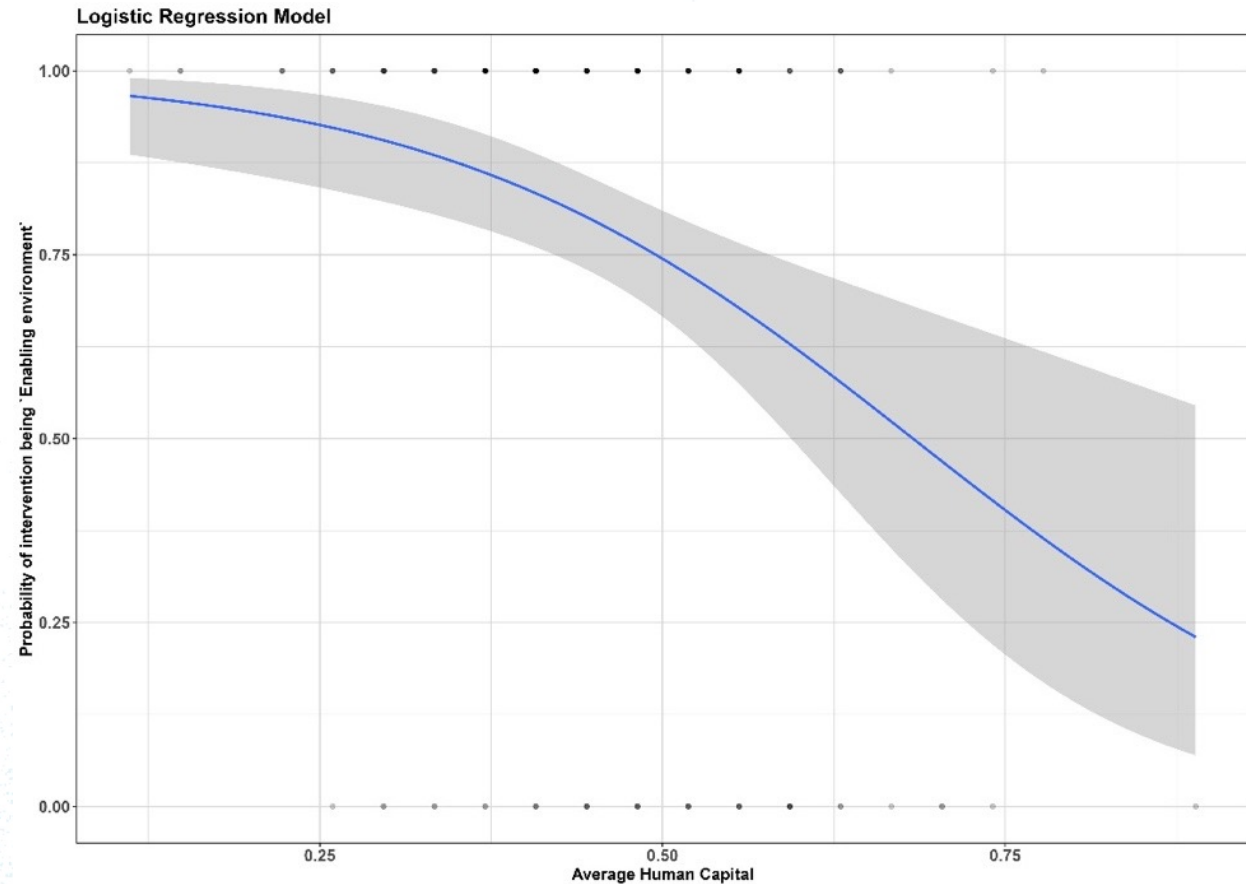
Type of interventions selected by community characteristics : result / objective

- Probability of an intervention being labeled as 'Reduce vulnerability' is inversely related with physical and social capital – communities with either low physical, social or both capitals



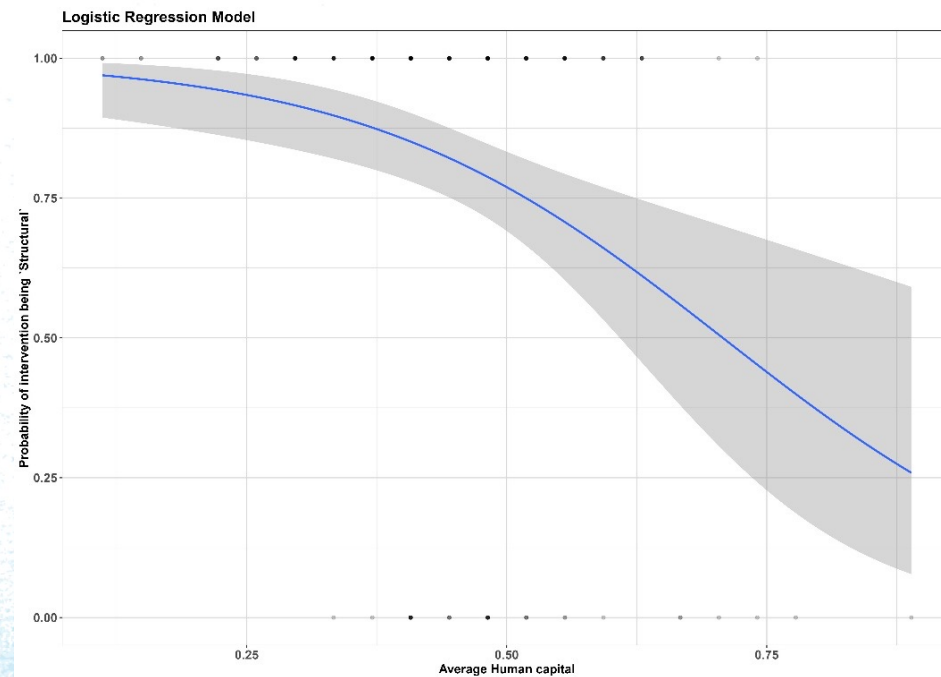
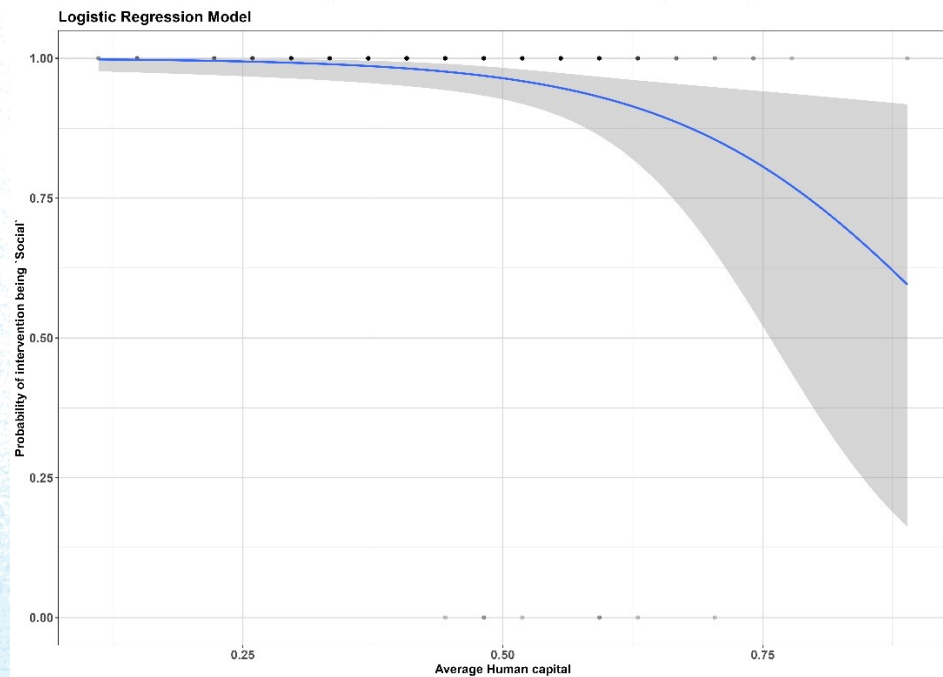
Type of interventions selected by community characteristics : result / objective

- `Enabling environment` interventions were more likely to be selected in communities with lower human capital and no previous flood experience
- If a community has suffered a flood event this reduces the probability that a community will have this type of intervention by around 16%



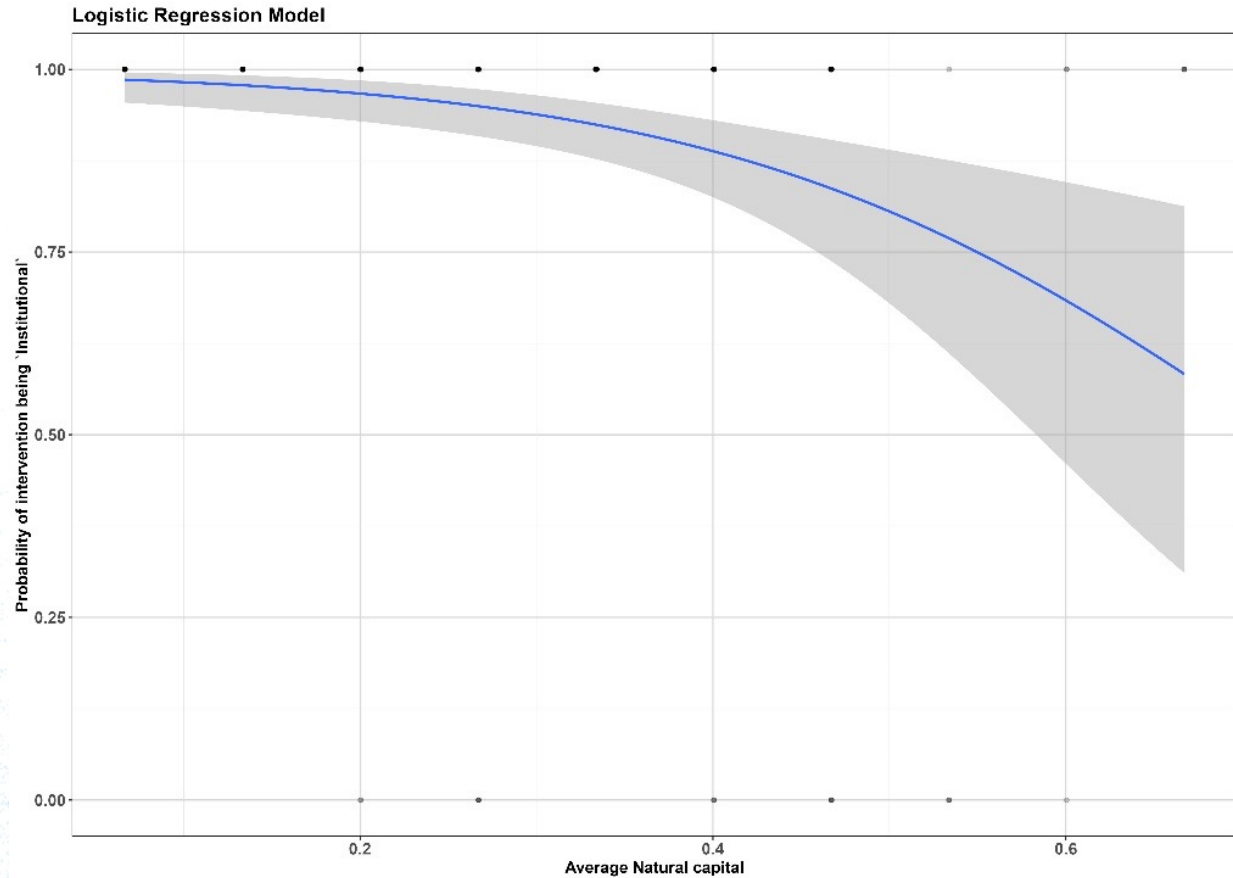
Type of interventions selected by community characteristics : component / mechanism

- Probability of an intervention being labeled as `Social` and `Structural` is inversely dependent on Human capital
 - `Structural` interventions further focus more on communities which have experienced a flood event. That is communities which have experienced flood are around 13% more likely to have an intervention marked as structural.



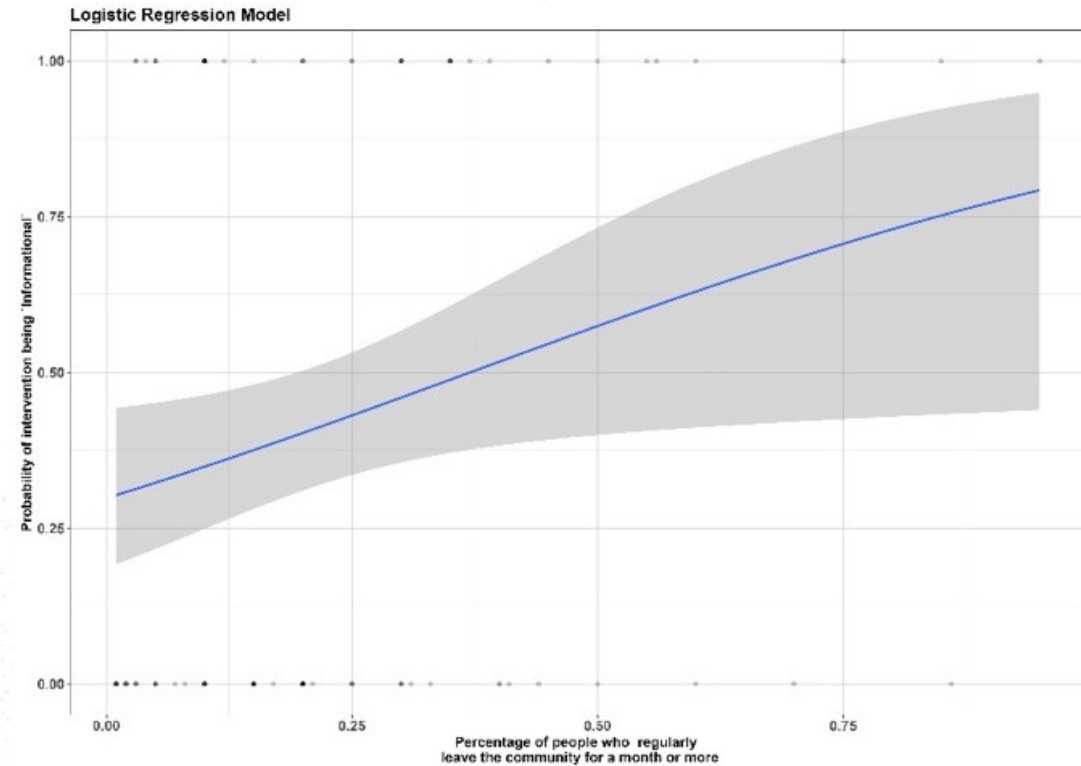
Type of interventions selected by community characteristics : component / mechanism

- Probability of an intervention being labeled as 'Institutional' is inversely related to communities' Natural Capital



Type of interventions selected by community characteristics : component / mechanism

- Unable to find a fitting to assess the likelihood of `Educational` interventions – widely selected across community characteristics
- While, `Informational` interventions were more likely to be selected in communities where a larger percentage of people regularly leave for a month or more as well as those relying on income sent from those working outside the community (mobile communities)



Key findings

Descriptive and exploratory statistical analysis of ZFRA communities' interventions finds:

1. Do interventions correspond to each communities' needs?
 - Interventions build pathways of change under different community conditions (capital grades)** and their DM criteria (resources and priority)** and partner organizations' guidance*
2. How does the FRMC framework facilitate more systems-based interventions and thinking?
 - FRMC's framing of resilience through a diverse set of lenses, wide range of sources (indicators) and ensuring community priorities (social, ecological, and economic development and growth objectives) allows for more human-centered resilience-building action

Insights to future study directions

Framework for capturing the 'impact', M&E of community-based interventions that:

- ✓ Serves as a **boundary object**
 - resilience-based approaches securitize climate change and create oppressive ecologies of fear, legitimizing the growing control of experts and technocrats proficient in the resilience trade over those deemed too vulnerable to adapt to the impending impacts of climate change on their own (Chaturvedi and Doyle, 2015; Swyngedouw, 2013)
- ✓ Promotes **equitable, inclusive and political** decision-making
 - depoliticized development and deprive local people of their political power and subjectivity (Evans and Reid, 2013; Velicu and Kaika, 2017)



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Thank you!

For any questions and comments please contact
hyun@iiasa.ac.at

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Resilience interventions measurement, typology

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