

Climate change impacts on livelihood vulnerability
assessment-Adaptation and mitigation options in marine
hot spots in Kerala, India

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Introduction

- **Vulnerability** : The degree to which a system is susceptible to, or unable to cope with, adverse effect of climate change, including climate variability and extremes

- **Objective**

To assess the overall vulnerability of fishery based livelihood due to the impact of climate variation

Study Area

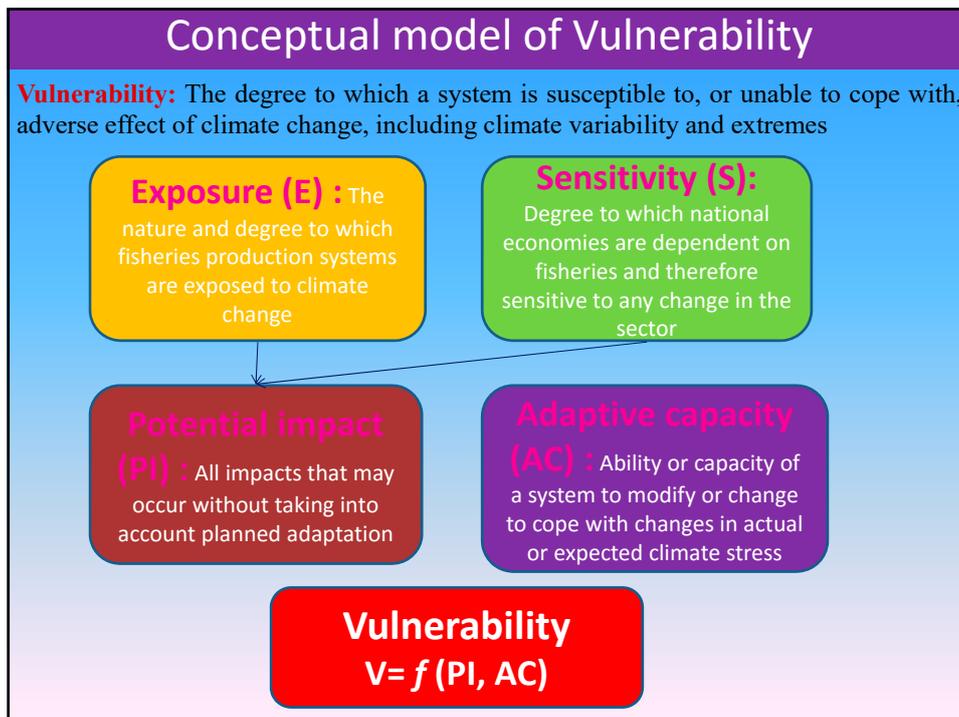
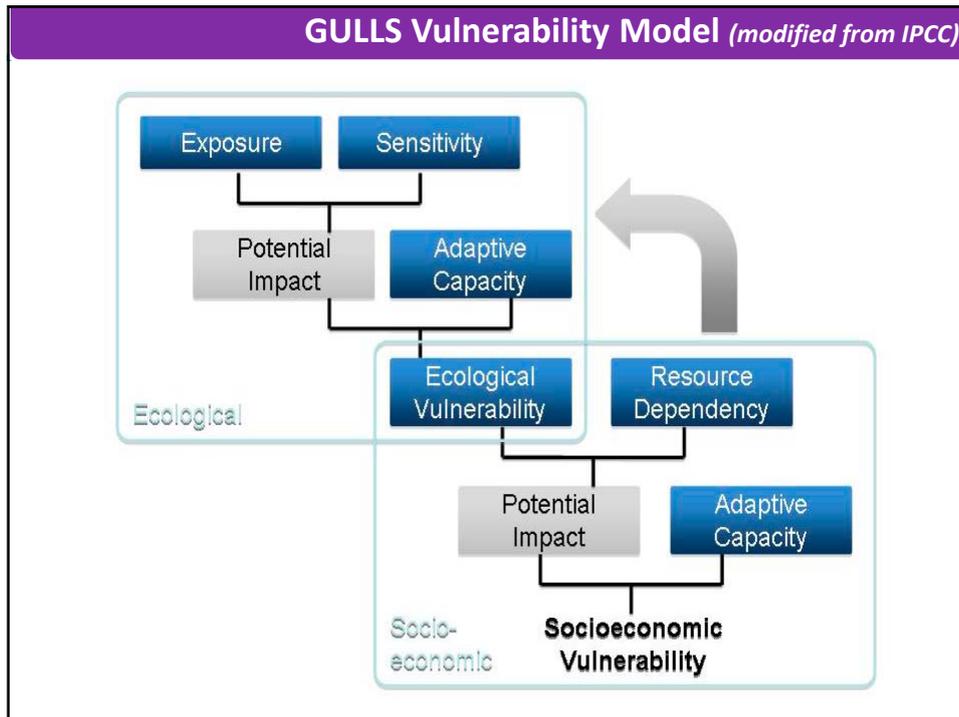
Kerala

- Poonthura (8°29'N and 76°59' E)
- Elamkunnappuzha (10° 00' N and 76° 15' E)



Climate change Hotspots in South Kerala - Rationale

- Southern India is situated in regions that are predicted to warm substantially faster than the global average
- Kerala has extensive system of backwaters
- Falls within the upwelling ecosystem of the south-west coast.
- Has rich biodiversity and supports substantial marine and estuarine fisheries
- Identified as major spawning gyre of many pelagic species based on fish and larval surveys



Materials and method

- Sample size: 800
- Analysed vulnerability of fishery-based livelihoods to climate variability and change using a combination of composite index and qualitative methods.
- The vulnerability indices were computed for the data set
- Normalized to 0 and 1 using the Patnaik and Narain method (2005)

$$x_{ij} = \frac{X_{ij} - \min_i \{X_{ij}\}}{\max_i \{X_{ij}\} - \min_i \{X_{ij}\}}$$

if ↑ relationship with vulnerability

$$y_{ij} = \frac{\max_i \{X_{ij}\} - X_{ij}}{\max_i \{X_{ij}\} - \min_i \{X_{ij}\}}$$

if ↓ relationship with vulnerability

- The data analysis was done using the common scoring framework and analysis method (1-4 scale)

Factors	Indicators
Sensitivity (S): 42 indicators	Social dependence on fishing
	Economic dependence on fishing
	Economic dependence on other resources
	Historical and Cultural dependence on fishing
Exposure (E) : 36 indicators	Environmental Change
	Personal Exposure
	Storms
	Floods
	Droughts
	Shoreline changes
Adaptive Capacity (AC): 126 indicators	Flexibility
	Social dependence
	Economic dependence
	Historical and cultural dependence
	Social Capital
	Human Capital
	Financial capital
	Physical capital
	Natural capital
Adaptation options	

RESULTS

Percentage contribution of indicators to Vulnerability

Factors	Indicators	Elamkunnapuzha	Poonthura
EXPOSURE (E)	Attitude and perception	16.50	13.67
	Environmental change	12.53	15.72
	personal exposure	11.53	12.19
	storms	10.74	14.36
	flood	14.17	14.73
	drought	15.01	13.17
	shoreline change	19.52	16.16
SENSITIVITY (S)	Social dependence	23.64	21.95
	Economic dependence on fishing	23.52	22.98
	Economic dependence on other resources	29.80	31.42
	Historical and Cultural dependence	23.03	23.65
ADAPTIVE CAPACITY (AC)	Flexibility	12.94	13.30
	Social capital	14.49	15.07
	Human capital	16.35	15.82
	Financial capital	14.74	14.85
	Physical capital	13.88	14.05
	Natural capital	11.71	12.23
	Adaptation options	15.88	14.67

Coastal vulnerability Index of selected hotspots

Region	Exposure (E)	Sensitivity (S)	Adaptive capacity(AC)	Overall Vulnerability (E+S-AC)
Poonthura	2.80	2.57	2.52	2.85
Elamkunnapuzha	2.67	2.70	2.57	2.80

Fishermen vulnerability (%)

Category	Elamkunnapuzha	Poonthura
Low vulnerable	0	1
Moderately vulnerable	35	20
Highly vulnerable	64	62
Very highly vulnerable	2	17

Conclusion

- Adaptations to climate change should consider the multi specific nature of the coastal India's fisheries and the different biological and socioeconomic stressors that might affect them.
- Actions can be implemented at the local, regional, national, and international scale and both for short-and long-term.
- Efforts to reduce livelihood vulnerability in coastal fishing communities should be multidimensional so as to simultaneously tackle exposure, sensitivity, and adaptive capacity.

Thank you