



# Reviving people's trust in Bamboo technology

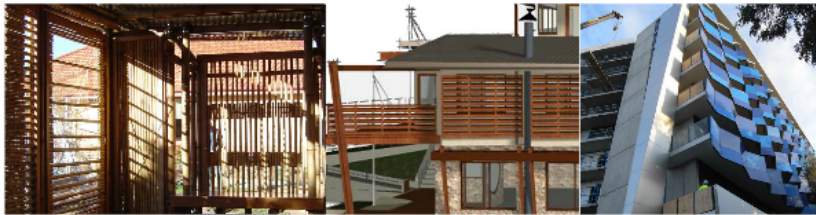
A case-study of Orlaha settlement reconstruction in Bihar after the 2008 Kosi floods

20-Sep-2015

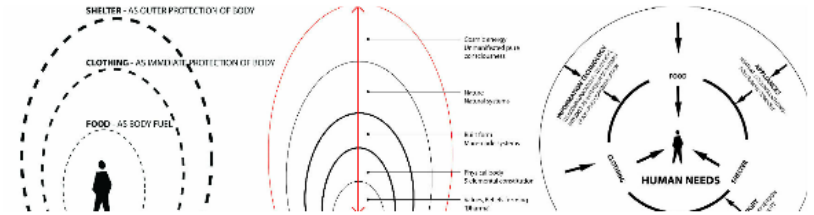
Mittul Vahanvati

# My motivation

I am passionate about identifying ways in which design and construction practices can empower those involved in the process and ensure better long-term outcomes.



Architect



MBEEnvSustDev



Lecturer, Course-coordinator



Own practice: self-build



Mittul Vahanvati

Co-building is the process of building something together with community members who have no stake in the outcome. This book shows how we have evolved our design and construction approach over the past 10 years. Our co-building with bamboo included over **500 participants** in **35 workshops** building **23 structures**.

"Time and again, Mittul and Munir show us that a collection of unskilled builders can quickly contribute to an enjoyable process, building not just shelter but bonds between us."

-Darrel DeBoer

"Munir and Munir were able to generate a sense of aspiration and group cohesion in a very short space of time. Important qualities I feel when you are co-constructing something."

- Danielle Von Der Borch



# CO-BUILDING WITH BAMBOO

Munir Vahanvati & Mittul Vahanvati



Mittul Vahanvati

# Research question

How can post-disaster housing reconstruction projects enhance the disaster-resilience of at-risk communities in India?



# CONTENTS

## The case of Bihar

### Bihar, India:



### Housing project and household samples:

Sample size in settlements of Oriha and Puraini, Bihar

Settlement	Household	Beneficiary	Household
Orha	100	50	100
Puraini	100	50	100

Beneficiary sample: caste-based hierarchy (1= high and 4= low social status)

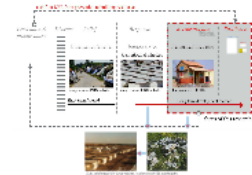
Social profile of Oriha	Social profile of Puraini
1. Brahmin	1. Brahmin
2. Kshatriya	2. Kshatriya
3. Vaishya	3. Vaishya
4. Shudra	4. Shudra



## Research



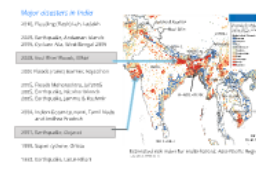
### Disaster-Resilience



Note: 0% in brackets indicate the value of the same metric (adapted from Table 1, legend and Table 2, 2011)

Disaster	Disaster-Resilience	Disaster-Resilience	Disaster-Resilience	Disaster-Resilience
Agency	1	2	3	4
1. National Disaster Response Force (NDRF)	2. State Disaster Response Force (SDRF)	3. District Disaster Response Force (DDRF)	4. Local Disaster Response Force (LDRF)	5. Community Disaster Response Force (CDRF)
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### Research setting

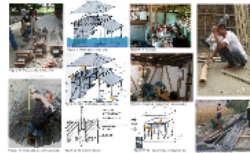


## Preliminary findings

Table 1. Key themes from DISRC case studies

Theme 1: Social mobilization and facilitation for reconstructing effective engagement
Theme 2: Technical Disaster resilience house design and construction
Theme 3: Social facilitation process
Theme 4: Participatory governance
Theme 5: Resilience assessment as a concept - has done a little work
Theme 6: Resilience assessment as a concept - has done a little work

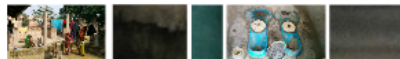
### Technical: Design & technology



### Social facilitation process:



### 6 years after the reconstruction



## Conclusion & way forward

Primary research question:  
How can post-disaster housing reconstruction projects increase the long-term disaster-resilience of at-risk communities in India?

Sub-question:  
What approaches to community participation and capacity-building during an ODR approach, are most likely to enhance the awareness and confidence in decision making of at-risk communities?

Research Design:  
A case-study approach - multiple case-studies;  
Mixed-methods research  
Thematic analysis

Preliminary findings:

- Beneficiary selection - remained top-down; influence, power and corruption amongst local leaders; external development agency has positive effect of no social tension & participatory dispute resolution
- Community mobilization and facilitation: Trust-building; set up of social-hub and facilitation key to the success of enhancing community awareness and confidence.



# Research

## Background:

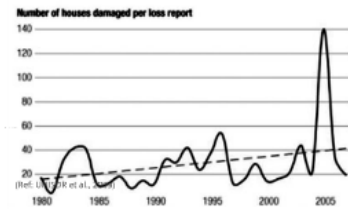
### Disaster

number ↑ from 428 to 707  
natural & technological disasters per annum  
 from 1994-1998 to 1999-2004  
(UNEP/WHO/UNEP et al. 2005)

42 million people  
 displaced in year 2011 alone  
(UN/WHO/UNEP 2011)

↑ by 235%  
 economic loss in year 2011  
(UN/WHO/UNEP et al. 2012)

89 % of people affected  
 48% of the houses damaged  
are in developing countries of Asia (1975-2011)  
(UN/WHO/UNEP 2011)



Focus on housing reconstruction

## Disaster-Resilience

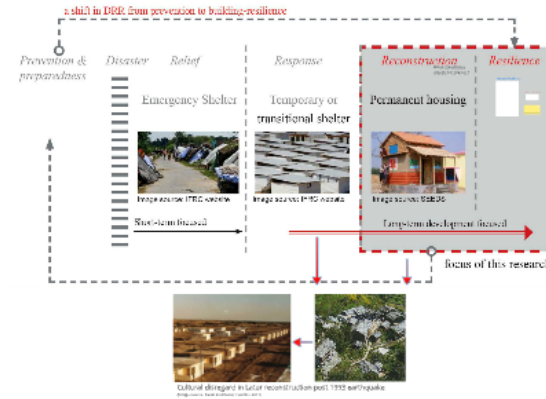


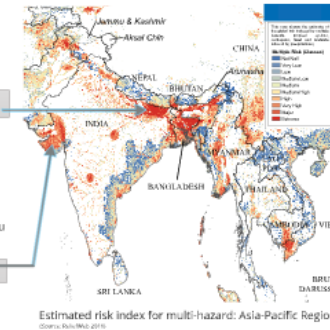
Table 1 Criteria for the selection of the case-studies (Adapted from Charlesworth and Ahmed, 2012)

	Post-2001 Gujarat earthquake reconstruction program		Post-2008 Bihar Kosi River flooding reconstruction by ODRC		
	Abhiyaan + Hamarshala	SEEDs	Hamarshala	SEEDs	
Key selection criteria	Resilience features explicitly incorporated in housing	✓	✓	✓	
	Community driven housing solutions & facilitation (money to households)	✓	✓	✓	
	Upfront consideration for cultivating local capacity in disaster-resilience in housing	✓	✓	✓	
	Special mention/ awards	UN-Habitat, UNHCR & IFRC 2008			
Variables	Communities exposed to natural hazards (type, location specific)	Earthquake, drought		Cyclone, floods, storm surges	
	Location (rural, urban)	Bhuj (rural)	Patanka (rural)	Supaul (rural)	Madhepura (rural)
	Shelter project wholly or largely complete	Wholly	Wholly	Largely	Largely
	Years since the shelter project built	12 years old		5 years old	
	Implementing agency setup	NFP	NGO	NFP	NGO

## Research setting

### Major disasters in India

- 2010, Flooding (Flash) Leh, Ladakh
- 2009, Earthquake, Andaman Islands
- 2009, Cyclone Aila, West Bengal
- 2008, Kosi River Floods, Bihar
- 2006 Floods (rains) Barmer, Rajasthan
- 2005, Floods Maharashtra, Jul/2005
- 2005, Earthquake, Nicobar Islands
- 2005, Earthquake, Jammu & Kashmir
- 2004, Indian Ocean tsunami, Tamil Nadu and Andhra Pradesh
- 2001, Earthquake, Gujarat
- 1999, Super cyclone, Orissa
- 1993, Earthquake, Latur-Killari



# Background:

## Disaster

number **↑** from 428 to 707

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(Ref: Guha-Sapir et al. 2012)

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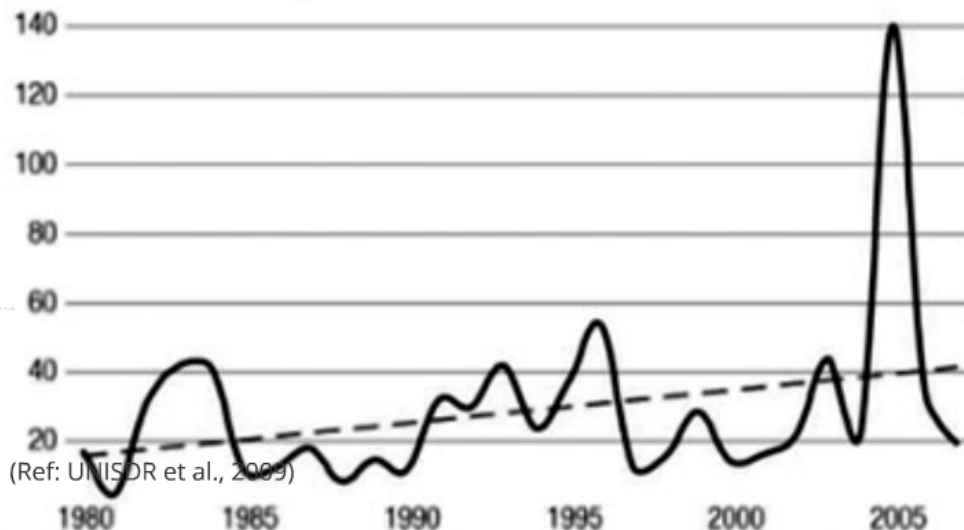
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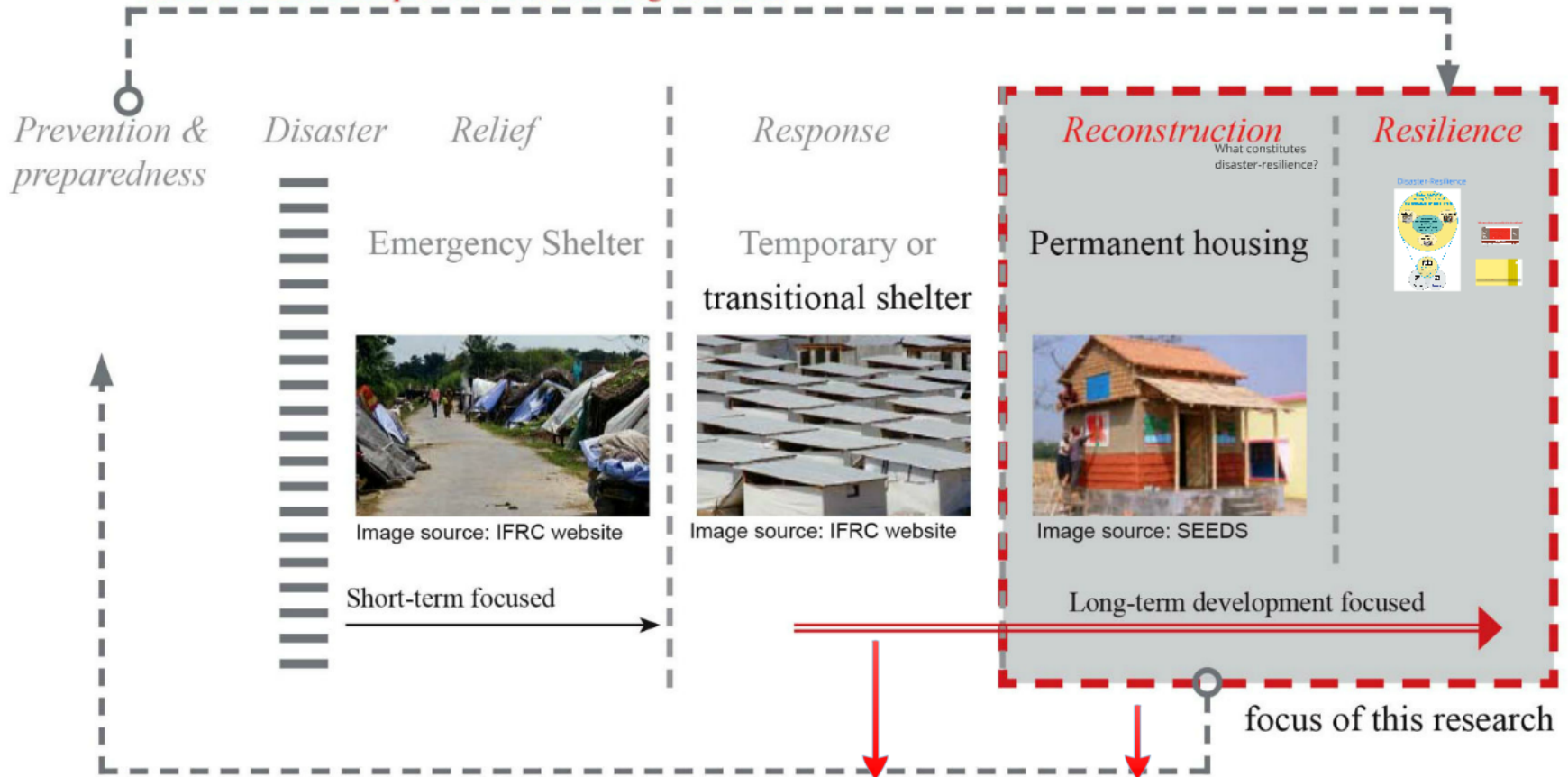
Number of houses damaged per loss report



Focus on housing reconstruction

# Disaster-Resilience

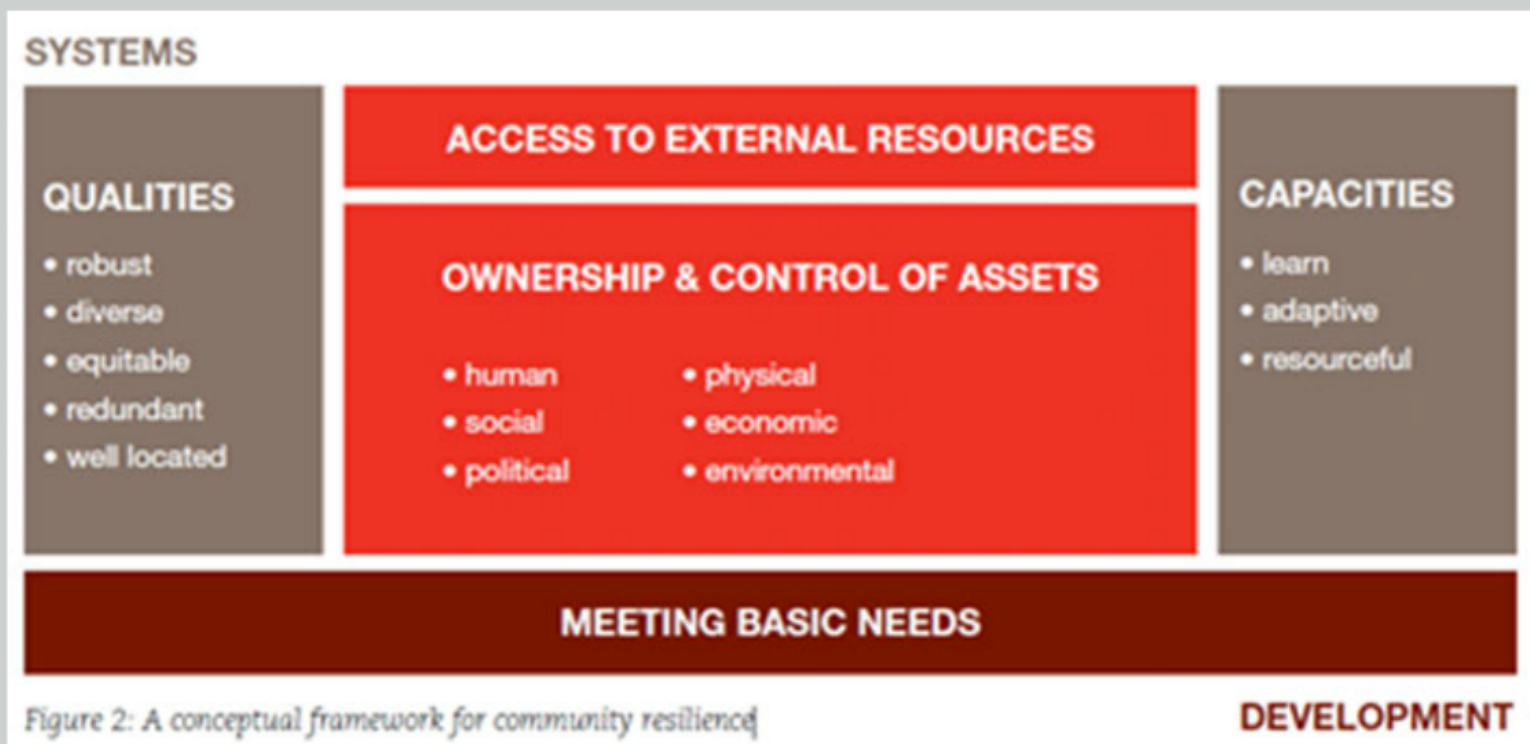
a shift in DRR from prevention to building-resilience



Cultural disregard in Latur reconstruction post 1993 earthquake  
 (Image source: Desai and Desai, Aquilino 2011)



# What constitutes community's disaster-resilience?



Source: IFRC 2012

## KEY FACTORS OF POST-DISASTER HOUSING RECONSTRUCTION

	Technical	Func.	Social	Env.	Economy	Inst.	Org.	
UNEP + SKAT, 2007	[Yellow bar]		[Yellow bar]	[Yellow bar]	[Yellow bar]	[Yellow bar]	X	Sust. dev.
Lizarralde et al, 2010	[Yellow bar]	[Yellow bar]		[Yellow bar]	[Yellow bar]	[Yellow bar]	[Yellow bar]	Knowledge, skills
Boano et al, 2010	[Yellow bar]			[Yellow bar]	[Yellow bar]	[Yellow bar]	X	People, space & place
Palleroni, 2011	[Yellow bar]		[Yellow bar]	[Yellow bar]	[Yellow bar]		X	Cultivating resilience
Wiek et al, 2010	[Yellow bar]		[Yellow bar]	[Yellow bar]	[Yellow bar]		X	Knowledge, skills
DA, 2001	[Yellow bar]		[Yellow bar]	[Yellow bar]	[Yellow bar]	[Yellow bar]		Building community
Hunnarshala, 2007	<i>Technical</i>	<i>Spatial</i>			<i>Economic</i>	<i>and Human</i>		Capacitate people
IFRC,	[Yellow bar]		[Yellow bar]			[Yellow bar]		Community resilience & DRR

Strategic dimensions

Resource forms

Capital forms

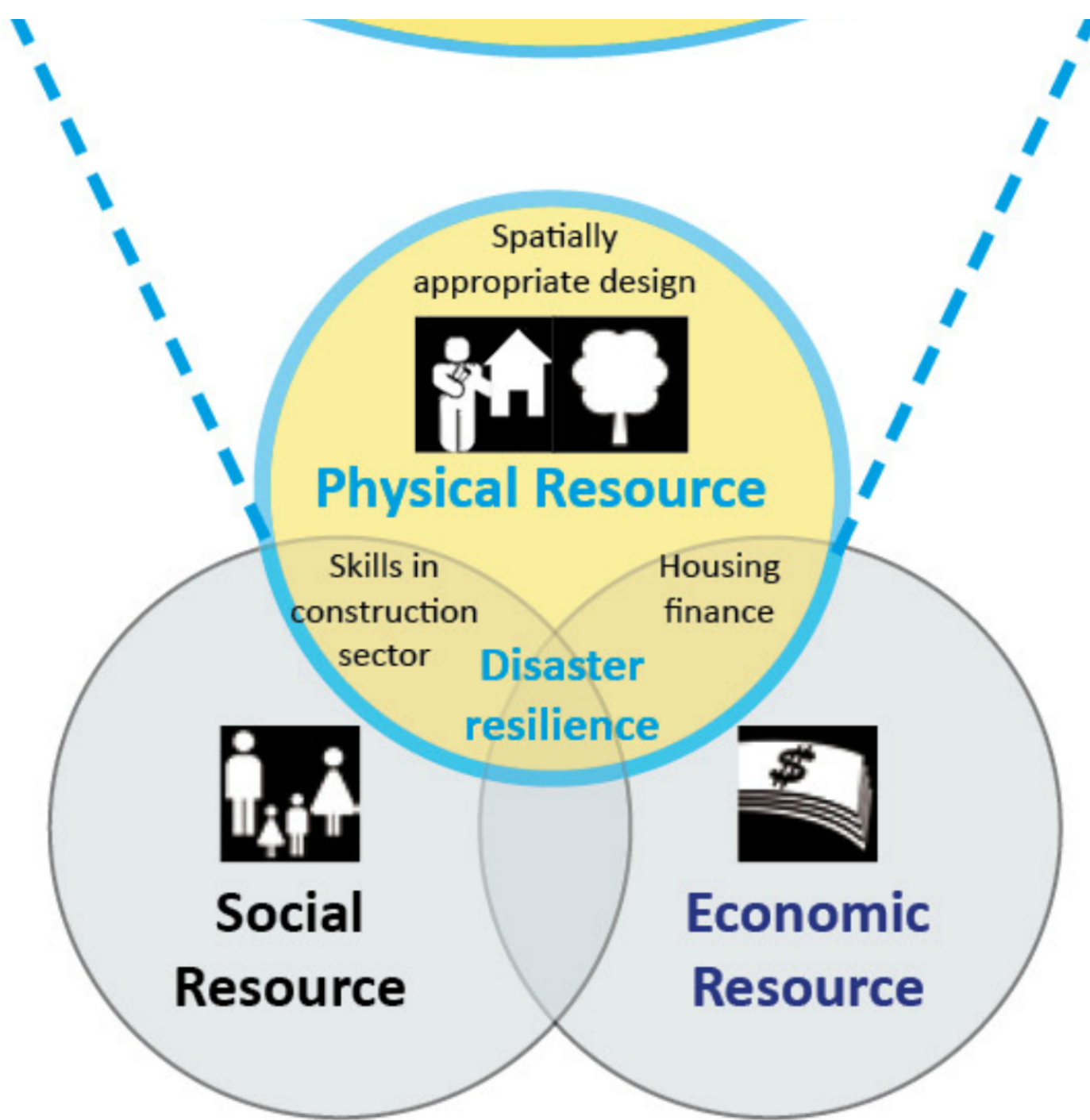
Policy informing

Enabling policy env.

Building capacities

Collaborative env.

Source: See references at the end of summary sheet



# Physical Resource (Housing & Settlement Reconstruction Projects in India)

**Spatial design**



**Capacity building**



**Disaster-resilience/  
long-term effectiveness of  
post-disaster  
housing & settlement  
reconstruction projects**

**Funding  
mechanisms**



Spatially  
appropriate design



**Physical Resource**

Skills in  
construction  
sector

Housing  
finance

**Disaster  
resilience**



**Social  
Resource**



**Economic  
Resource**

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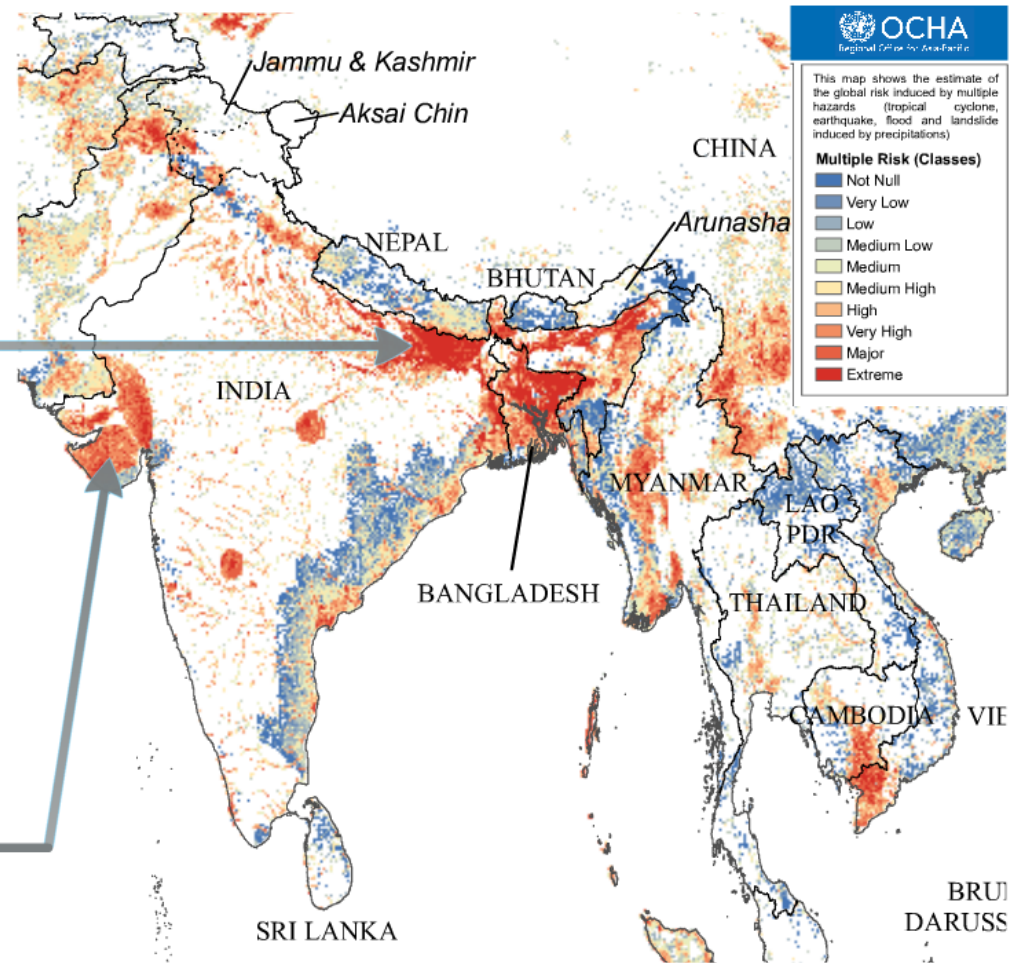
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1993, Earthquake, Latur-Killari



Estimated risk index for multi-hazard: Asia-Pacific Region

(Source: ReliefWeb 2011)

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	<b>Shelter project wholly or largely complete</b>	<b>Wholly</b>	<b>Wholly</b>	<b>Largely</b>	<b>Largely</b>
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	<b>Implementing agency setup</b>	<b>NFP</b>	<b>NGO</b>	<b>NFP</b>	<b>NGO</b>

# The case of Bihar

## Bihar, India:



Image source: mapsofindia.com

- 3 million people affected
- > 200,000 homes damaged
- 1000 villages had significant damage in five districts of Araria, Madhepura, Purnia, Saharsa and Supaul (GoB)



Image source: www.gfdr.org



## Housing project and household samples:

Sample size in settlements of Orlaha and Puraini, Bihar

Settlement Name	Households	Beneficiaries	Interviewees
Orlaha	110	41	9 Beneficiaries 11 (Agency members - Non-beneficiaries)
Puraini	102	89	8 Beneficiaries 10 (Agency members - Non-beneficiaries)

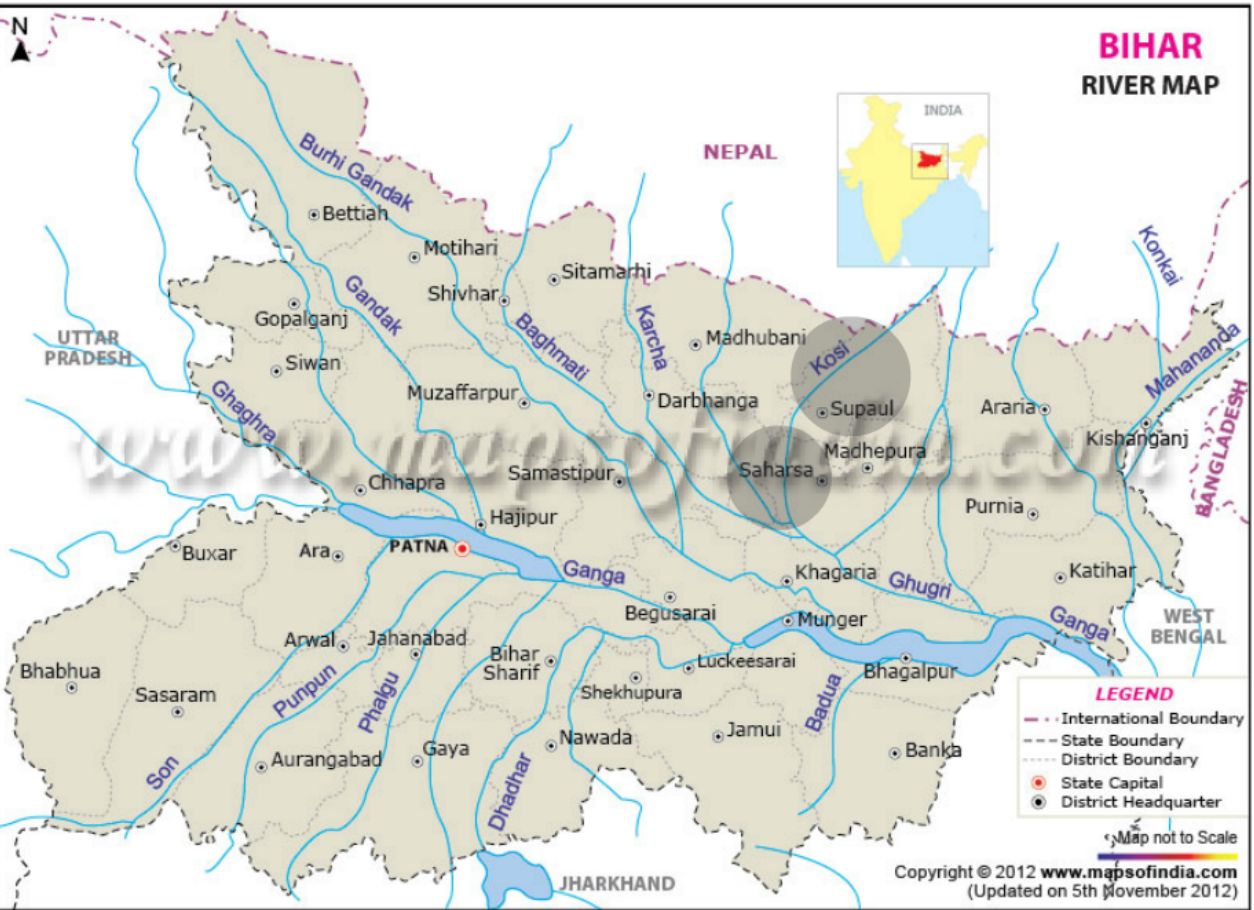


Beneficiary sample: caste-based hierarchy (1 = high and 4 = low social status)

Social profile of Orlaha	Status (high to low)	Social Profile of Puraini
Mandal (agricultural land owners, contractors)	1	Mandal (agricultural land owners/ Master masons)
Patwa (labourer – agricultural/ construction)	2	Rajput (driver, migrant labourer)
Muslim (labourer – cotton quilt makers)	3	Mehta (land owners)
Sardar (labourer- masons/ bamboo artisans)	4	Harijan (labourers)



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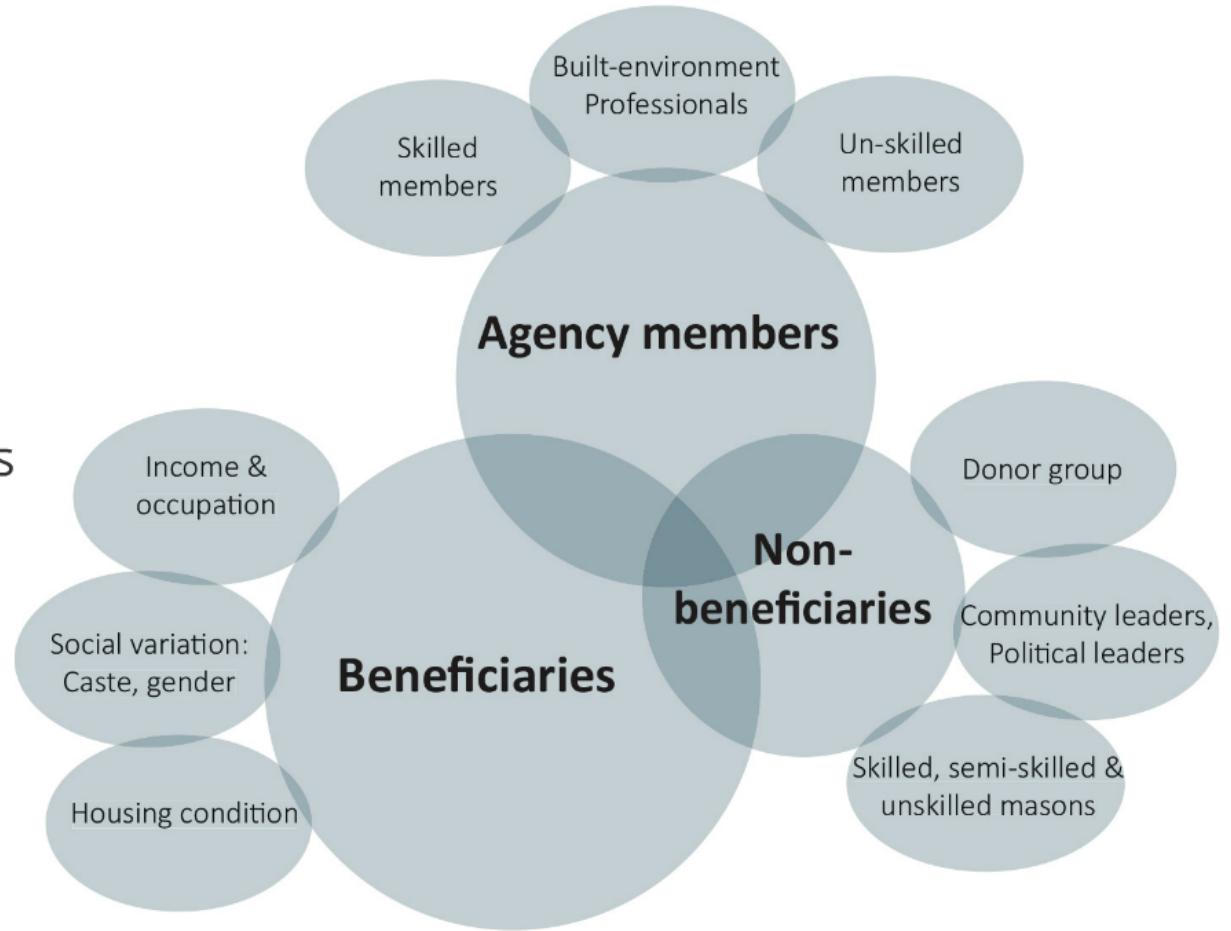






## Sampling:

- Purposive sampling
- Triangulation logic
- Sample size:
  - 8-9 households/ beneficiaries
  - 6-7 agency members
  - 3-4 non-beneficiaries



**Figure: Triangulation of information source samples**

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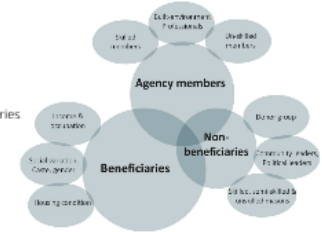


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Table1: Key themes from ODRC case-studies

<b>Theme-1</b>	<b>Social mobilisation and facilitation for maintaining effective engagement</b>
a)	Social facilitation process leading to formation of the “ <i>Kosi setu kendras</i> ” (KSKs)
b)	Beneficiary selection
<b>Theme-2</b>	<b>Technical: Disaster resilient house design and construction:</b>
c)	Legalising traditional construction technology
	Model house for spatial understanding
	Is owner-driven equal to owner-build?
	Incentive based timely completion
	Access to basic amenities – drinking water, sanitation and power
<b>Theme-3</b>	<b>Modes of financial assistance and livelihood incorporation during ODR process</b>
	Land titles resolution
	Financial assistance – in household’s control (male and female)
	Livelihood incorporation/ diversification
<b>Theme-4</b>	<b>Participatory governance</b>
	Participatory governance great as a concept – but does it really work?
	Transition from civil society to local government

# Technical: Design & technology



Figure 10: Pre-cast pile foundations

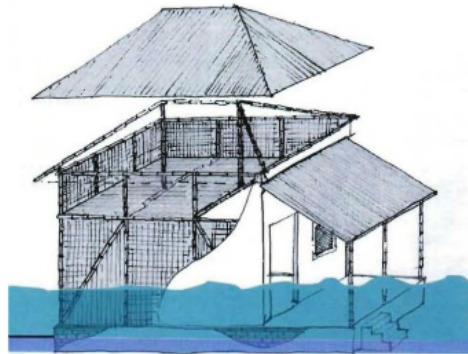


Figure 8: Flood resistant features



Figure 9: Attic space

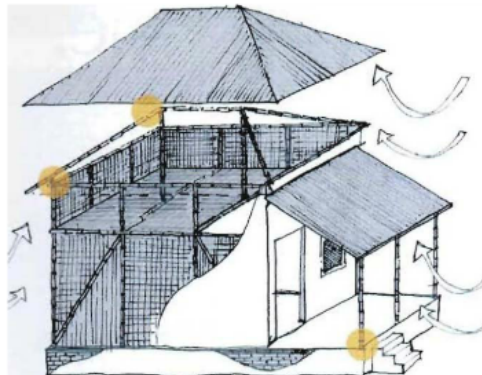


Figure 12: High-wind velocity safety features



Figure 13: Diagonal braces for earthquake safety



Figure 11: Hole dug in soil from drum

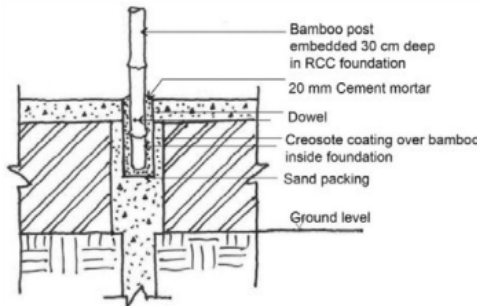


Figure 14: Bamboo foundation

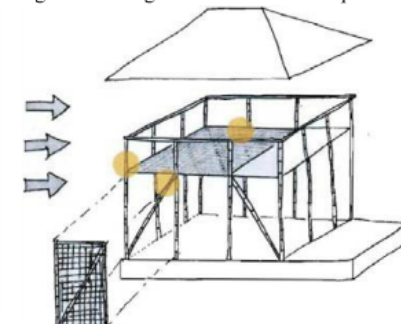


Figure 15: Earthquake resistant diagonal ties



7: Bamboo treatment in a soak pond

Image source: Figure 8, 12, 15: Rawal & Virmani 2012; Figure 10, 11. Sankalpa, CEPT, India; Figure 14. GoB 2010

# Social facilitation process:



Photo source: Hunnarshala

# 6 years after the reconstruction













