

# **Emergency Response Preparedness: Earthquake and Flood Contingency Planning**

Based on HCT Presentation on 21<sup>st</sup> February at UN House

# Emergency Response Preparedness: Earthquake contingency planning



Collapsed stone and mud mortar house in Duna, Sindhupalchok, following 2015 Gorkha earthquake

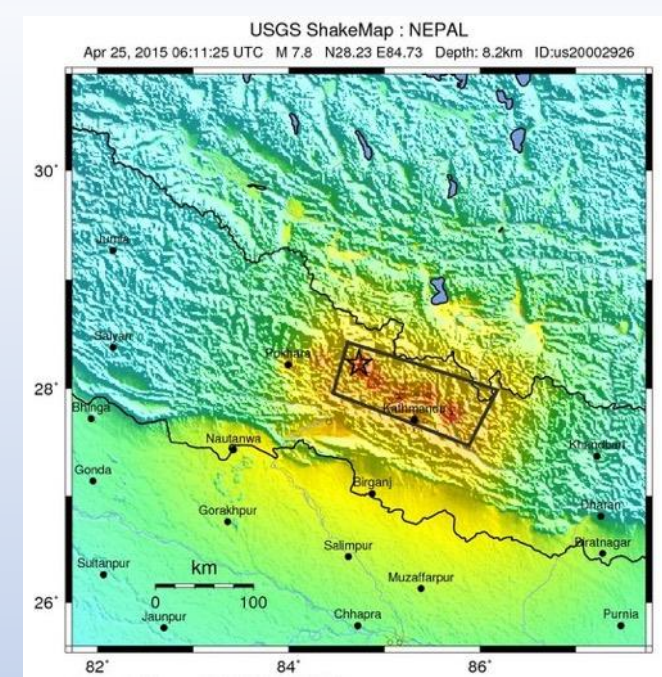
**Tom Robinson, Nick Rosser, Alex Densmore, Katie Oven,  
Surya Shrestha, Ramesh Guragain**





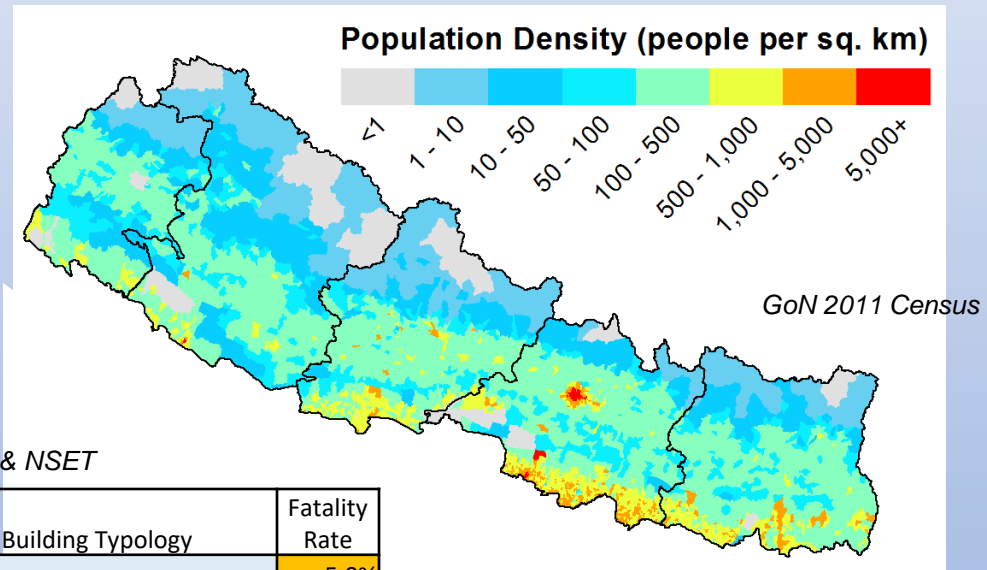
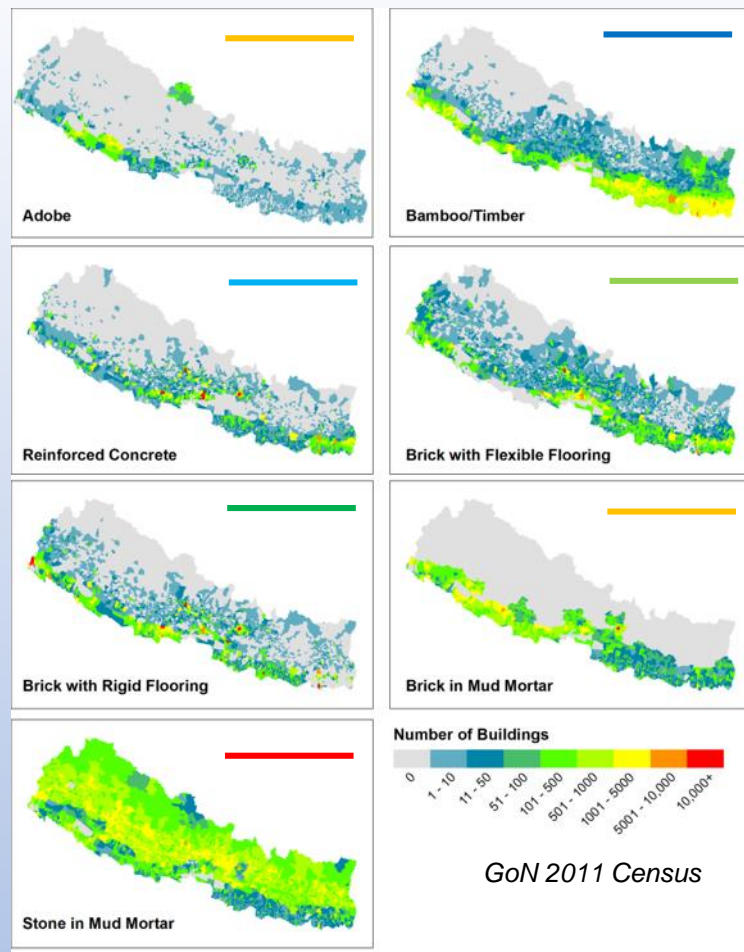
# Overview

- 2015 Gorkha earthquake was worst in 90 years
- 9000 fatalities, 22,000 injuries, 3.5 million displaced
- Not as large as had been expected –  $M_w$  8.5+ earthquake anticipated with 100,000+ fatalities (Dixit et al 2014; Bilham et al. 2001, Wyss, 2005)
- Scope of this study:
  - Inform contingency planning, not training
  - Absolute impacts to residential buildings:
    - Fatalities
    - Injuries
    - Building Collapse
    - Displaced population
  - Focus on large EQs requiring International response
    - M7.0 – M8.6
  - Results at all Administrative levels

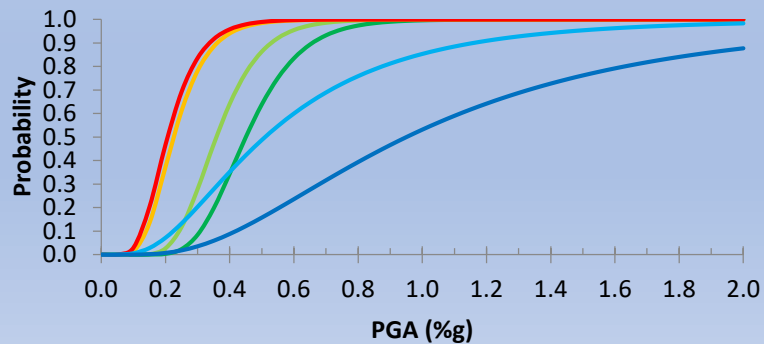


# Earthquake Loss Modelling

- Population and building data from 2011 National Census
- **Fragility curves and fatality rates from global empirical data** (Guragain, 2012; HAZUS, GEMECD)
- Verified on the 2015 earthquake
- 30 EQs for 3 different times = **90 scenarios**



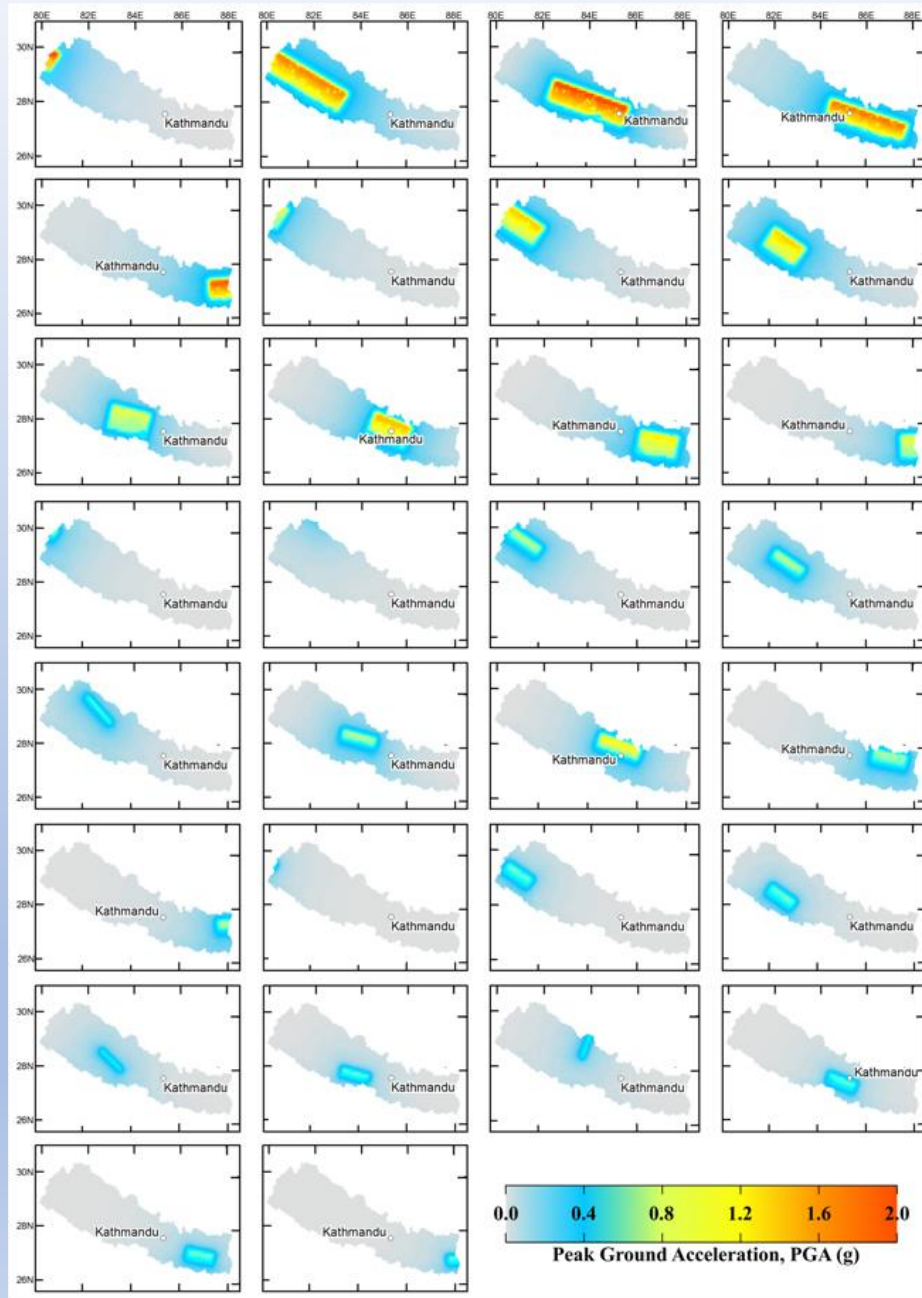
## Complete Damage



## GEM & NSET

Building Typology	Fatality Rate
Adobe	5.0%
Bamboo	0.5%
Timber	2.0%
Reinforced Concrete	10.0%
Brick with flexible flooring	5.0%
Brick with rigid flooring	15.0%
Brick in mud mortar	5.0%
Stone in mud mortar	5.0%

# Scenario Ensembles

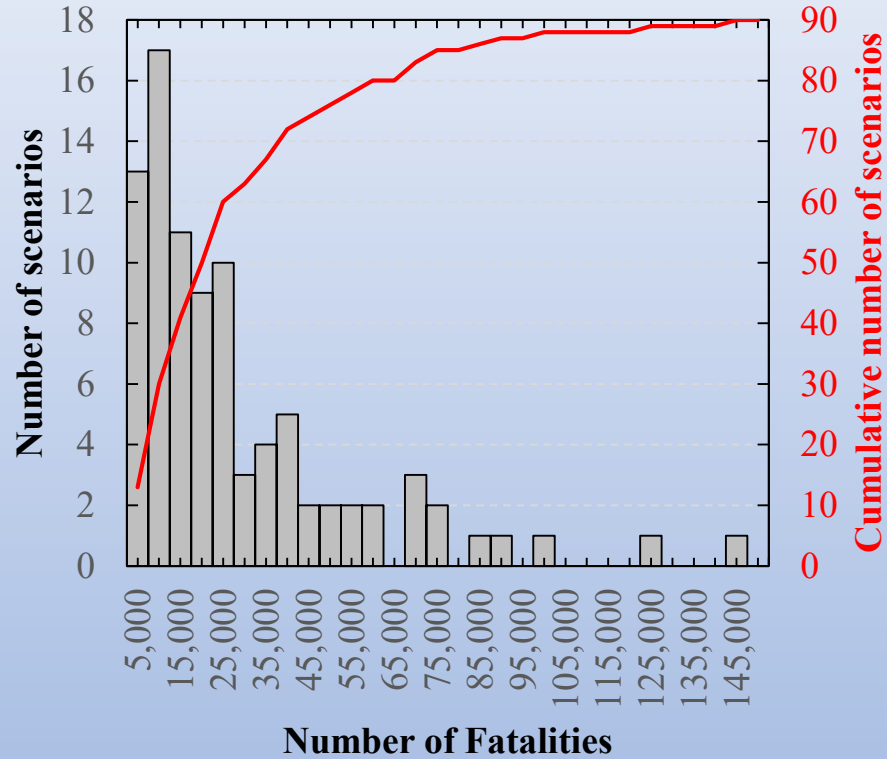


Scenario (Location-Fault_Mag)	Time of Day		
	Work Day	Non-work Day	Night
Wind-MFT_8.6	10,631	16,023	24,137
FWMW-MFT_8.6	36,770	53,175	81,434
WC-MFT_8.6	74,256	85,299	144,394
CE-MFT_8.6	65,946	71,960	124,942
Eind-MFT_8.6	15,231	20,321	32,665
W-Ind-MFT_8.3	5,908	8,956	13,458
FW-MFT_8.3	15,907	24,490	36,544
MW-MFT_8.3	24,404	37,559	56,089
W-MFT_8.3	32,200	43,013	68,178
C-MFT_8.3	53,025	55,444	98,375
E-MFT_8.3	23,731	30,196	49,265
Eind-MFT_8.3	7,536	10,608	16,679
WInd-MFT_7.8	3,100	5,070	7,429
FW-MFT_7.8	8,561	14,070	20,491
MW-MFT_7.8	12,796	21,050	30,638
W-MFT_7.8	19,644	26,476	41,891
C-MFT_7.8	38,333	36,876	68,301
E-MFT_7.8	9,739	14,316	22,200
Eind-MFT_7.8	3,791	5,911	8,902
WInd-MFT_7.0	856	1,298	1,958
FW-MFT_7.0	6,474	10,338	15,259
MW-MFT_7.0	8,518	13,645	20,090
W-MFT_7.0	11,369	16,400	25,114
C-MFT_7.0	28,038	23,261	46,414
E-MFT_7.0	6,882	9,916	15,537
Eind-MFT_7.0	2,267	3,372	5,134
SChn-KKM_7.8	166	323	523
MW-WFSN_7.8	5,292	9,023	13,042
MW-WFSS_7.3	7,361	12,134	17,727
W-TKG_7.3	1,560	2,531	3,798



# Scenario Results

Distribution of modelled earthquake fatalities in Nepal

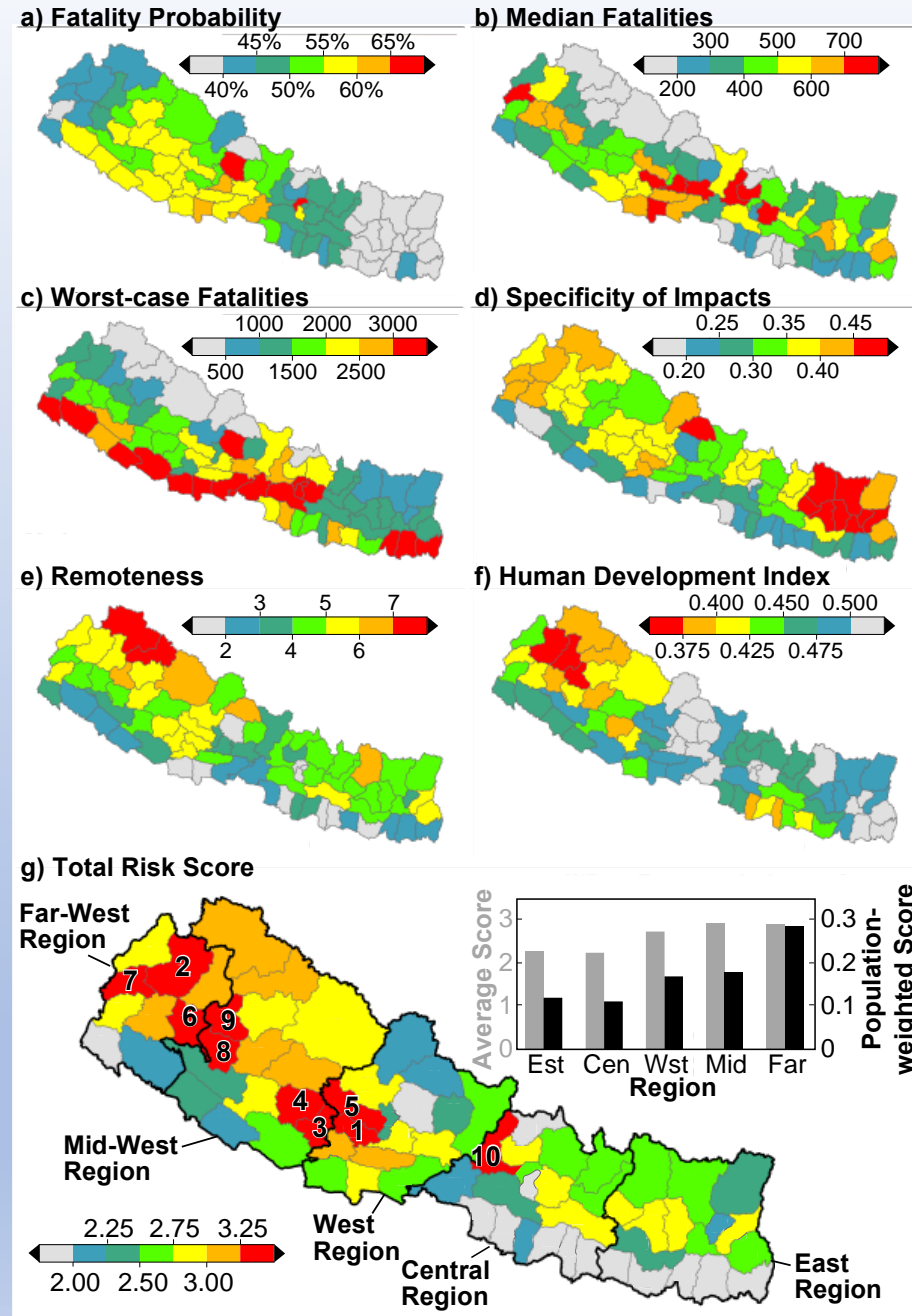


Worst-case - 144,394

Average (median) – 25,932

Most common – 5,000 → 10,000

Variability – 0.180





# Province 1

## Fatalities:

Likelihood: 43%

**Average: 5,500**

Worst-case: 20,000

Variability: 0.329 - Avg

## Injuries:

Likelihood: 64%

**Average: 18,000**

Worst-case: 138,000

Variability: 0.295 - Avg

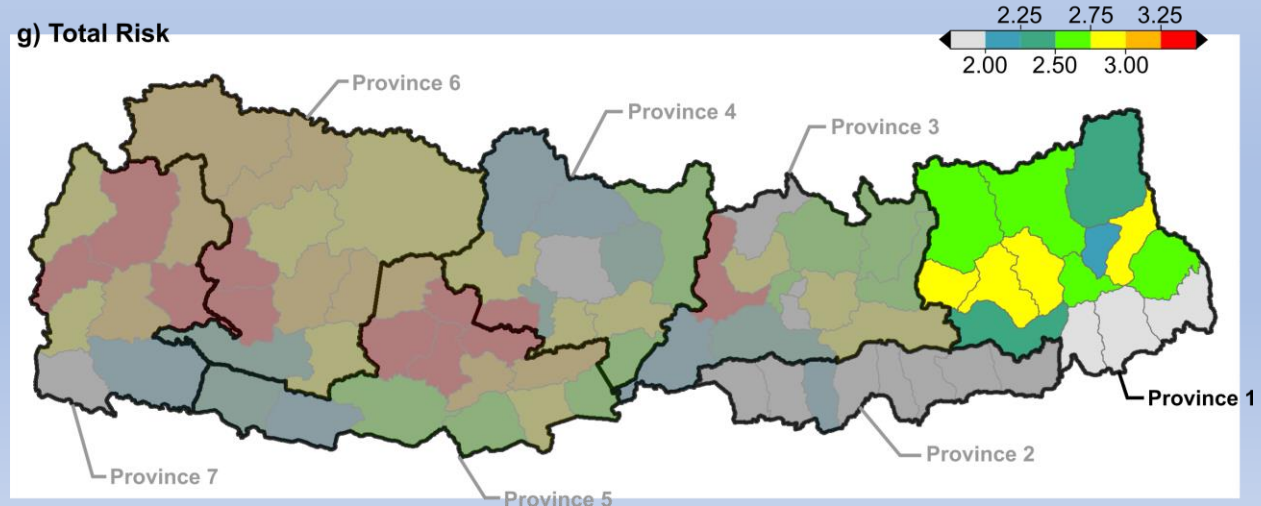
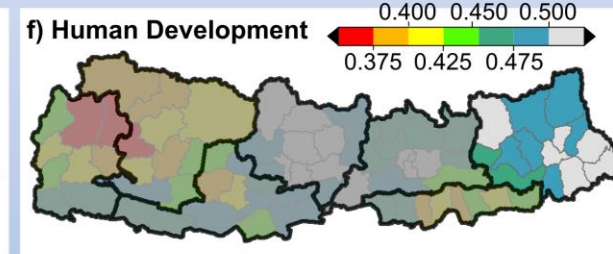
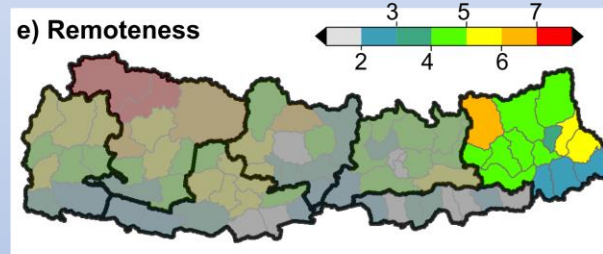
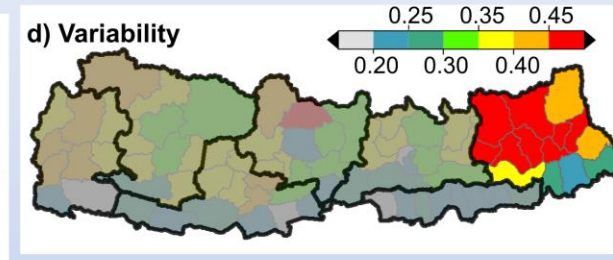
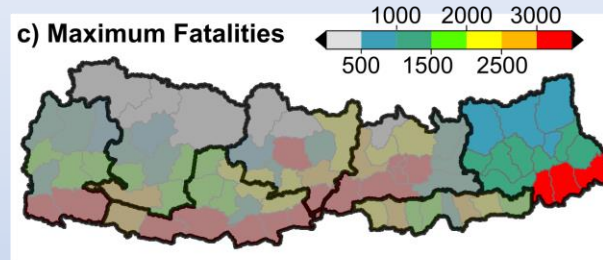
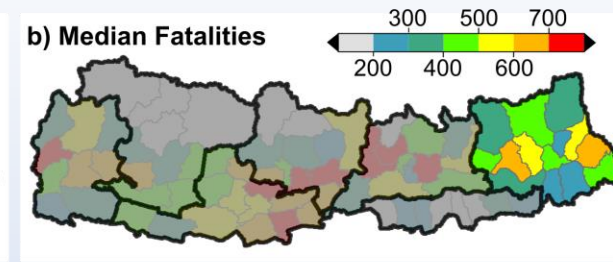
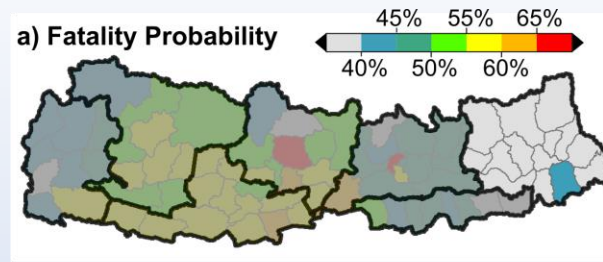
## Building Damage:

Likelihood: 50%

Average: 24,000

**Worst-case: 79,000**

Variability: 0.423 - Max





# Province 2

Fatalities:

**Likelihood:** 59%

**Average:** 800

**Worst-case:** 17,000

**Variability:** 0.176 - Avg

Injuries:

**Likelihood:** 89%

**Average:** 3,000

**Worst-case:** 89,000

**Variability:** 0.165 - Avg

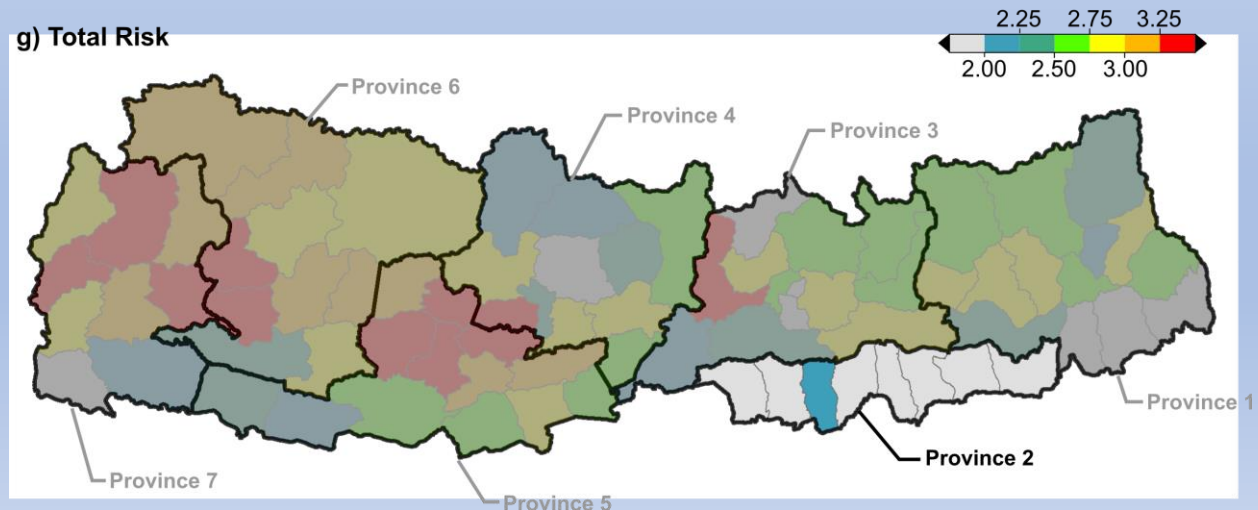
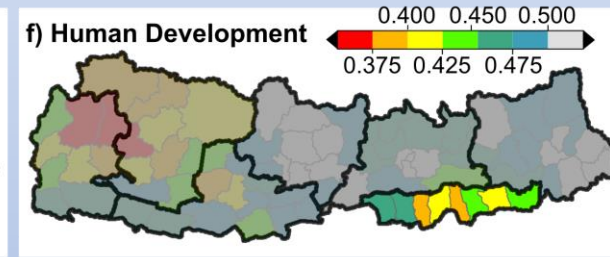
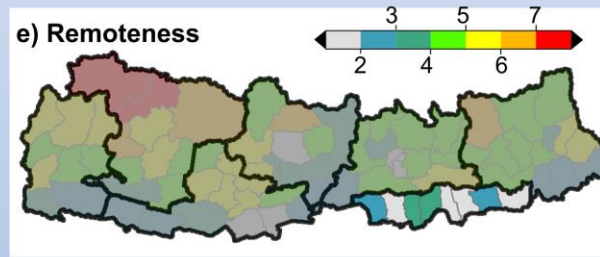
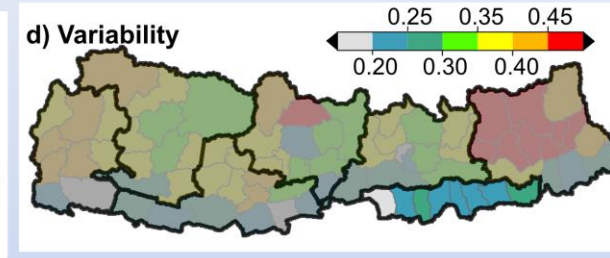
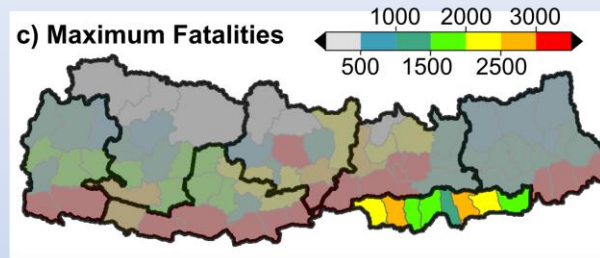
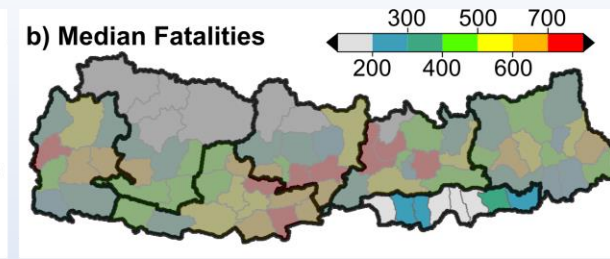
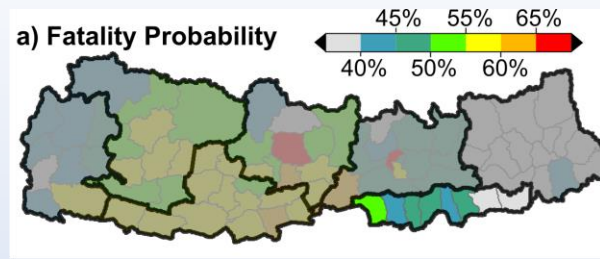
Building Damage:

**Likelihood:** 70%

**Average:** 3,000

**Worst-case:** 39,000

**Variability:** 0.231 - Avg



# Province 3

## Fatalities:

Likelihood: 72%

**Average: 3,000**

Worst-case: 58,000

Variability: 0.205 - Avg

## Injuries:

Likelihood: 92%

**Average: 10,000**

Worst-case: 274,000

Variability: 0.217 - Avg

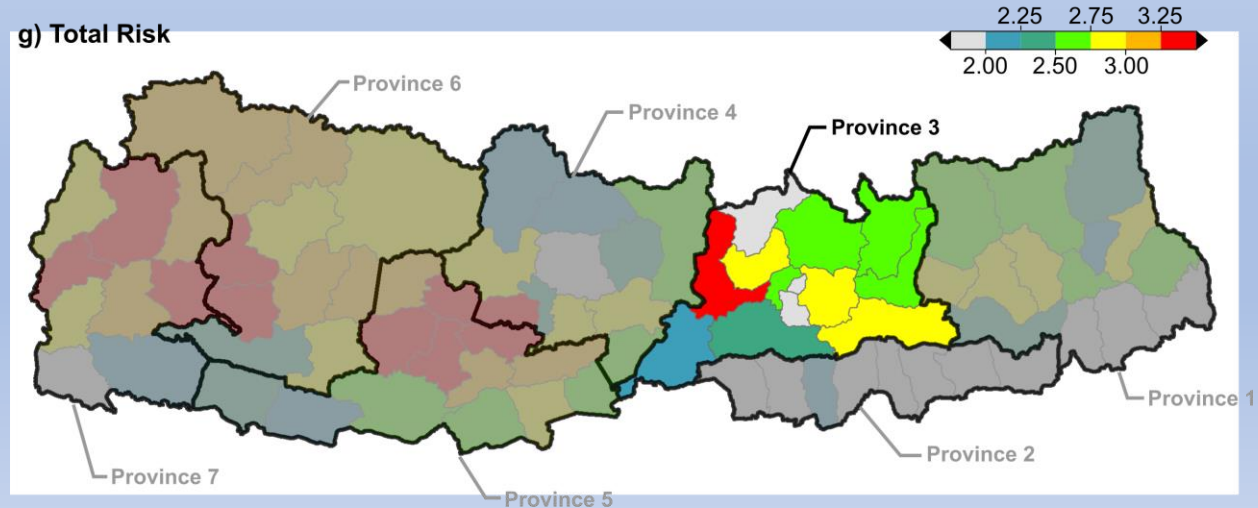
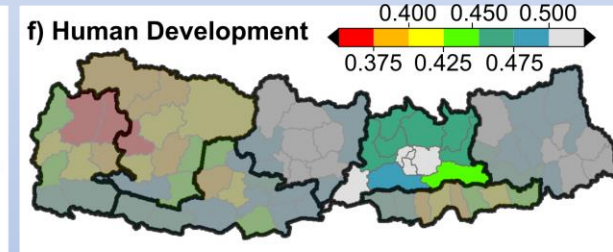
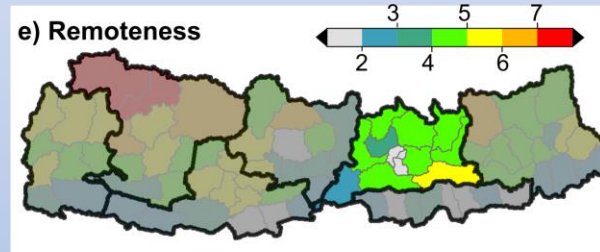
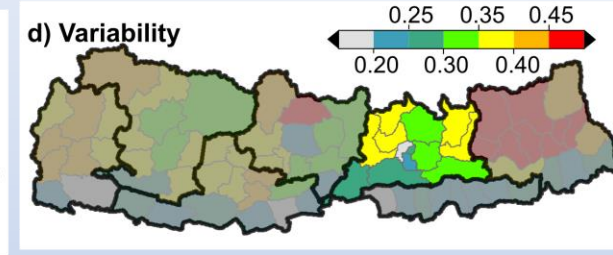
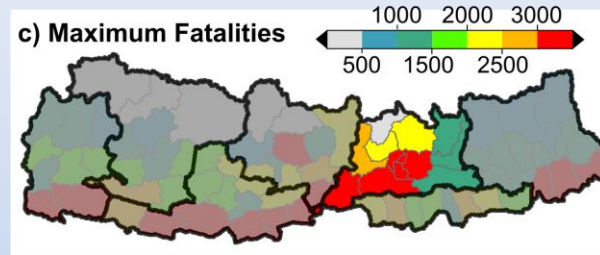
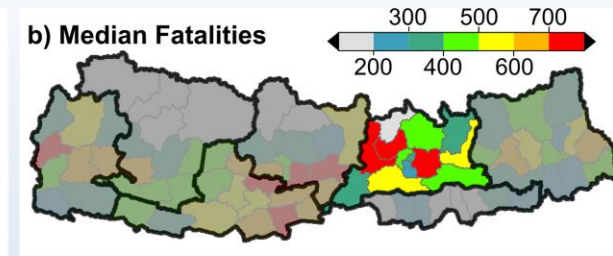
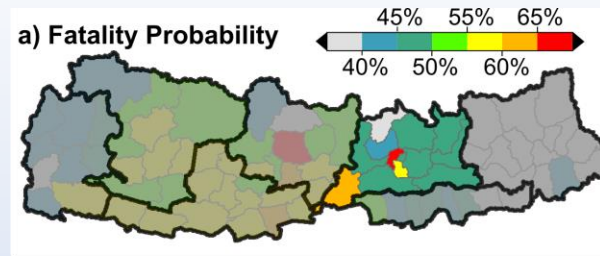
## Building Damage:

Likelihood: 77%

**Average: 11,000**

Worst-case: 172,000

Variability: 0.289 - Avg





# Province 4

## Fatalities:

**Likelihood:** 84%

**Average:** 1,400

**Worst-case:** 20,000

**Variability:** 0.222 - Avg

## Injuries:

**Likelihood:** 97%

**Average:** 8,000

**Worst-case:** 122,000

**Variability:** 0.249 - Avg

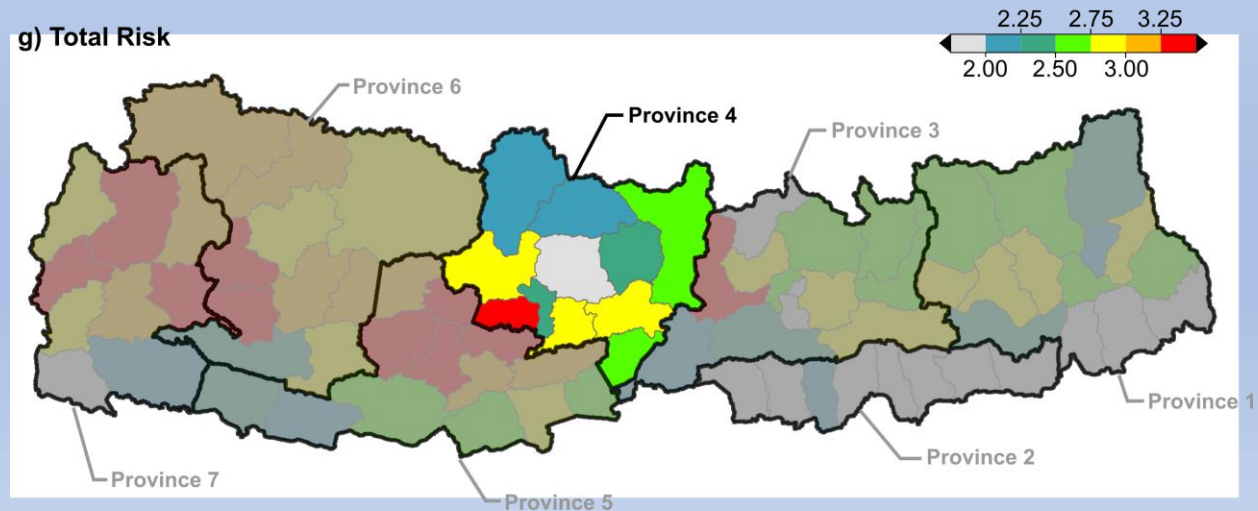
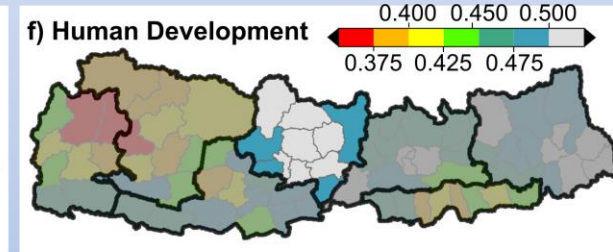
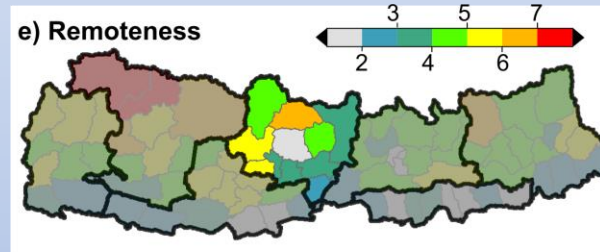
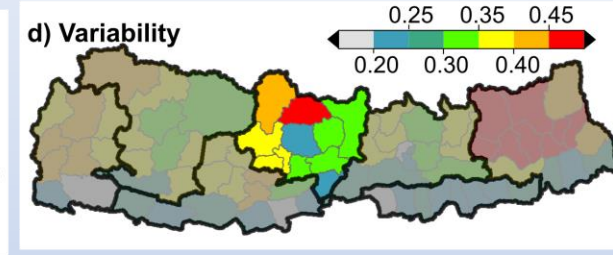
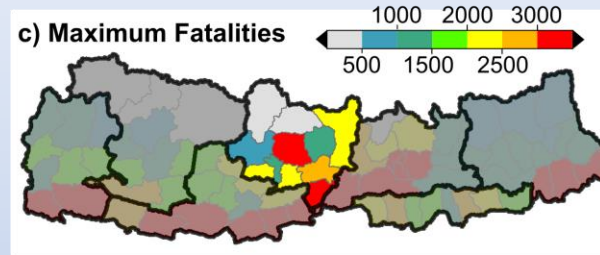
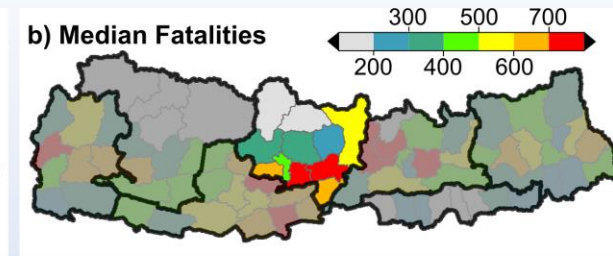
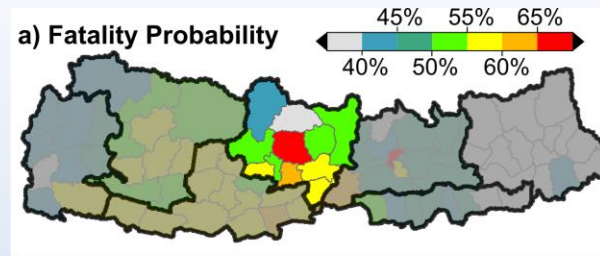
## Building Damage:

**Likelihood:** 87%

**Average:** 11,000

**Worst-case:** 79,000

**Variability:** 0.319 - Avg





# Province 5

## Fatalities:

Likelihood: 77%

**Average: 4,500**

Worst-case: 35,000

Variability: 0.218 - Avg

## Injuries:

Likelihood: 96%

**Average: 25,000**

Worst-case: 202,000

Variability: 0.236 - Avg

## Building Damage:

Likelihood: 87%

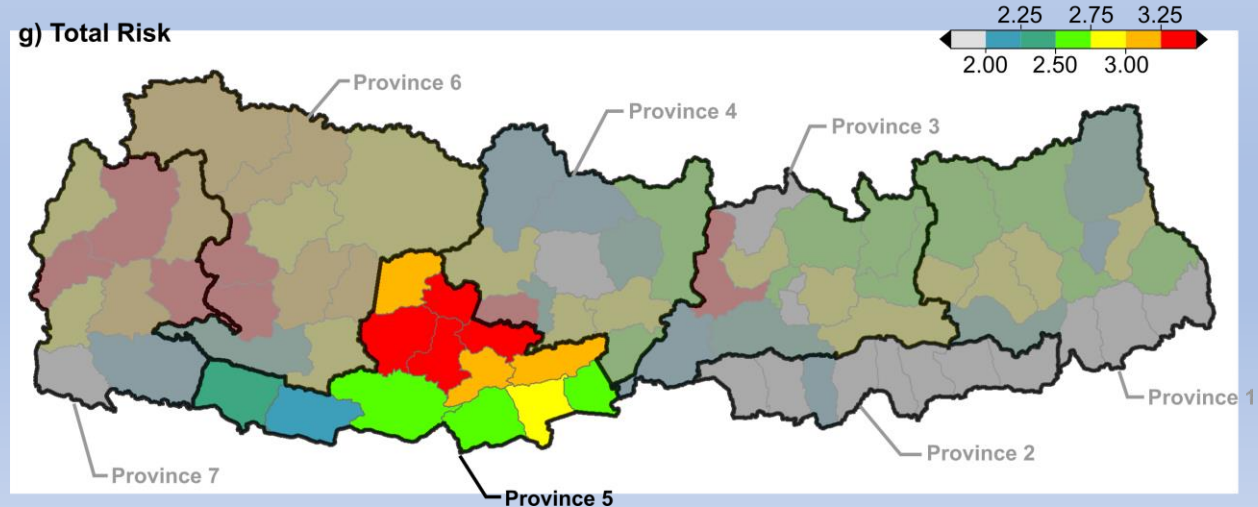
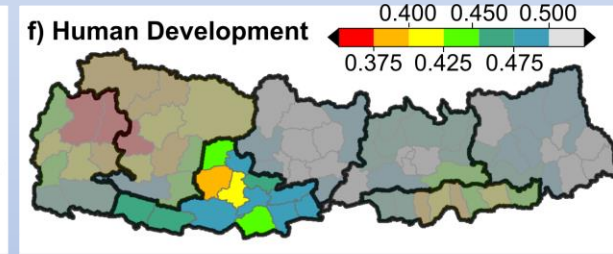
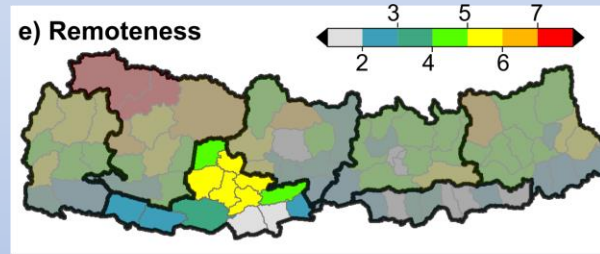
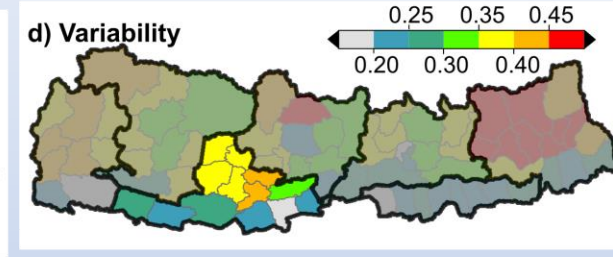
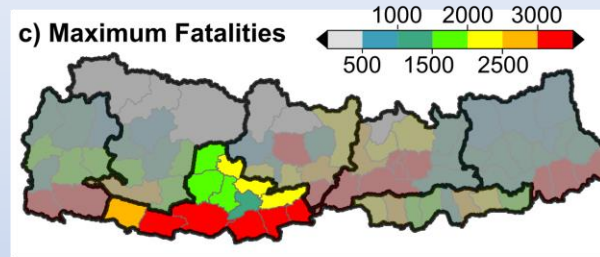
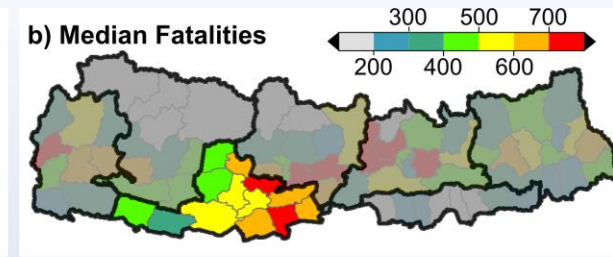
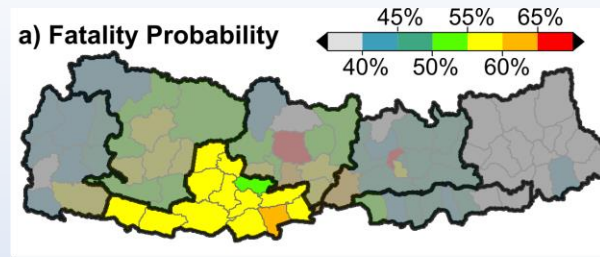
**Average: 17,000**

Worst-case: 107,000

Variability: 0.308 - Avg

\* Worst-case in hills – 44,000

\* Average in terai – 3,000



# Province 6

## Fatalities:

**Likelihood:** 64%

**Average:** 2,200

**Worst-case:** 11,000

**Variability:** 0.288 - Avg

## Injuries:

**Likelihood:** 82%

**Average:** 11,000

**Worst-case:** 84,000

**Variability:** 0.278 - Avg

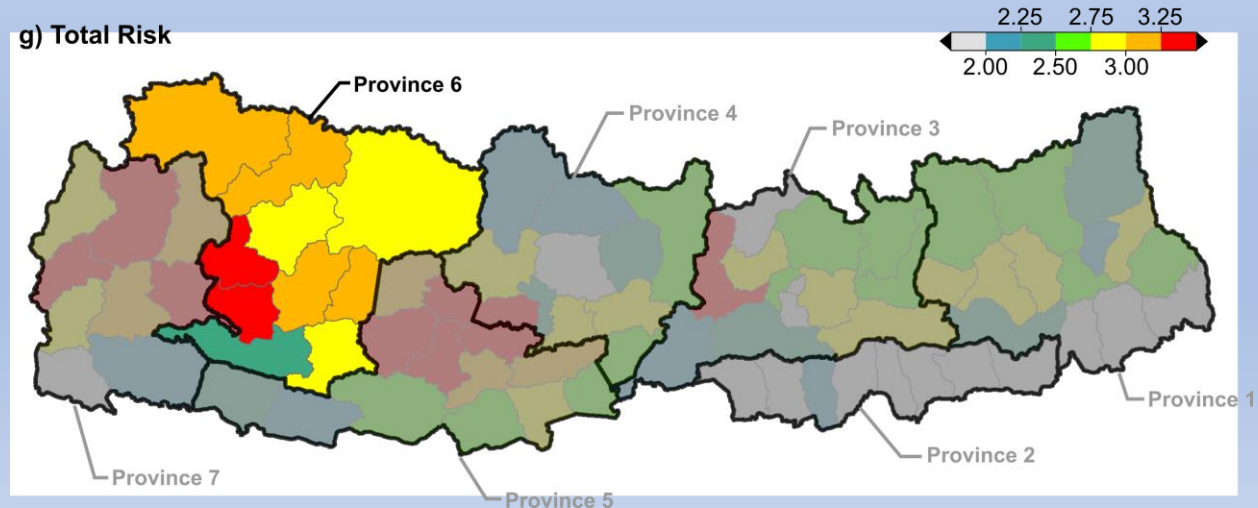
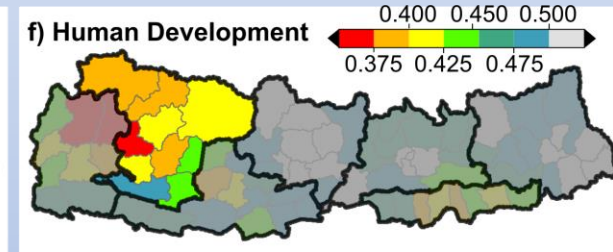
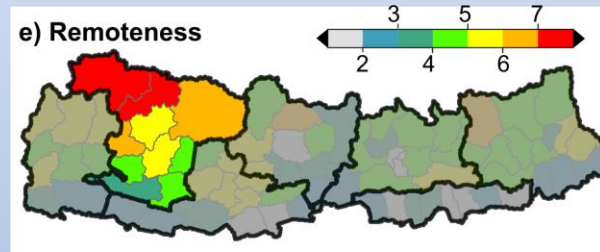
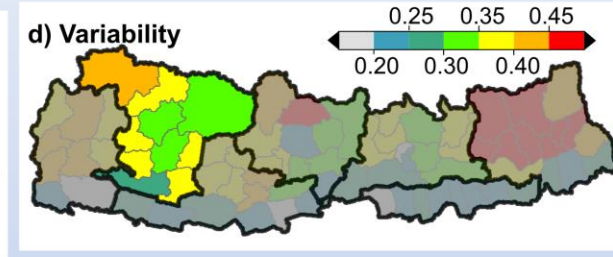
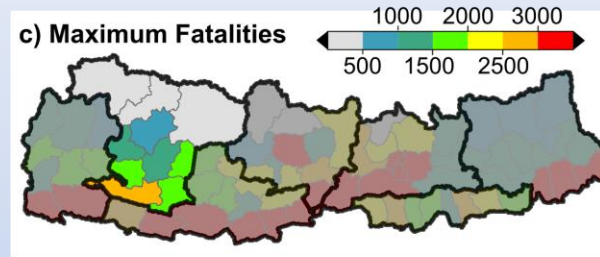
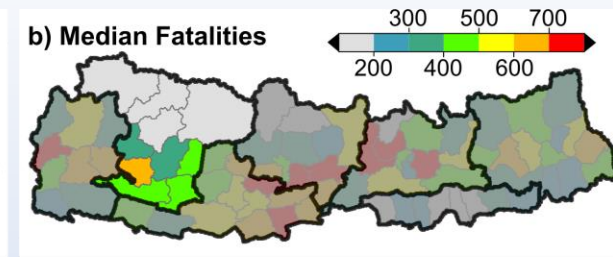
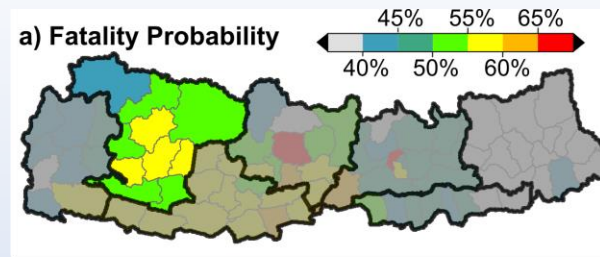
## Building Damage:

**Likelihood:** 70%

**Average:** 10,000

**Worst-case:** 42,000

**Variability:** 0.388 - Max





# Province 7

## Fatalities:

**Likelihood:** 61%

**Average:** 2,000

**Worst-case:** 17,000

**Variability:** 0.250 - Avg

## Injuries:

**Likelihood:** 80%

**Average:** 6,000

**Worst-case:** 109,000

**Variability:** 0.253 - Avg

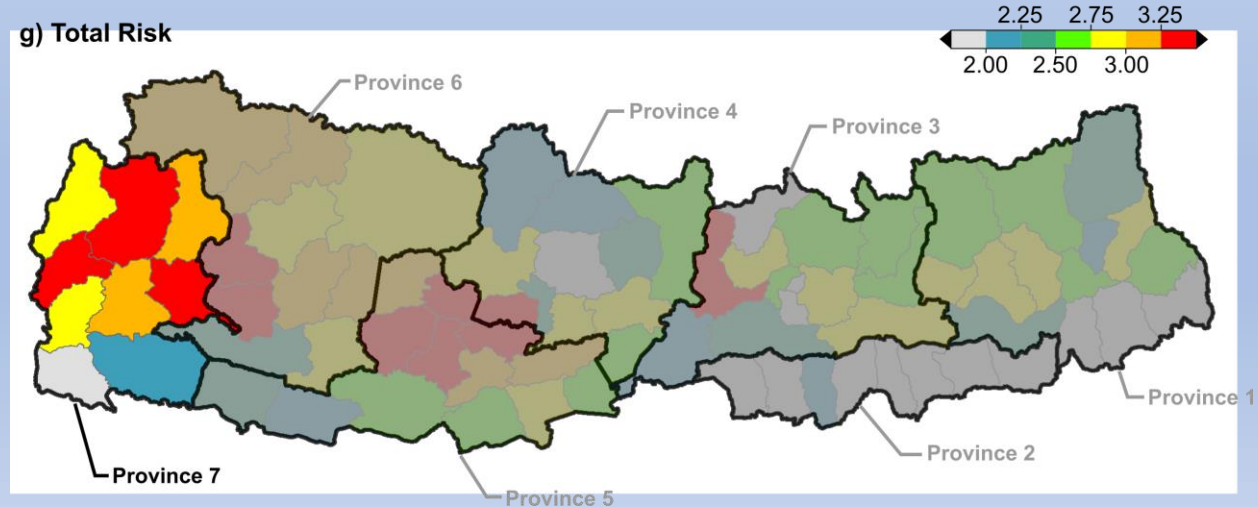
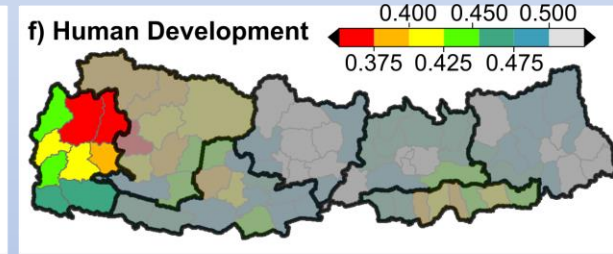
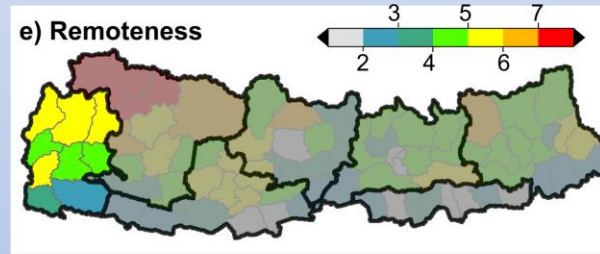
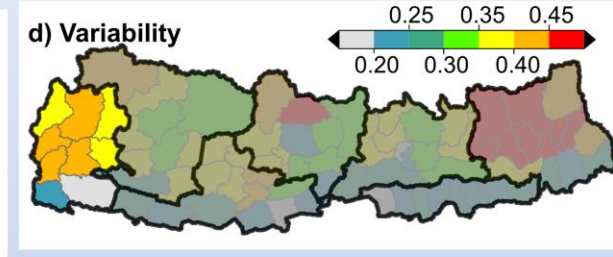
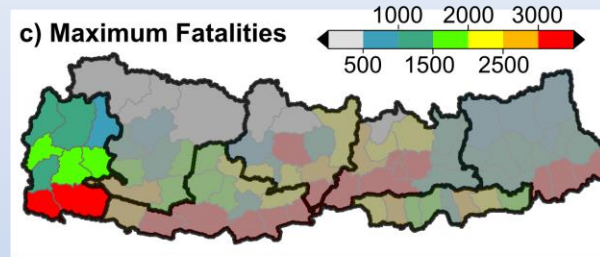
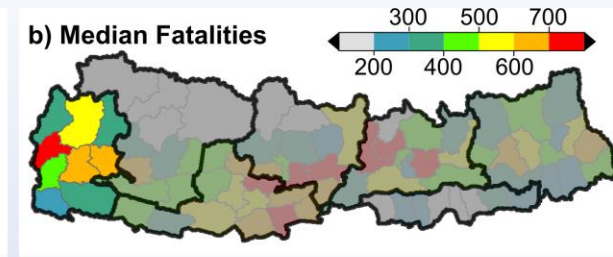
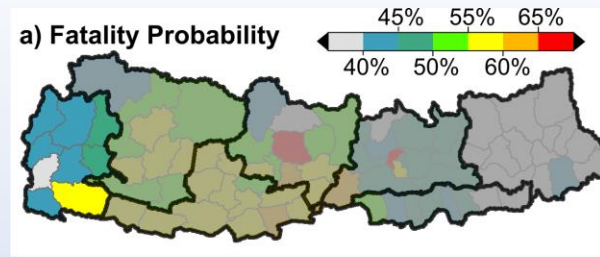
## Building Damage:

**Likelihood:** 63%

**Average:** 10,000

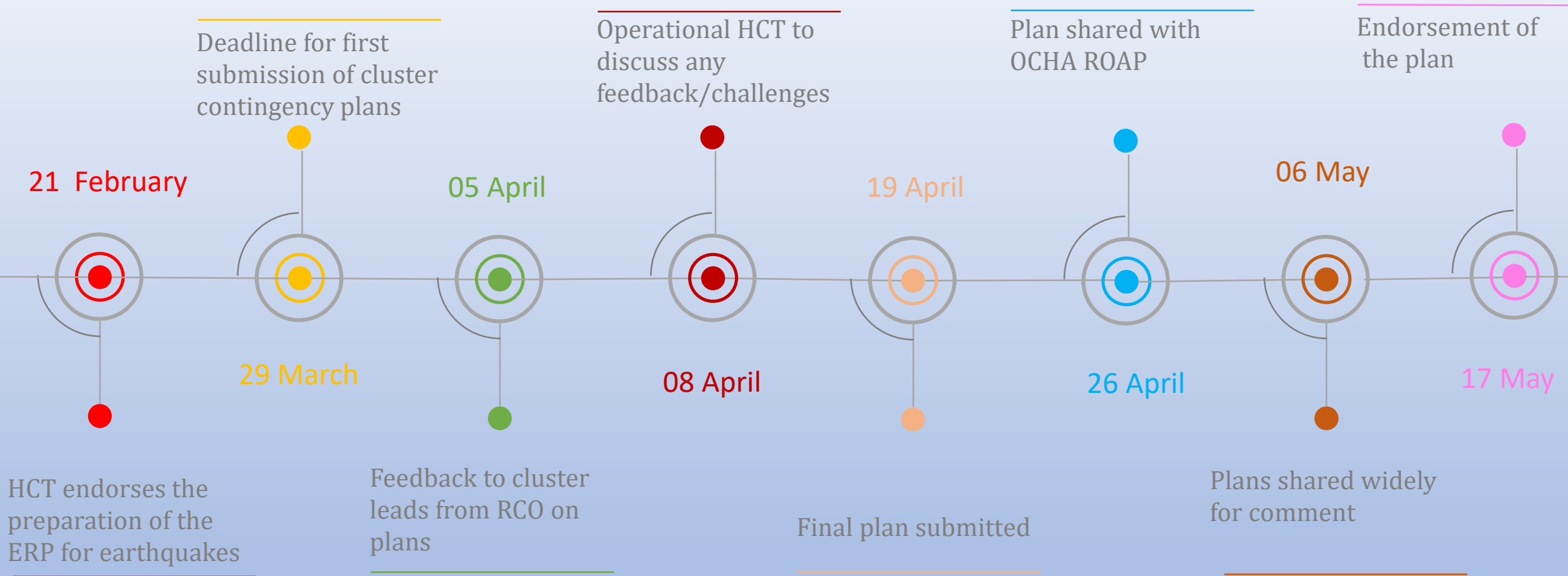
**Worst-case:** 53,000

**Variability:** 0.376 - Max

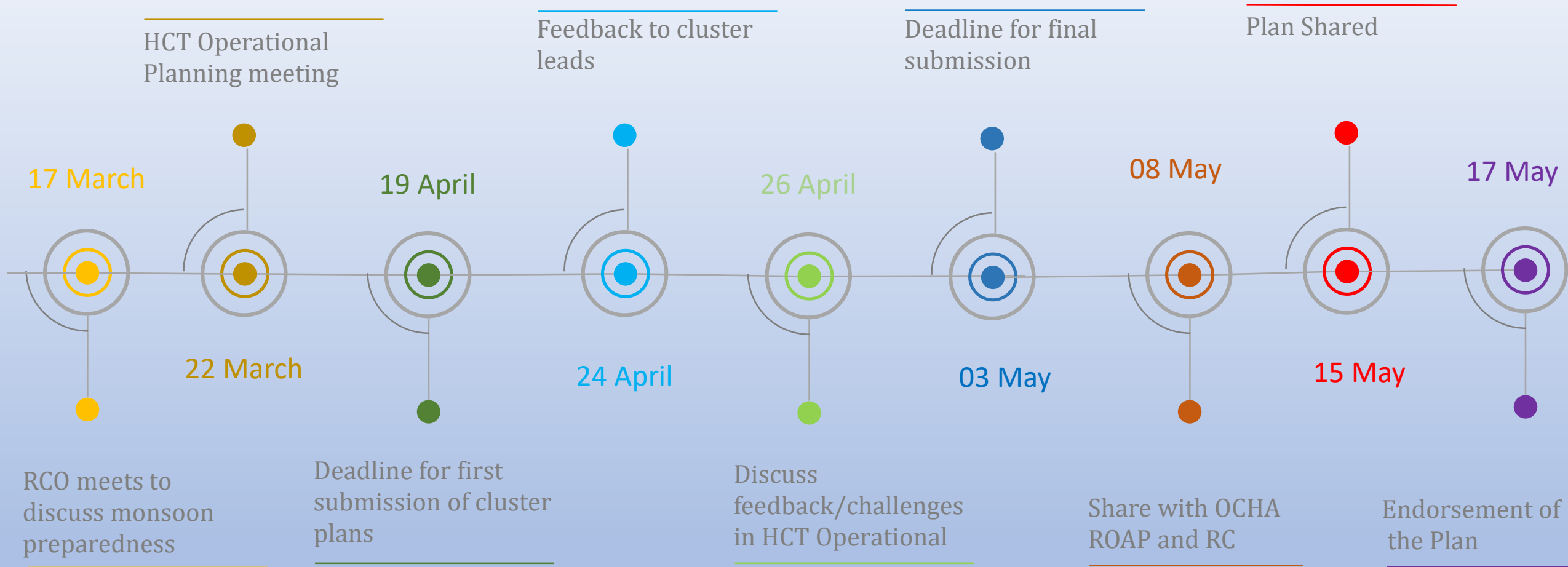




# Emergency Response Preparedness Schedule (Earthquake)



# Emergency Response Preparedness Schedule (Flood)



## CLUSTERS FOR EMERGENCY





## Country: Disaster Type Contingency Plan (Month-Month Year)

Key Planning  
Figures

**xxx,000**

People  
affected

**xxx,000**

people  
displaced

**XX**

districts/areas  
affected

**xxx,000**

deaths

**xxx,000**

injured

**xxx,000**

houses  
destroyed

### MAP TITLE

### SCENARIO OVERVIEW

Every year, between June and September, flooding in the Terai warrants for increased preparedness by the Government and the Humanitarian Country Team (HCT). To optimize the speed and volume of critical assistance, the HCT has developed a contingency plan to 1) Reach a common understanding of the flood risk and how to monitor potential flooding in the Terai to ensure early action is taken when required; 2) Establish a minimum level of multi-hazard preparedness across core clusters; and to 3) Build the basis for a joint HCT response strategy to meet the needs of affected people in the first 30 days of a humanitarian emergency

### PLANNING ASSUMPTIONS

- |            |          |
|------------|----------|
| i. xxxxx   | iv. xxxx |
| ii. Xxxxx  | v. xxxx  |
| iii. xxxxx |          |

### RESPONSE OBJECTIVES

- |   |           |
|---|-----------|
| i. Alleviate human suffering by providing ..... | iv. xxxxx |
| ii. Facilitate .....                            | v. xxxx   |
| iii. Strengthen .....                           |           |

### Affected areas

XXX, XXX, XXX,

XXX, XXX, XXX

STANDARD OPERATING PROCEDURES

Early Warning/Preparedness		
Phase	Procedure	Lead
-5		RCO
-4		Gov
-3		RC
-2		OCHA
-1		UN



Response – First 24 hours		
Phase	Procedure	Lead
+3		RCO
+6		Gov
+12		OCHA
+24		All

Response from first day onwards		
Phase	Procedure	Lead
D1		RCO
D2		Gov
D3		xxx
D4		xxx
D5		
D6		
W1		
W2		
W3		
M1		
M3		
M6		

RESPONSE BY SECTOR



**WATER SANITATION AND HYGIENE**

Government Lead: Ministry of ..

Sector Lead: AGENCY/NAME/EMAIL

Members: AGENCY NAME, AGENCY NAME

**Priority Preparedness**

**Activities**

- Strengthen..
- ..
- Develop....
- Support....

**Priority Response**

**Activities**

- Strengthen..
- ..
- Ensure....
- Address....



**EDUCATION**

Government Lead: Ministry of ..

Sector Lead: AGENCY/NAME/EMAIL

Members: AGENCY NAME, AGENCY NAME

**Priority Preparedness**

**Activities**

- Strengthen..
- ..
- Develop....
- Support....

**Priority Response**

**Activities**

- Strengthen..
- ..
- Ensure....
- Address....



**SHELTER**

Government Lead: Ministry of ..

Sector Lead: AGENCY/NAME/EMAIL

Members: AGENCY NAME, AGENCY NAME

**Priority Preparedness**

**Activities**

- Strengthen..
- ..
- Develop....
- Support....

**Priority Response**

**Activities**

- Strengthen..
- ..
- Ensure....
- Address....

RESPONSE BY SECTOR



HEALTH

Government Lead: Ministry of ..

Sector Lead: AGENCY/NAME/EMAIL

Members: AGENCY NAME, AGENCY NAME

Priority Preparedness

Activities

- Strengthen..
- ..
- Develop....
- Support....

Priority Response

Activities

- Strengthen..
- ..
- Ensure....
- Address....



FOOD SECURITY

Government Lead: Ministry of ..

Sector Lead: AGENCY/NAME/EMAIL

Members: AGENCY NAME, AGENCY NAME

Priority Preparedness

Activities

- Strengthen..
- ..
- Develop....
- Support....

Priority Response

Activities

- Strengthen..
- ..
- Ensure....
- Address....



PROTECTION

Government Lead: Ministry of ..

Sector Lead: AGENCY/NAME/EMAIL

Members: AGENCY NAME, AGENCY NAME

Priority Preparedness

Activities

- Strengthen..
- ..
- Develop....
- Support....

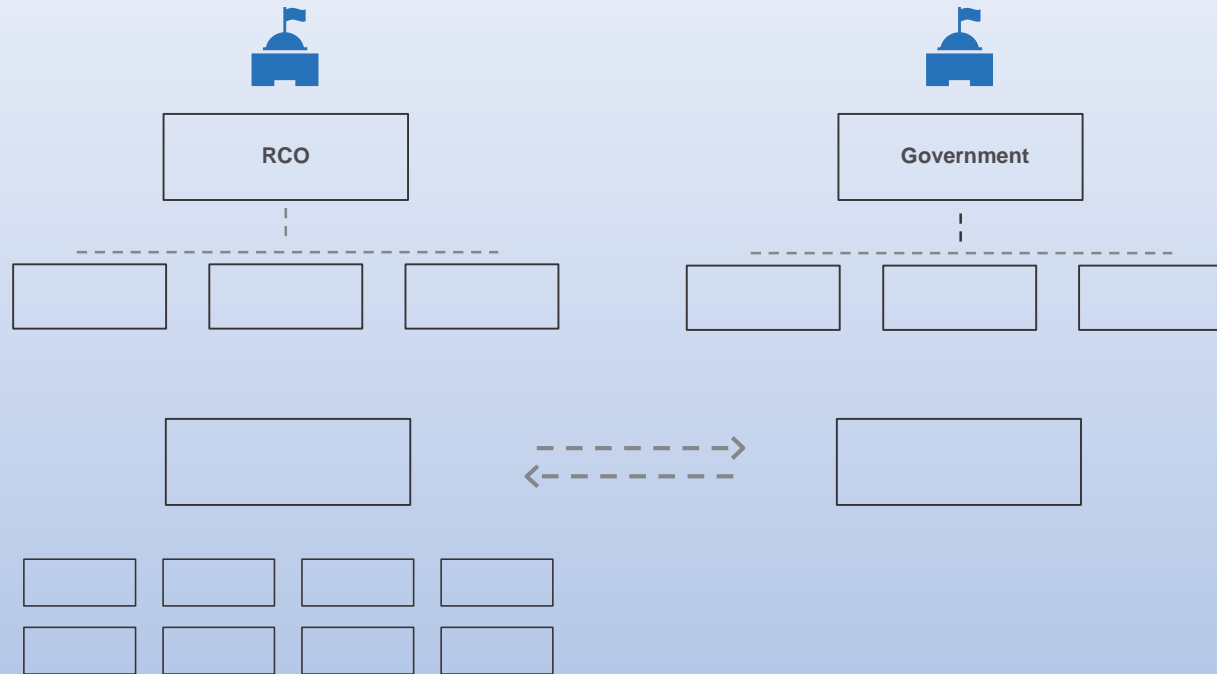
Priority Response

Activities

- Strengthen..
- ..
- Ensure....
- Address....



COORDINATION STRUCTURE



Alignment of emergency sectors and government functions

KEY CONTACTS

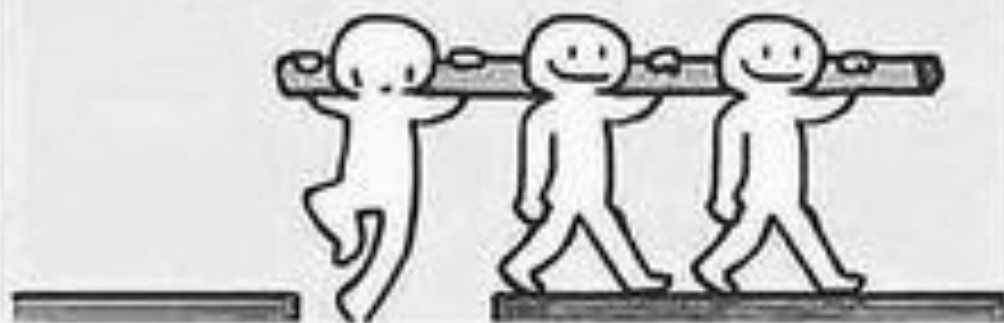
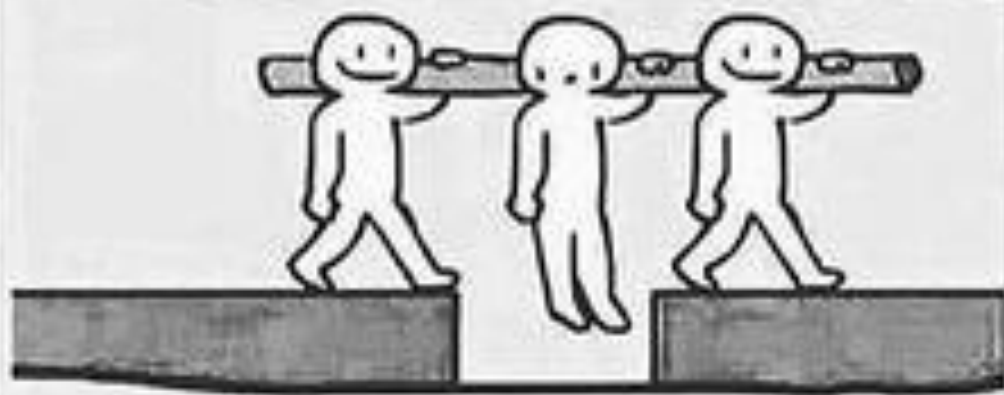
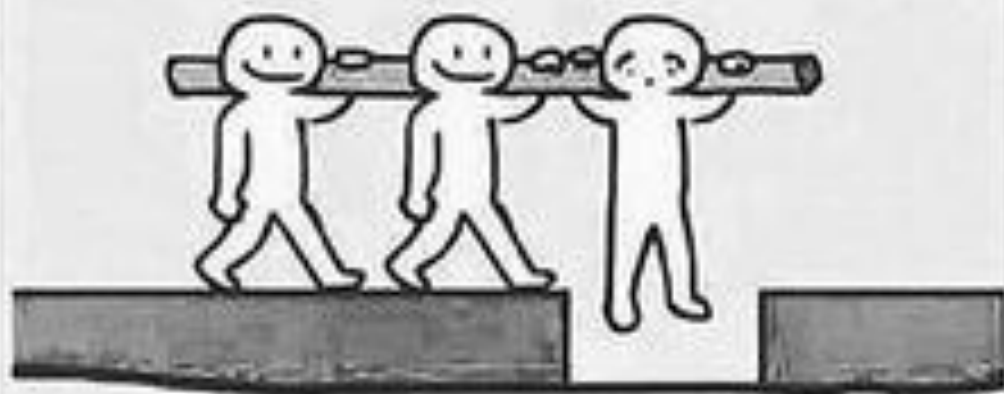
Office of the Resident Coordinator (RCO)  
xxx, UN Resident Coordinator (RC)  
[xxx@one.un.org](mailto:xxx@one.un.org), +xxx xxx 1000

National Disaster Management Centre  
xxx, Deputy Minister for  
[xxx xxx@.gov](mailto:xxx xxx@.gov), +xxx xxx 1000

UN Regional Office for Asia and the Pacific  
Mr. Markus Werne, Head of Office  
[xxx@un.org](mailto:xxx@un.org), +66 xxx xxx xxx

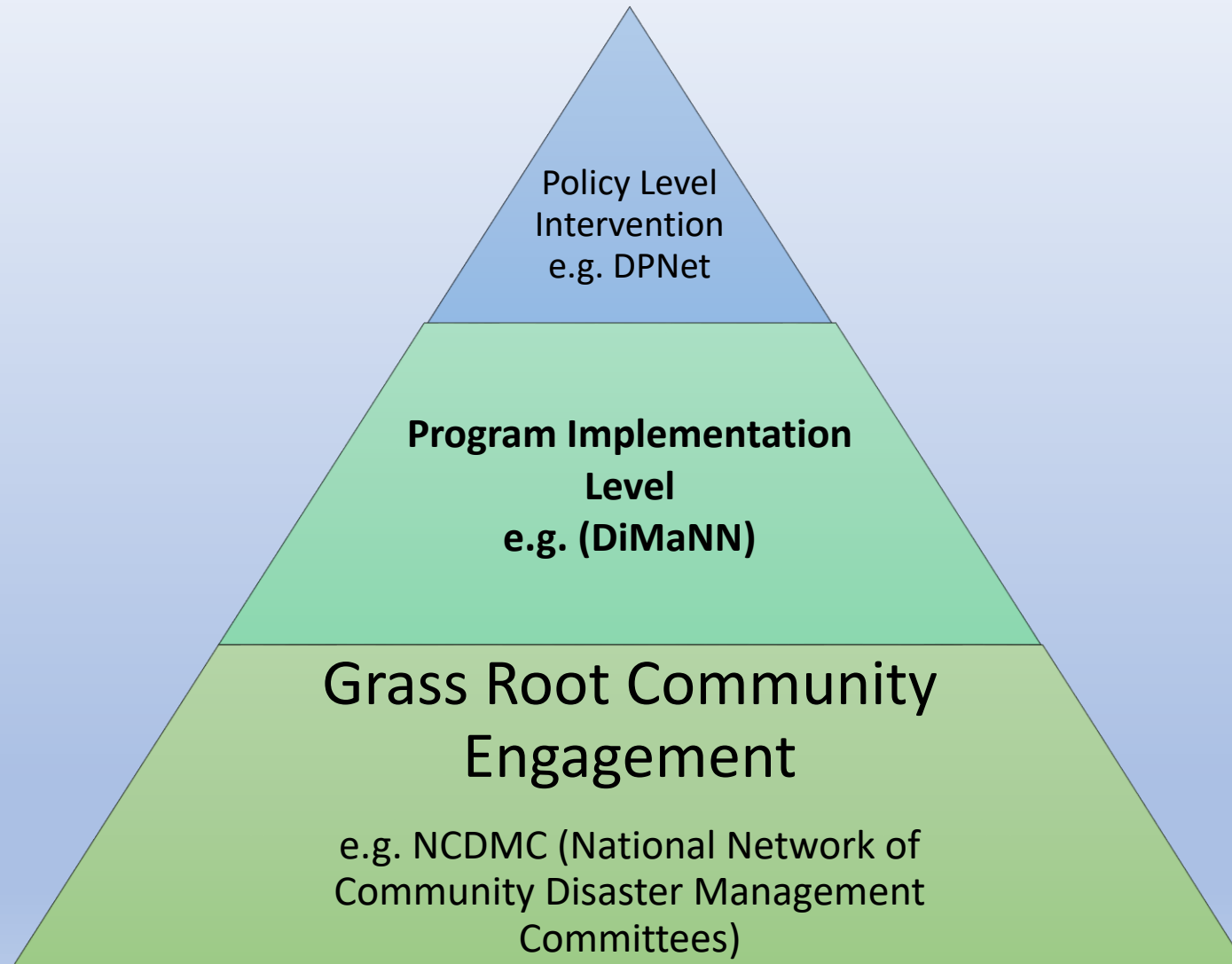
Need of Collaboration and Partnership  
with National Level DM Network

**If we unite nobody falls**

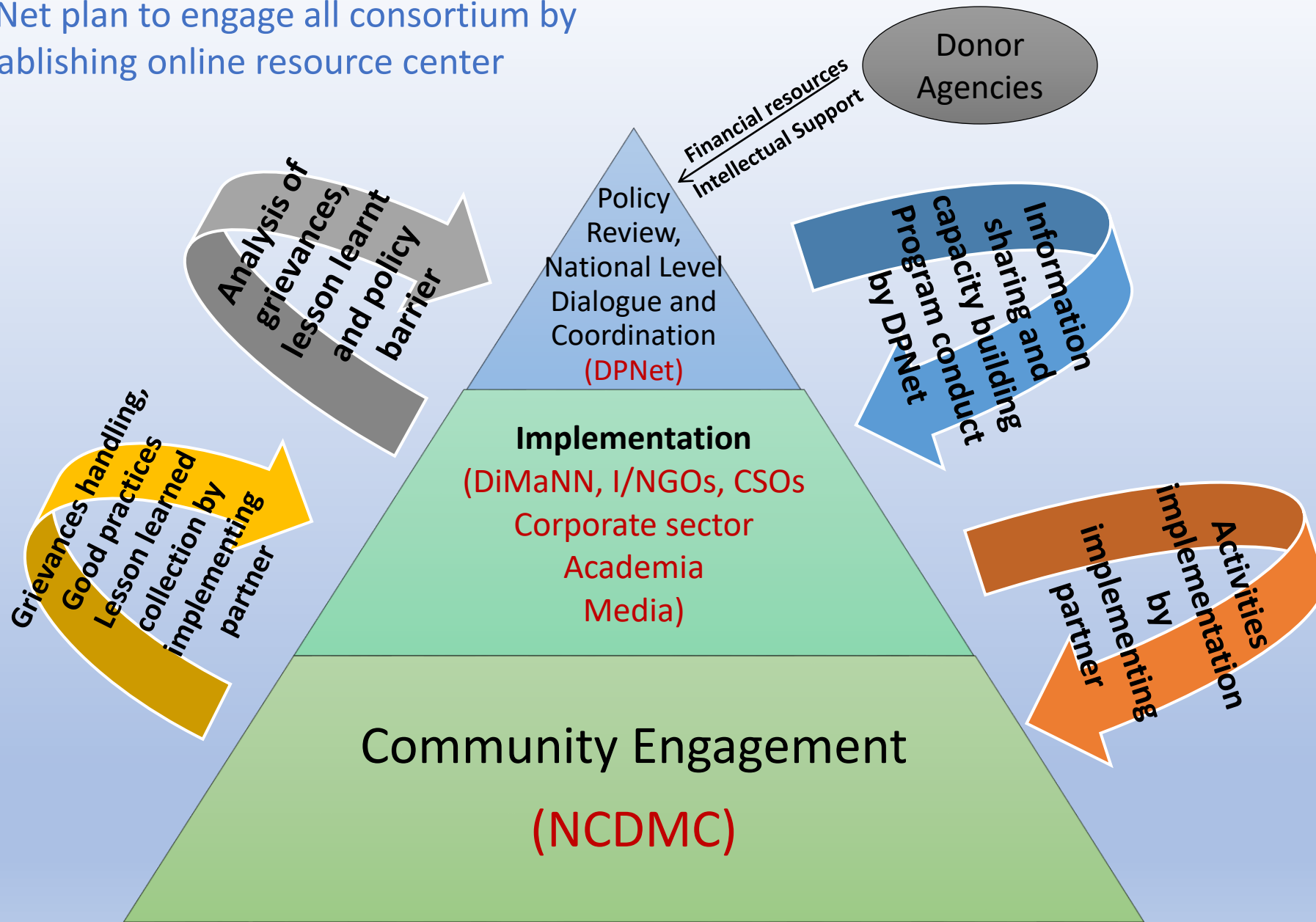




# Example of Existing Consortium on DRRM



DPNet plan to engage all consortium by establishing online resource center



**Thank you!**