



University Of Dhaka



Mapping climate change vulnerability in the fisheries sector of Bangladesh using a composite index approach and GIS

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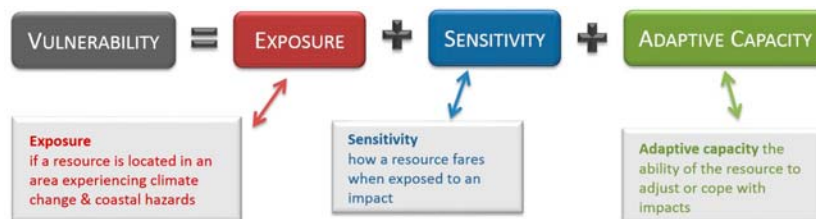
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Introduction

Climate change vulnerability

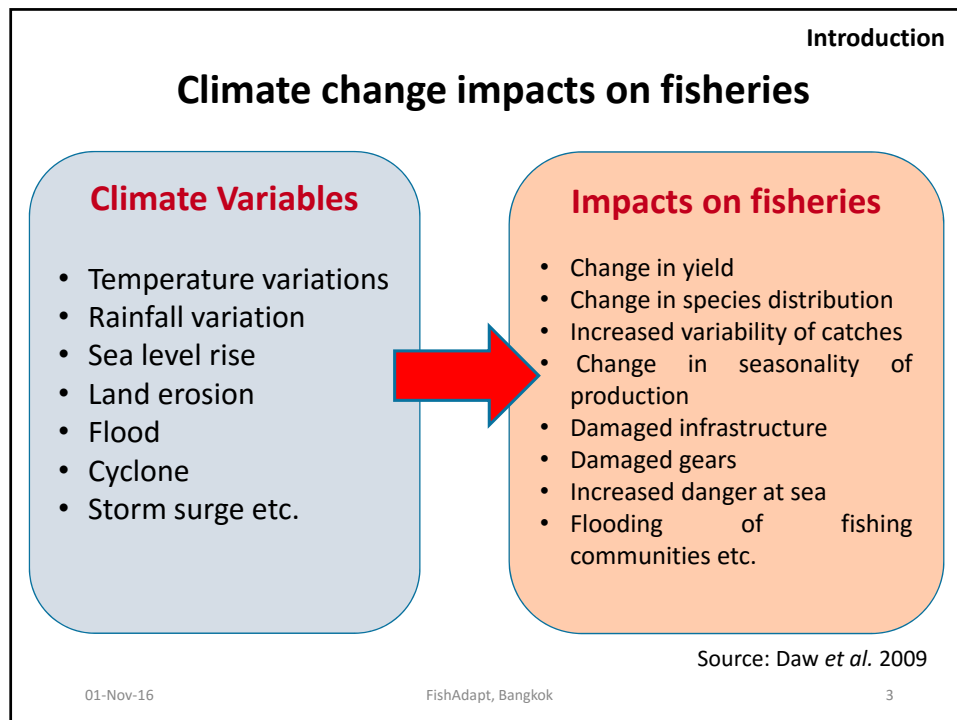


Source: <https://www.nps.gov/subjects/climatechange/vulnerabilityandadaptation.htm>

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- Introduction
- **The impacts of climate change vary spatially, temporally and across sectors.**
 - **Compare to inland, coastal areas are considered more vulnerable to climate change (Zsomboky et al. 2011).**
 - **However, inland areas may not be always less vulnerable compare to coastal areas.**
 - **One study found that compare to inland, coastal states have more awareness and have been the quickest to develop plans (Babcock 2013).**
 - **However, inland areas may also need to be aware and develop policy and plans to tackle climate change.**
 - **This is specifically an important issue for a sector that covers both inland and coastal areas.**
 - **Fisheries is one of such sectors.**

Introduction

- ❑ **Vulnerability** of a certain district's fisheries can be **highly context-dependent** and large number of factors may influence on it
- ❑ As such, it is crucial to measure district wise vulnerability in fisheries on which no study has been done in Bangladesh. Although global level study is available (Allison et al 2009).
- ❑ The **objective** of this study is to **develop the indicators and measure the degree of vulnerability of fisheries to climate** variability and change in 64 districts of Bangladesh using a composite vulnerability index approach and geographic information system (GIS)

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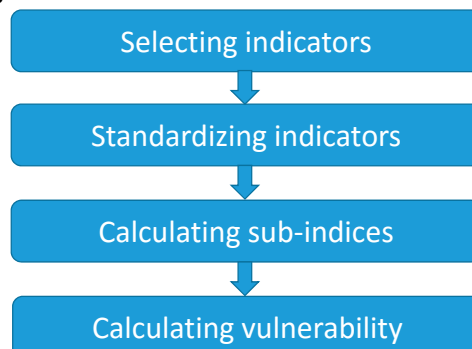
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Methodology

❑ Composite vulnerability index approach

- Computes vulnerability indices by aggregating data for a set of indicators

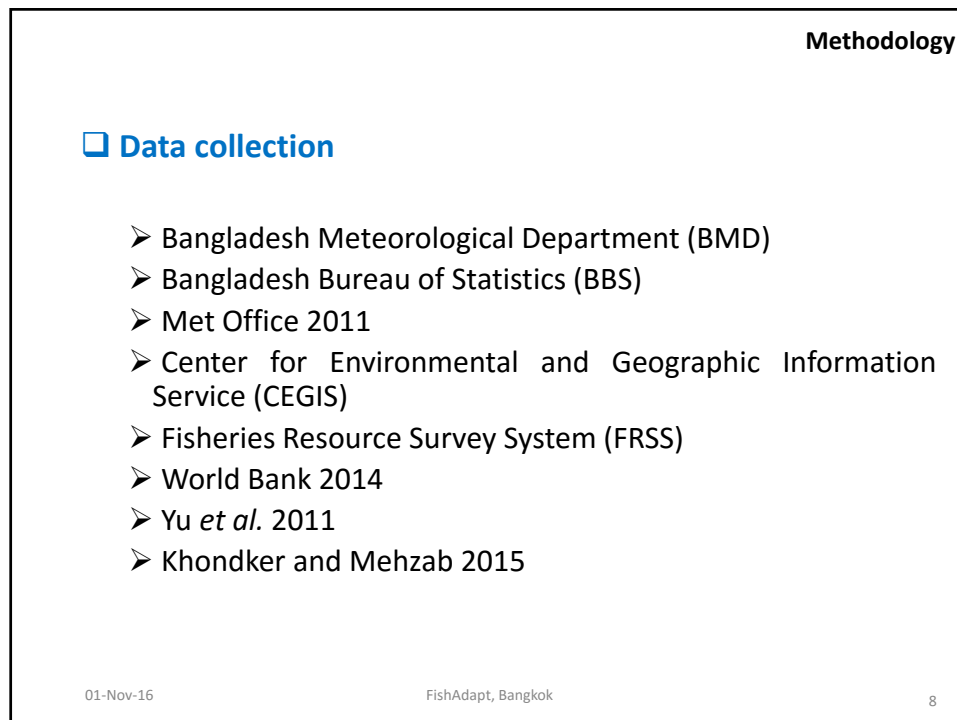
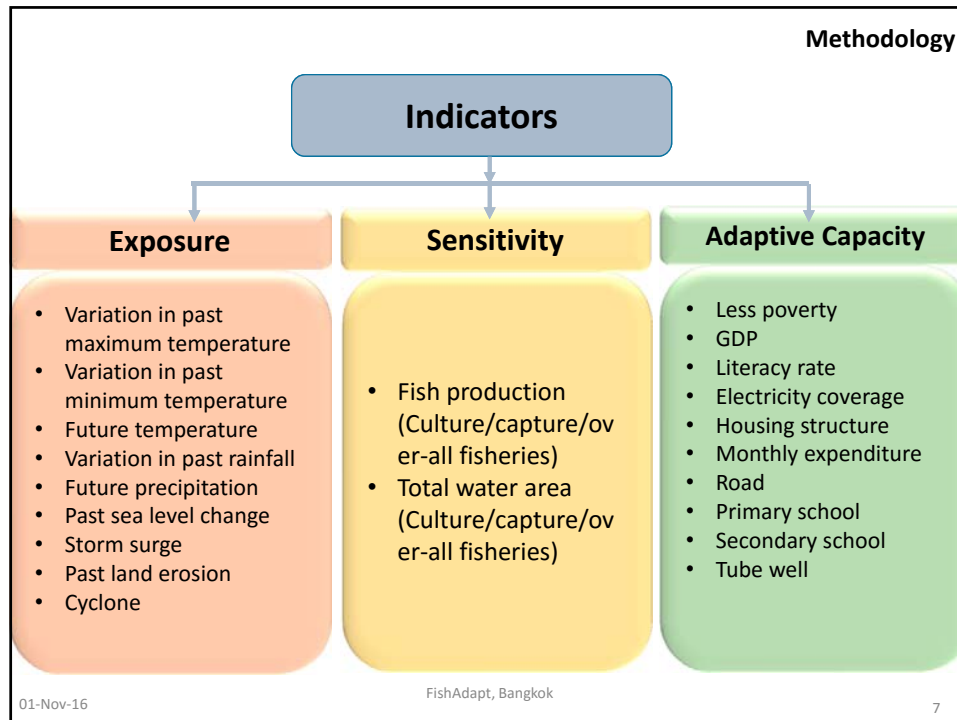
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Methodology

□ Calculating vulnerability

- The values of exposure, sensitivity and adaptive capacity were combined to create vulnerability

$$V = [(E + S) - AC]$$

Where,
 V = Vulnerability
 E = Exposure
 S = Sensitivity
 AC = Adaptive Capacity

- The final vulnerability values depends equally on all three components (i.e. exposure, sensitivity and adaptive capacity)

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Methodology

□ Standardizing Indices

- Resulting values of exposure, sensitivity, adaptive capacity and vulnerability were standardized
- Rescaled in a range 0 to 1
- Categorized based on quartiles

Quartiles	Categories
First quartile	Low
Second quartile	Moderate
Third quartile	High
Fourth quartile	Very high

- GIS software used to map at the district level

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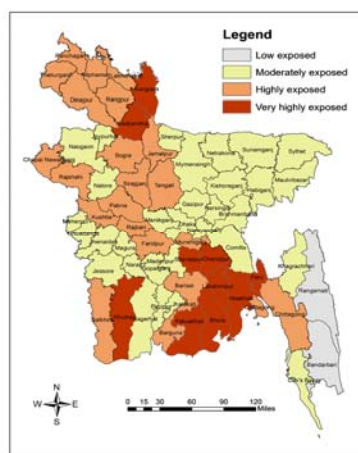
Results and Discussion

□ Climatic exposure values of fisheries (standardized)

Districts	Exposure	Districts	Exposure	Districts	Exposure
Dhaka	0.36	Kushtia	0.59	Naogaon	0.39
Faridpur	0.54	Magura	0.37	Natore	0.39
Gazipur	0.36	Meherpur	0.37	Pabna	0.59
Gopalganj	0.31	Narail	0.37	Rajshahi	0.59
Jamalpur	0.54	Satkhira	0.57	Sirajganj	0.57
Kishoreganj	0.37	Barguna	0.51	Bandarban	0
Madaripur	0.31	Barisal	0.74	Brahmanbaria	0.30
Manikganj	0.36	Bhola	0.84	Chandpur	0.84
Munshiganj	0.56	Jhalokati	0.5	Chittagong	0.57
Mymensingh	0.37	Patuakhali	0.79	Comilla	0.30
Narayanganj	0.36	Pirojpur	0.43	Cox's Bazar	0.46
Narsingdi	0.36	Dinajpur	0.60	Feni	0.79
Netrakona	0.37	Gaibandha	0.77	Khagrachhari	0.40
Rajbari	0.54	Kurigram	0.8	Lakshmipur	0.94
Shariatpur	0.88	Lalmonirhat	0.6	Noakhali	1
Sherpur	0.37	Nilphamari	0.61	Rangamati	0.20
Tangail	0.56	Panchagarh	0.61	Habiganj	0.42
Bagerhat	0.45	Rangpur	0.6	Maulvibazar	0.42
Chuadanga	0.37	Thakurgaon	0.6	Sunamganj	0.45
Jessore	0.37	Bogra	0.54	Sylhet	0.45
Jhenaidah	0.37	C. Nawabganj	0.59		
Khulna	0.76	Joypurhat	0.34		

Results and Discussion

Exposure of fisheries of Bangladesh to climate variability and change



10 districts are very highly exposed

- 8 districts are located in the coastal region
- 2 districts are in northern region

Results and Discussion
Climatic sensitivity values of fisheries (standardized)

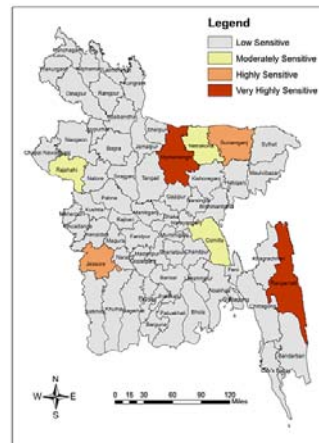
Districts	Sensitivity	Districts	Sensitivity	Districts	Sensitivity
Dhaka	0.14	Kushtia	0.07	Naogaon	0.23
Faridpur	0.06	Magura	0.01	Natore	0.06
Gazipur	0.1	Meherpur	0.02	Pabna	0.12
Gopalganj	0.1	Narail	0.04	Rajshahi	0.25
Jamalpur	0.06	Satkhira	0.21	Sirajganj	0.09
Kishoreganj	0.18	Barguna	0.03	Bandarban	0
Madaripur	0.03	Barisal	0.1	Brahmanbaria	0.06
Manikganj	0.04	Bhola	0.07	Chandpur	0.13
Munshiganj	0.05	Jhalokati	0.01	Chittagong	0.12
Mymensingh	1	Patuakhali	0.05	Comilla	0.3
Narayanganj	0.08	Pirojpur	0.02	Cox's Bazar	0.07
Narsingdi	0.05	Dinajpur	0.06	Feni	0.09
Netrakona	0.26	Gaibandha	0.08	Khagrachhari	0.02
Rajbari	0.04	Kurigram	0.05	Lakshimpur	0.08
Shariatpur	0.02	Lalmonirhat	0.02	Noakhali	0.19
Sherpur	0.08	Nilphamari	0.04	Rangamati	0.94
Tangail	0.11	Panchagarh	0.02	Habiganj	0.15
Bagerhat	0.18	Rangpur	0.07	Maulvibazar	0.24
Chuadanga	0.05	Thakurgaon	0.04	Sunamganj	0.65
Jessore	0.52	Bogra	0.15	Sylhet	0.21
Jhenaidah	0.1	Chapai Nawabganj	0.06		
Khulna	0.08	Joypurhat	0.04		

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Results and Discussion
Sensitivity of fisheries of Bangladesh to climate variability and change

Rangamati and Mymensingh districts are very highly sensitive

Most districts are low sensitive



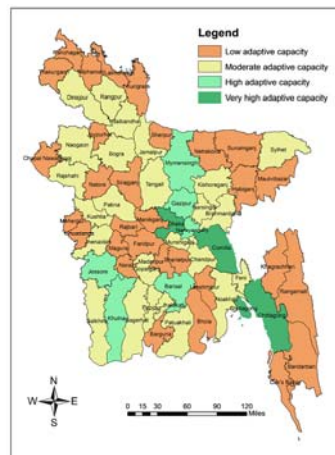
Results and Discussion

 Climate change adaptive capacity values (standardized)

Districts	Adaptive capacity	Districts	Adaptive capacity	Districts	Adaptive capacity
Dhaka	1	Kushtia	0.34	Naogaon	0.33
Faridpur	0.24	Magura	0.18	Natore	0.21
Gazipur	0.59	Meherpur	0.19	Pabna	0.38
Gopalganj	0.27	Narail	0.16	Rajshahi	0.45
Jamalpur	0.31	Satkhira	0.32	Sirajganj	0.19
Kishoreganj	0.27	Barguna	0.2	Bandarban	0
Madaripur	0.13	Barisal	0.58	Brahmanbaria	0.29
Manikganj	0.13	Bhola	0.18	Chandpur	0.39
Munshiganj	0.32	Jhalokati	0.28	Chittagong	1
Mymensingh	0.51	Patuakhali	0.26	Comilla	0.81
Narayanganj	0.53	Pirojpur	0.28	Cox's Bazar	0.17
Narsingdi	0.33	Dinajpur	0.35	Feni	0.42
Netrakona	0.13	Gaibandha	0.26	Khagrachhari	0.09
Rajbari	0.12	Kurigram	0.17	Lakshmipur	0.23
Shariatpur	0.13	Lalmonirhat	0.02	Noakhali	0.43
Sherpur	0.12	Nilphamari	0.08	Rangamati	0.13
Tangail	0.40	Panchagarh	0.04	Habiganj	0.13
Bagerhat	0.36	Rangpur	0.33	Maulvibazar	0.23
Chuadanga	0.18	Thakurgaon	0.12	Sunamganj	0.06
Jessore	0.55	Bogra	0.35	Sylhet	0.49
Jhenaidah	0.36	Chapai Nawabganj	0.14		
Khulna	0.65	Joypurhat	0.22		

Results and Discussion

Adaptive Capacity of Fisheries of Bangladesh to climate variability and change



- 6 districts, Jessore, Khulna, Barisal, Mymensingh, Gazipur and Narayanganj have high adaptive capacity
- Lalmonirhat has the lowest adaptive capacity followed by Panchagarh and Nilphamari

Methodology

❑ Calculating vulnerability

- The values of exposure, sensitivity and adaptive capacity were combined to create vulnerability

$$V = [(E + S) - AC]$$

Where,

V = Vulnerability

E = Exposure

S = Sensitivity

AC = Adaptive Capacity

- The final vulnerability values depends equally on all three components (i.e. exposure, sensitivity and adaptive capacity)

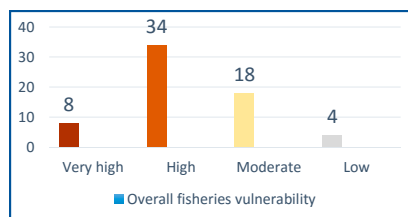
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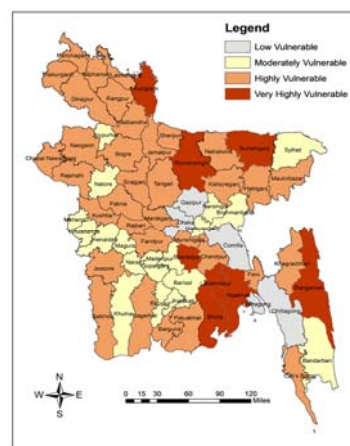
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Results and Discussion

Climate Change Vulnerability Map of Fisheries of Bangladesh



- 4 inland and 4 coastal districts have the highest vulnerability
- 4 districts – cities and towns – have the lowest vulnerability



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Conclusions

- For the fisheries of Bangladesh, **northern (inland) and coastal districts are very highly vulnerable** to climate variability and change.
- Which means that the ***inland areas are not always less vulnerable compare to the coastal areas*** which challenges the commonly held notion that coastal areas are more vulnerable than inland areas (Zsamboky et al. 2011).
- **Limitations:** In some cases, deficiency of district level data was prominent. Almost all of the organizations of Bangladesh produce mostly national level data. Future study should use more district level data to determine the level of vulnerability.
- **Policy Implications:** The findings of this study will allow the policymakers and practitioners to easily identify the most vulnerable districts so as to undertake actions to reduce the vulnerability and/or ensure sustainable adaptation to climate change.

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Thank you very much
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