



# Cultural resilience in complex mangrove ecosystem affected by climate change: Lessons from Sunderbans in Bangladesh

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# Introduction

The Sunderbans comprise a **complex mangrove ecosystem** because of its situation in fluvial-estuarine-marine interfaces

It comprises a system of **very high ecosystem productivity** with provision of food and raw materials, coastal protection, carbon sequestration, habitat provision, recreational services, and subjects of education and research (Barbier et al. 2011).

The mangroves are also **coupled socio-ecological systems** because of preexisting resource harvesting methods that are based on traditional knowledge (TK) on selective harvesting from mangrove ecosystems

It is **under constant threat** from unsustainable anthropogenic activities such as overexploitation of forest resources, industrial shrimp farming among others

## Resilience: Key features

“Resilience” in socio-ecological systems research is defined by the capacity of a system to recognize itself while undergoing changes so that the system still retains the essential structure, functions, processes and feedbacks that holds the system together.

However, since it is human society that is often seen to adversely affect ecosystems, the thinking of “coupled” socio-ecological system came into being (Berkes, 2003, Folk, 2006).

Every ecosystem is not a socio-ecological system and for the system to be coupled with the human society, it needs to be coupled through human’s interactions with the ecosystem

## Gap in resilience study

Resilience in SES has been studied at the macro level (i.e. institutions) that stops above the family level

This makes resilience at the individual level and under estimated aspect of SES research

We study this aspect of resilience in the complex mangrove SES through study of individual subsistence harvesters against climate change and forest degradation

Individual level studies are vital for Sunderbans SES as families of subsistence forest resource harvesters (e.g. honey and golpata collectors) are supported by individual resource users.

We argue that this local resilience is also related to the forest resilience and thus forms a vital part of the local ecological knowledge regarding climate change

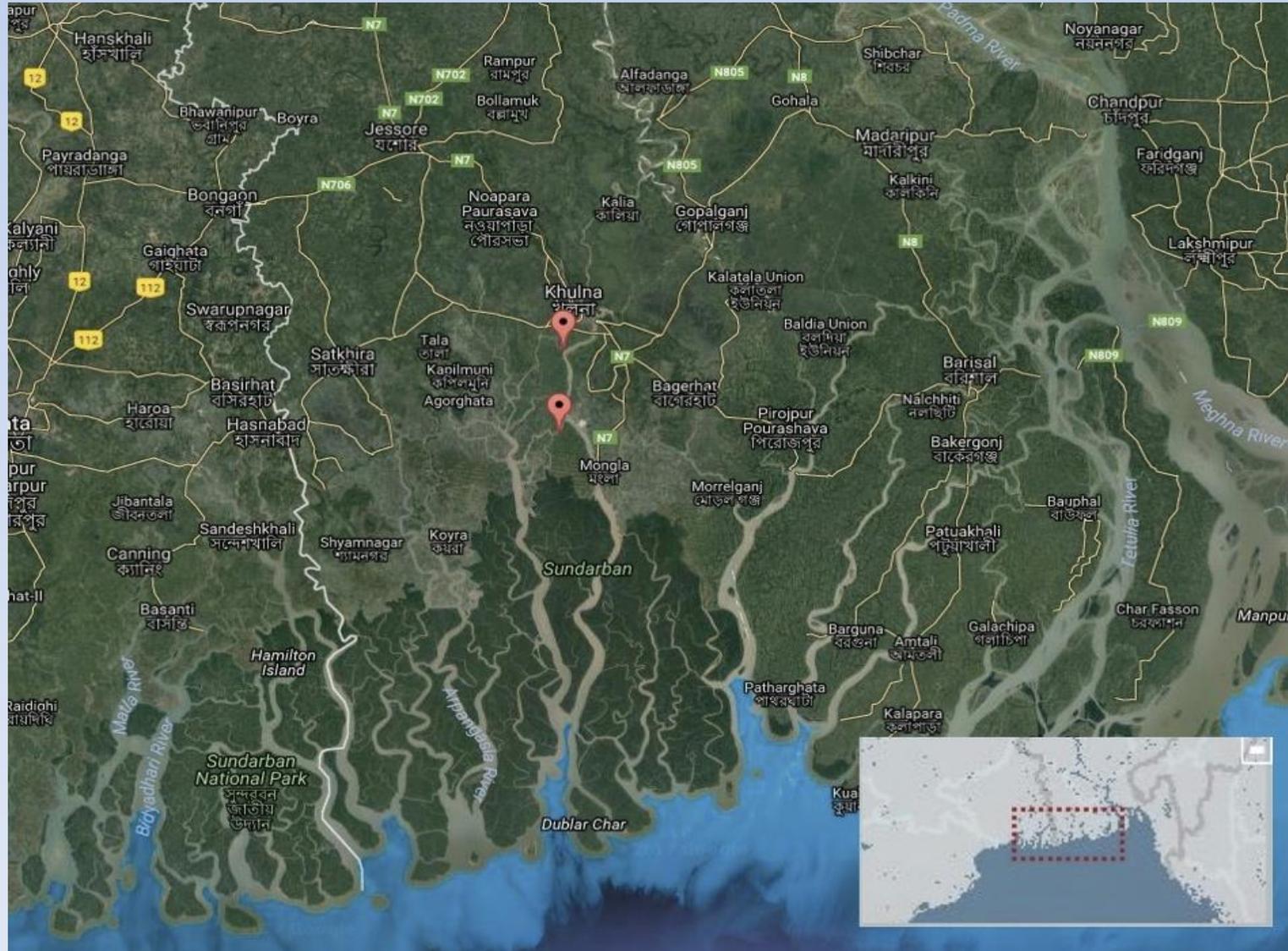
# Sunderbans in the face of climate change: where socio-ecological resilience will matter

The sunderbans socio-ecological system is expected to be affected most by the effects of climate change, both through the rise of sea level, as well as through natural calamities such as Sidr (2007) and Aila (2009).

Because of peculiar biogeography of the mangroves, as an ecosystem that develops in the fluvial-estuarine-marine interface, they are capable of withstanding sea level rise and storm surges.

This capacity to withstand ecosystem changes makes them resilient systems and is observed in studies by IUCN 2006, Marois et al 2015, Islam et al 2015, van Wesenbeeck et al. 2017

# Location of the study sites

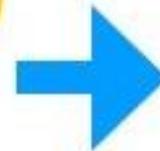


## Three salient features of sunderbans SES and its resilience

**Selective  
extractions**

**Limited  
access**

**Metaphors to  
accept apex  
predators  
(tigers)**



**Health of  
the  
sunderbans  
mangrove**

## Understanding synergies and trade offs of the socio-ecological interactions with the mangrove ecosystems

The salient features are three aspects in our case that makes us understand the “coupled” nature of the sunderbans mangrove system through individual resource harvesters

Subsistence harvesters enter the forests in small groups and their capabilities are supported by TK based learning through individual’s first-hand experiences in the forests

In a political ecological landscape where mangroves are degraded through noncompliance of PA laws through adverse effects of corruptions, illegal extractions, this TK remains as a main pillar of forest resilience and an inherent adaptive capacity within the local communities

We therefore stress that the maintenance of this adaptive capacity should be a top priority in the policy arena in the region, particularly inventorying, finding their synergies and trade offs with biodiversity and habitat conservation

## Proposed Local Solution

We studied local resource harvesters of Batiaghata (Debitala and Katianangla Village) and Dacope (Dangmari Village) sub-districts in Khulna district.

The local resource harvesters face problems from bribery and corruption regarding the protected area resource use for which they have to pay a greater share of their income from the forest resources.

This makes them economically vulnerable and look for extra income from the forests which degrades the TK based selective extractions

The local resource harvesters are affected by illegal harvesting of wood and golpata and fisheries resources which makes them loose the quality of their communal and selected resource harvesting grounds

The quality of the communal resource harvesting grounds are also related to the quality (health) of the forests.

## Proposed Local Solution

We argue that a better understanding of the local resilience can be achieved through **deliberative and participatory processes** Workshops, focus group discussions etc. that shows diverse **individuals opinion that is also shared on a common civilian platform**

The deliberative participatory processes can

1. Systematize diverse information based on multiple knowledge sources
2. Gather diverse ecosystem-based knowledge in relatively quick time
3. Help understand the conflicts arising from formal and informal resource use laws and rights

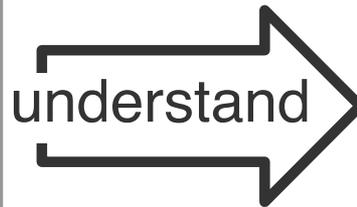


## How the solution would address the problem?

Shallow understanding of the importance of pre-existing TK based resource harvesting

Conflicting interests arising from formal and informal resource use rights and laws

Erosion of TK from outmigration from the forest proximity



Participatory processes



Ecosystem services as a tool to understand human-environment interactions for mangrove forest resilience

Provisioning  
Cultural

Regulating and supporting

## How the Implementing Agency Reach Out the Beneficiaries

Our research has not reached the implementation stage and is in the stage of information sharing and knowledge creation

We reached out to the local resource harvesters and exchanged information on various ecosystem services (mainly provisioning and cultural) coupled by literature review on regulating and supporting services of the mangroves

We have carried out FGDs and in depth interviews to realize the participatory process to elicit rich local knowledge based information

The resource harvesters opinions suggest that the three salient features (i.e. selective harvesting, limited access and metaphors) are three most important TK features of the study area that needs to be conserved for better forest resilience

**Better socio-ecological resilience = Better climate resilience**

