

Evaluating the Inter-dependency among Different Adaptive Capacity Indicators of Cyclonic Hazard

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Abstract

Coastal area is a hub of diversified activities and functions that create or comes to the people as resources. At the same time, high population density makes them more vulnerable to climatic hazards. Bangladesh is one of the most vulnerable countries to the climate change issues especially for cyclone hazards. The coastal people of Bangladesh suffer from various types of cyclone and cyclonic surges every year. For assessing the inter-dependency among various indicators of adaptive capacity against vulnerability due to storm surge, a base hotspot map is prepared. Then each adaptive capacity indicator is changed and respective hotspot map is generated keeping other indicators unchanged. From this analysis it is found that there is complex relation among the indicators. Increasing one indicator value i.e. improving that indicator of adaptive capacity influences the importance of other indicators. But there is no linear relationship among them. Further study can be carried out for assessing the interdependency of the indicators.

Introduction

- Bangladesh coast is one of the most vulnerable to natural hazards like storm surge, river bank erosion, fluvio-tidal flood, salinization.
- Socio-economic factors that increases vulnerability are high population growth rate, population density, poverty level, lower literacy rate etc.

- Exposure indicators are population density, water supply, number of household. Sensitivity indicators are proportion of crop land, social dependency and type of household. Adaptive capacity indicators are road density, literacy rate, cropping intensity and cyclone shelter.

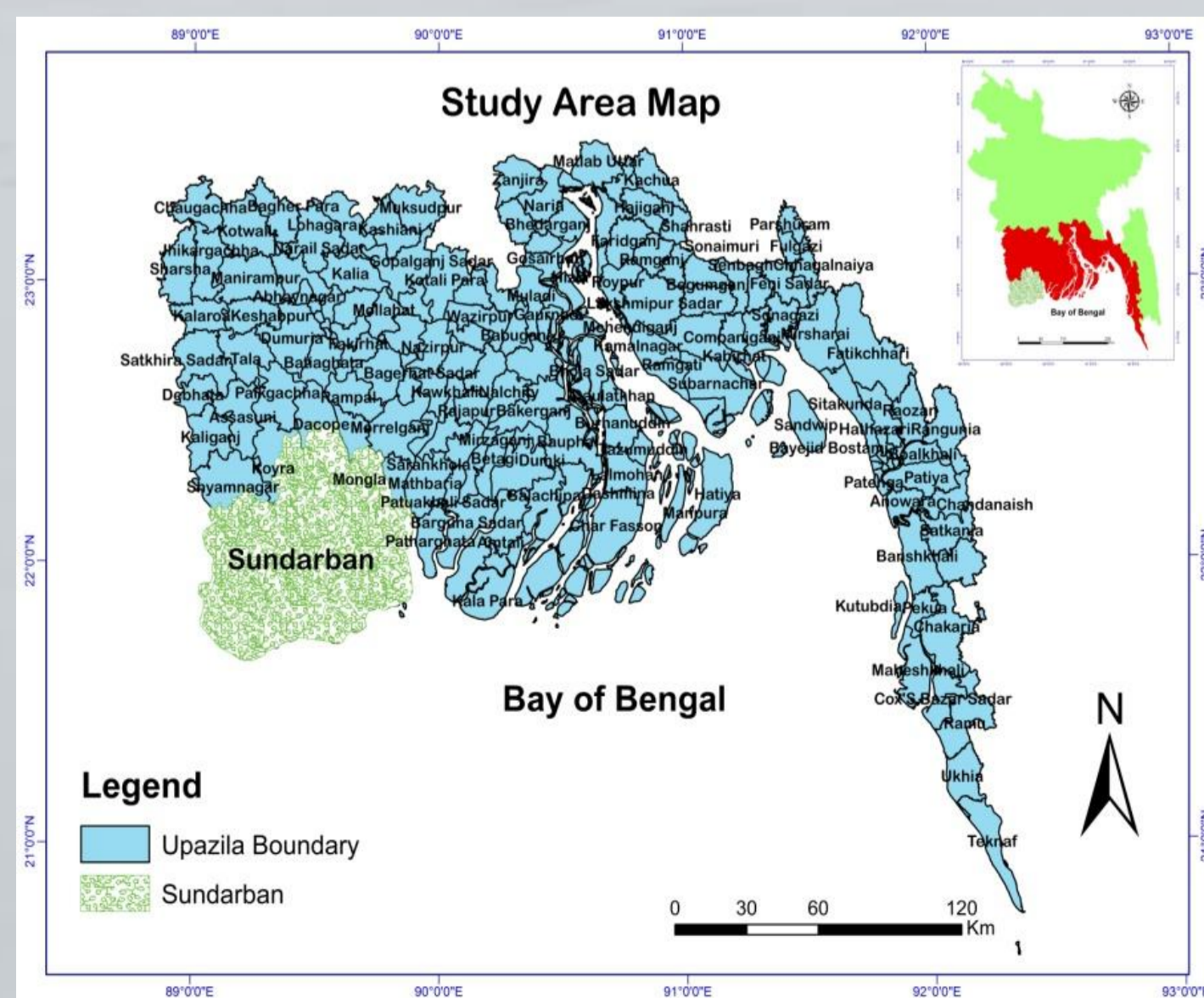


Figure 1: Study area

Methodology

$$\text{Vulnerability} = \text{Exposure} + \text{Sensitivity} - \text{Adaptive Capacity}$$

Four different hotspot maps for four different adaptive capacities

$$\text{Hotspot} = \text{Probability} * \text{Hazard} * \text{Vulnerability}$$

Table 1: Different cases for hotspot map

Different Cases	Changed Indicator (other indicators remained unchanged)
Case 1	Road Density
Case 2	Literacy Rate
Case 3	Cropping Intensity
Case 4	Cyclone Shelter

Results

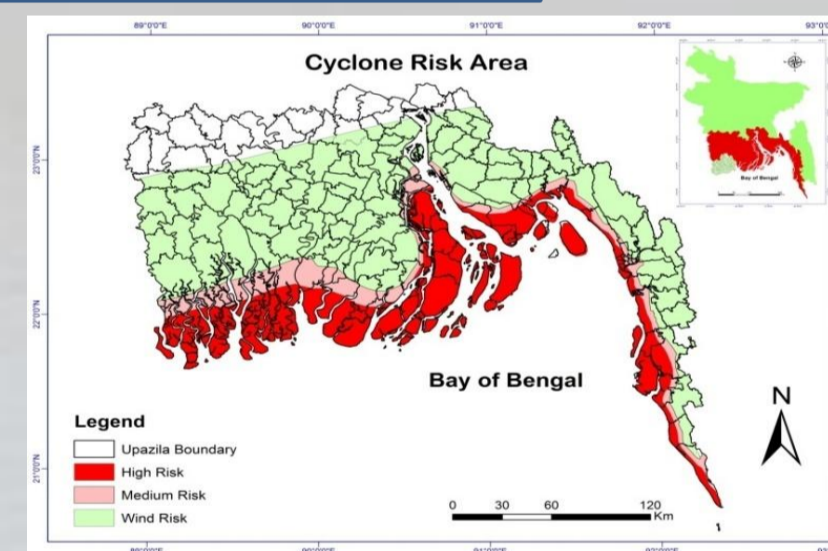


Figure 2: Cyclone risk area

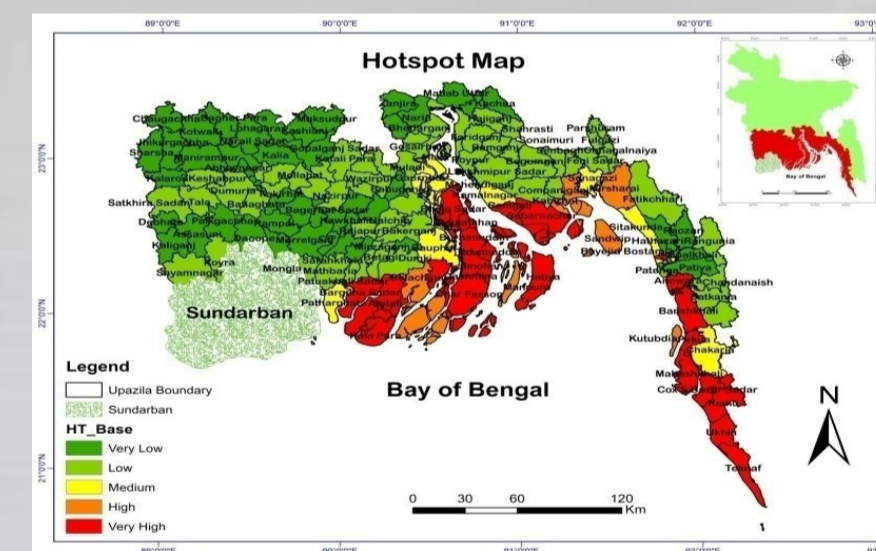


Figure 3: Hotspot Base Map

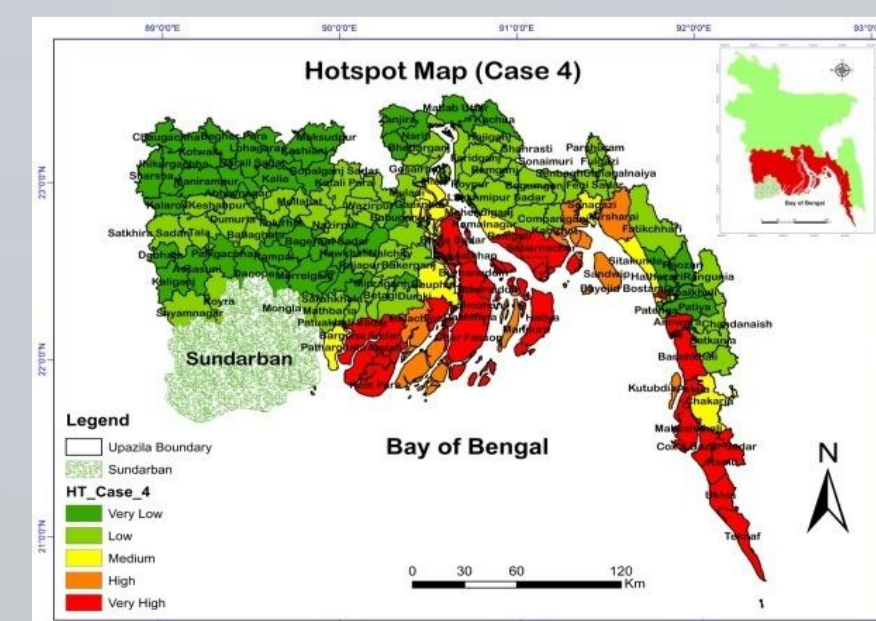
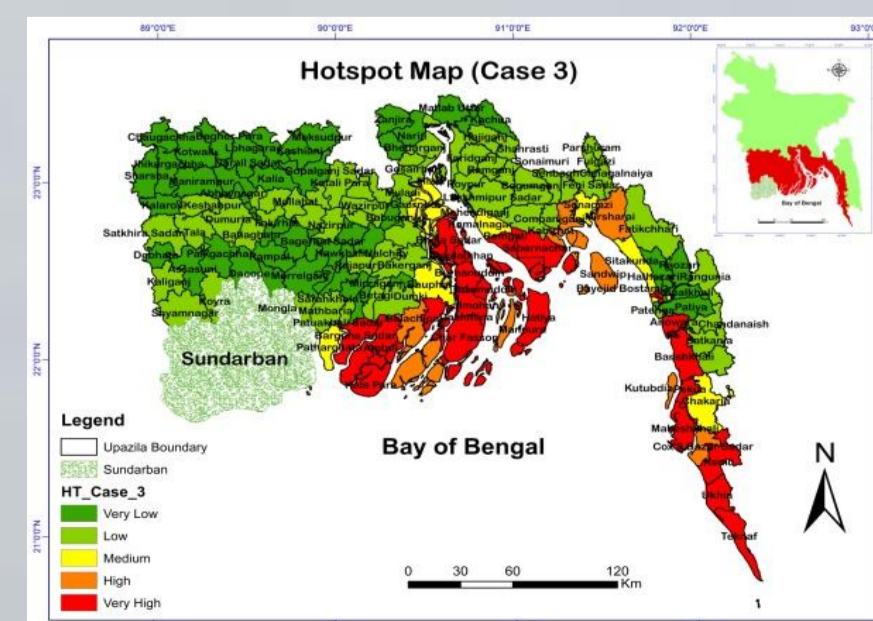
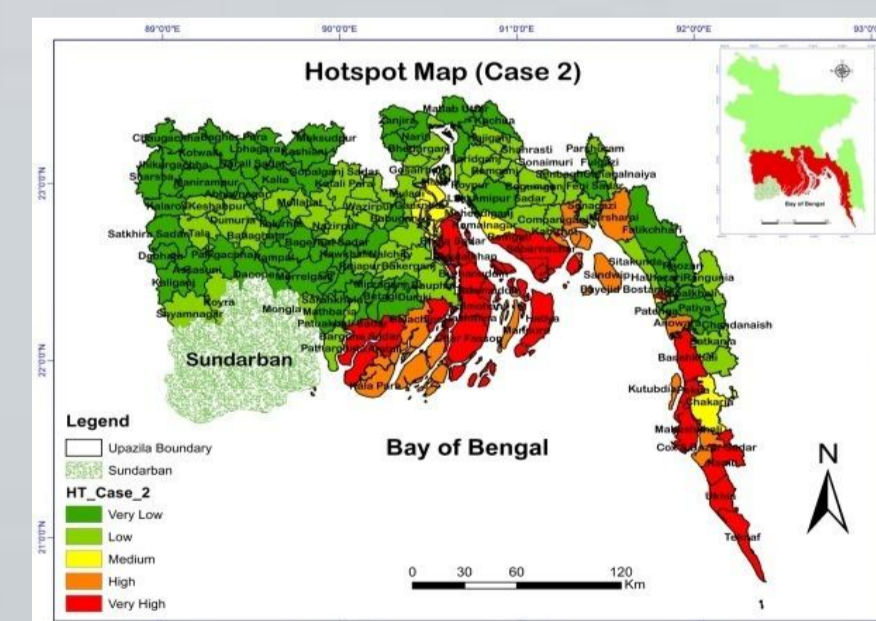
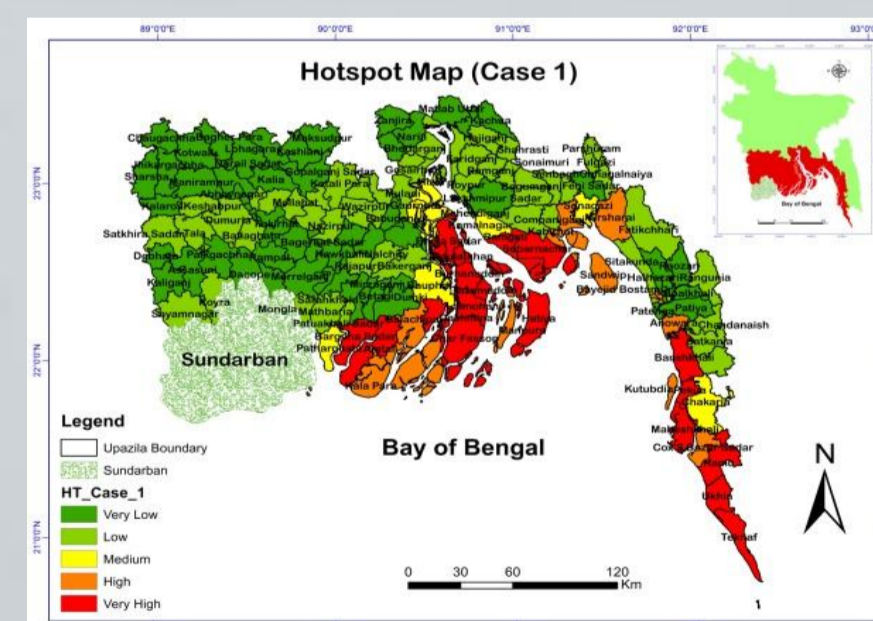


Figure 4: Changed hotspot maps for four different adaptive capacities

Table 2: Comparative ranking with base map for different cases

District	Upazila	Rank				
		Base	Case1	Case 2	Case 3	Case 4
Lakshmipur	Ramgati	1	1	1	1	1
Bhola	Bhola Sadar	2	2	3	2	2
Noakhali	Hatiya	3	3	2	3	3
Bhola	Daulatkhan	4	4	4	4	4
Bhola	Char Fasson	5	5	8	5	5
Bhola	Burhanuddin	6	10	10	8	6
Cox'S Bazar	Pekua	7	8	7	10	7
Barguna	Amtali	8	9	14	6	8
Cox'S Bazar	Teknaf	9	6	5	7	9
Noakhali	Subarnachar	10	7	6	9	10

Hotspot Score for Storm Surge High Risk Area

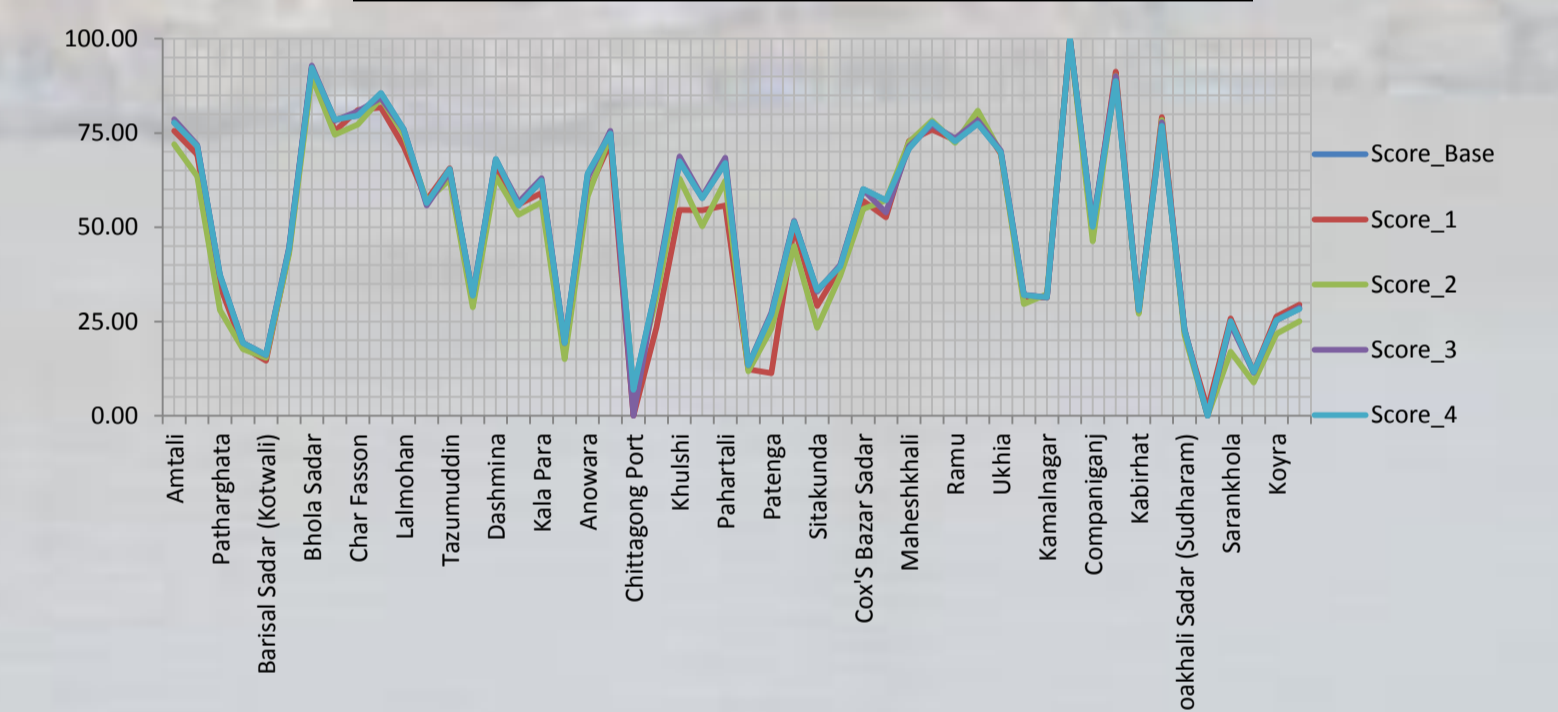


Figure 5: Graphical presentation of hotspot scores for different adaptive capacities

Conclusion

- There is no linear relationship among various indicators of adaptive capacity. The inter-dependency among exposure, sensitivity and adaptive capacity is not considered here.
- There will be more complexity when exposure and sensitivity indicators will be considered. Increasing number of indicator may also complicate the situation.
- Before taking any adaptive measure to reduce vulnerability of any system, it needs to prioritize the indicators. So, it is very important to understand the rank the indicators based on their importance to increase adaptive capacity.

Acknowledgement

