



**ISAP 2024**

持続可能なアジア太平洋に関する国際フォーラム

**IGES** 公益財団法人  
地球環境戦略研究機関

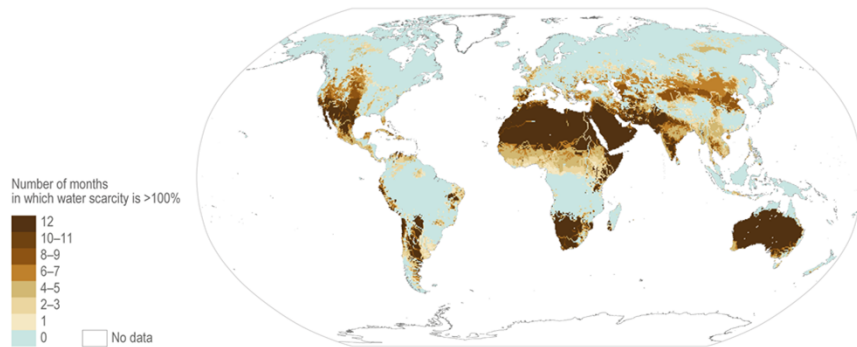
# Enhancing Community Adaptation in Vulnerable Riverine Islands

**Pankaj Kumar**

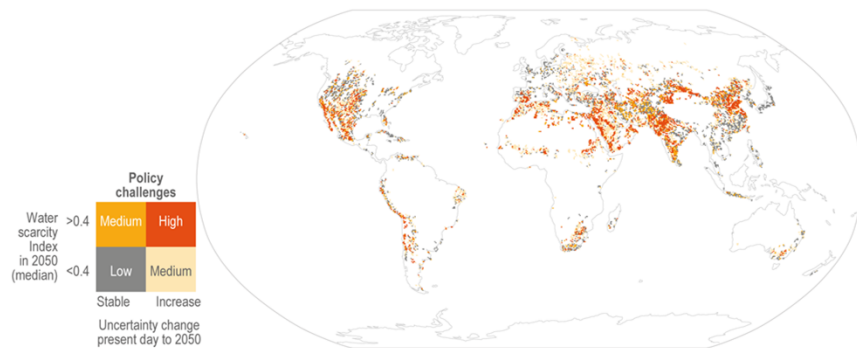
**Research Manager (Adaptation and Water); Head (IPBES TSU-SCM)  
Lead Author (IPBES NEXUS assessment; GEO 7 Report)  
Institute for Global Environmental Strategies (IGES), Japan  
[kumar@iges.or.jp](mailto:kumar@iges.or.jp)**

# Background

## Geographical distribution of current water scarcity and level of challenges for policies addressing future change

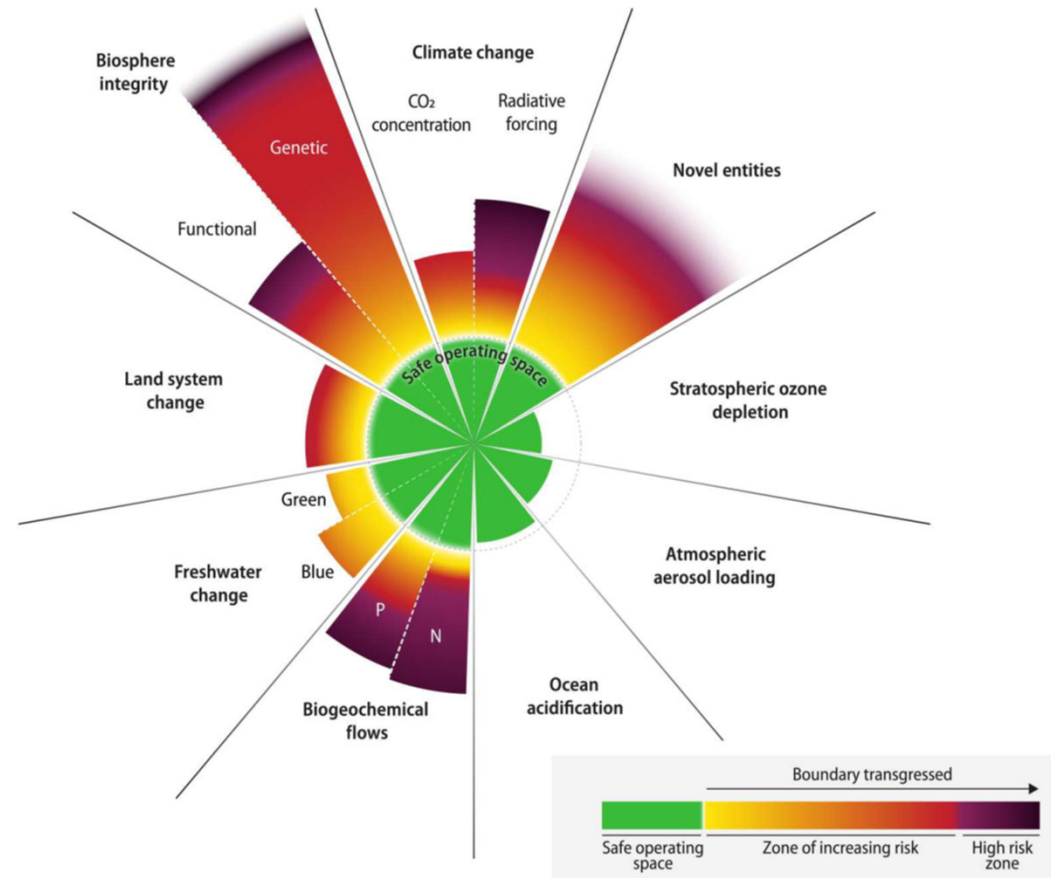


**a) Number of months per year with severe water scarcity**



**b) Local levels of policy challenges for addressing water scarcity by 2050**  
(IPCC AR6, 2023)

Average per capita water availability is sufficient enough but spatio-temporal asymmetry is great, which is a matter of concern for policy makers.



**Fig. Earth reaches beyond six of nine planetary boundaries** (Richardson et al., 2023)

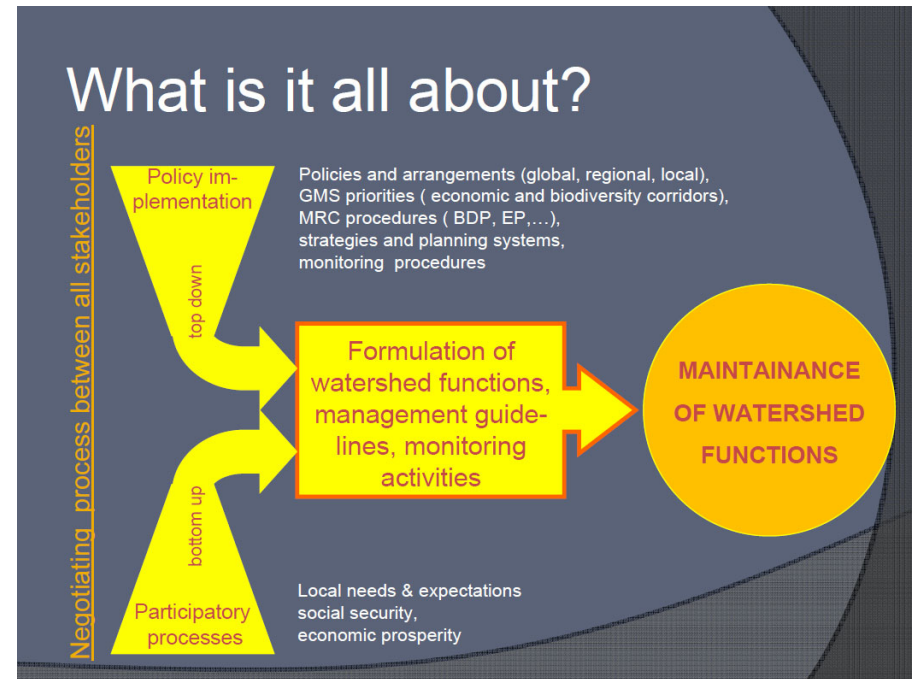
# Rivers in Asian region

- Rivers are one of the most important geological features in this region, playing a key role in shaping histories, cultures, societies and economies.
- They provide freshwater for drinking, irrigation and hydropower; are home to unique plants and animals that contribute to well-functioning ecosystems; support transportation, recreation/tourism and many other functions.
- However, in lieu of triple planetary crisis (climate change, biodiversity loss, and pollution) and land degradation; river environment are under extreme pressure which affects overall human well-being as well.



# IWRM and Nexus approach

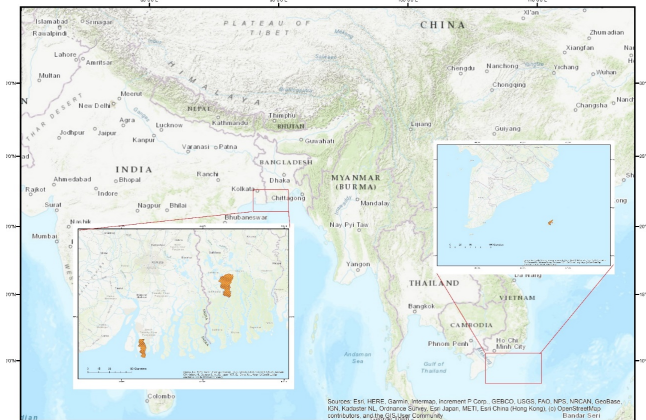
- Complex nature of water resource management at the basin scale, needs a clear vision on the following:



## Integrated Water Resource Management (IWRM)

Siligato (2007)

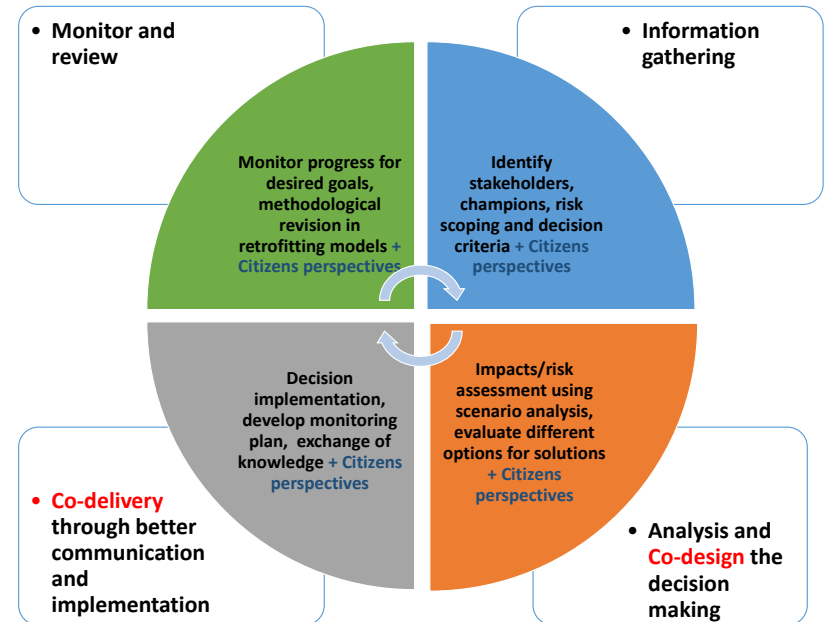
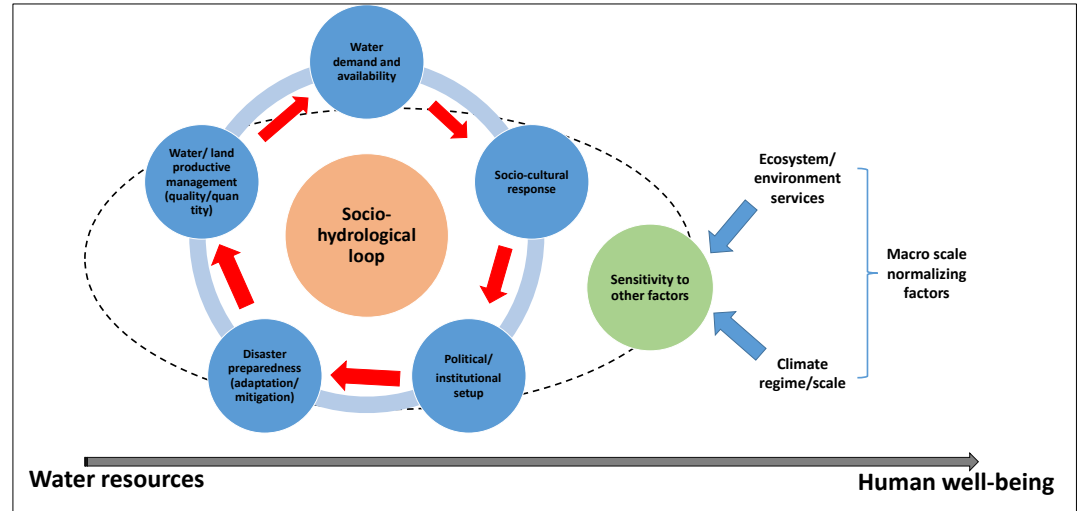
# Socio-hydrology



## Why riverine islands?

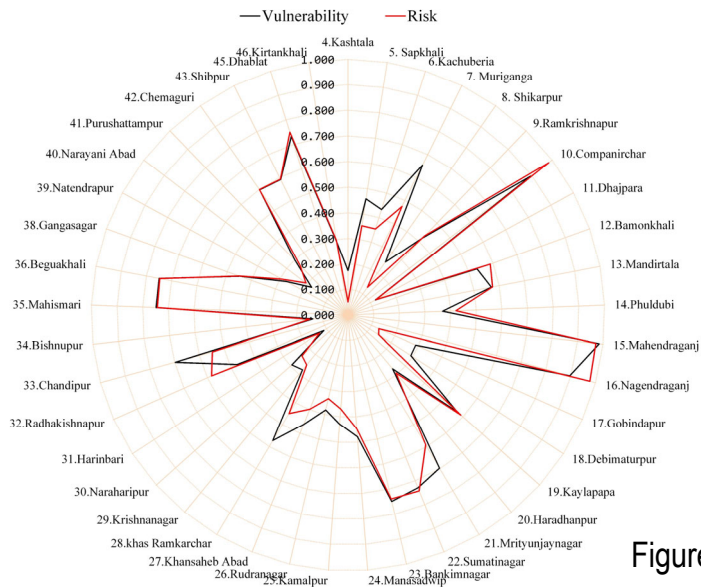
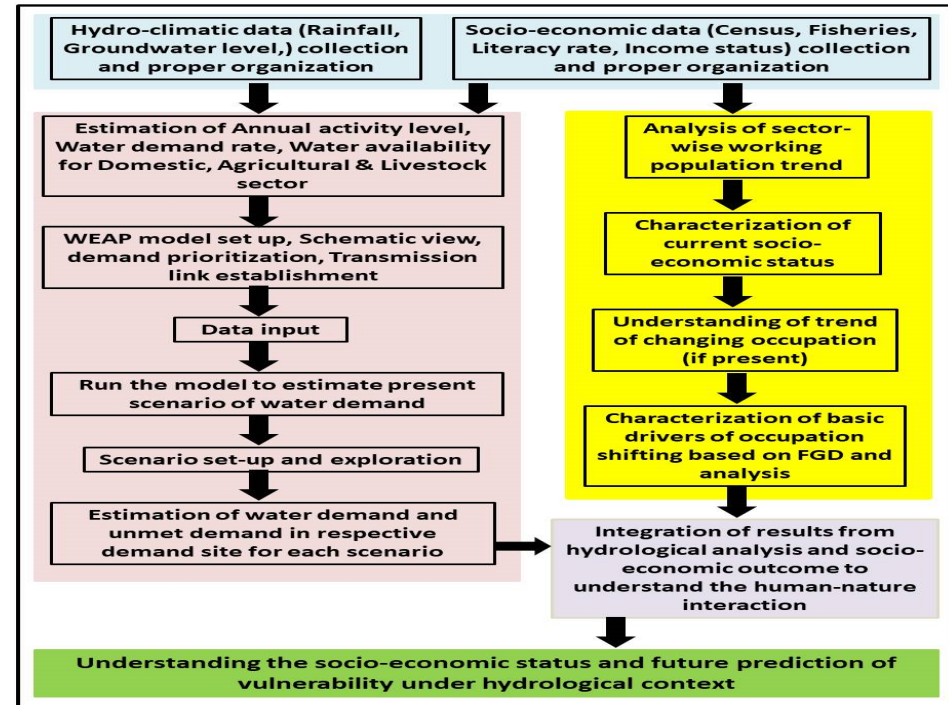
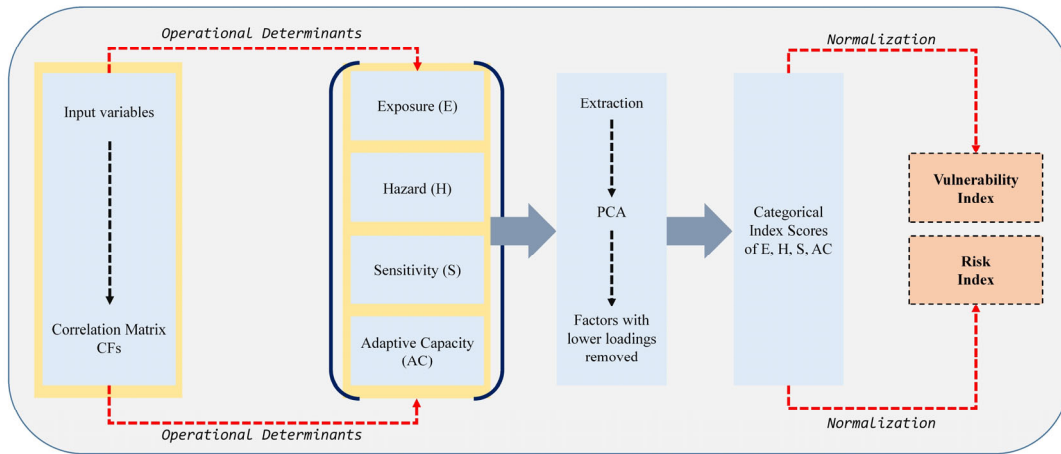
1. Huge productive zone
2. Very prone to hydro-meteorological hazards (frequent extreme weather conditions)
3. Densely populated area and extreme effects on the communities because of their poor adaptive capacities (limited resources/infrastructure as well as institutional setup)

Objective- How socio-hydrological approach can help to design possible adaptation and mitigation measures for positively enhancing the relation between water resources and human well-being?



**Pankaj et al., (2020) Progress in Disaster Science, 8, 100134**

# Socio-hydrology and some results



Dataset- Water quality/quantity, (primary data generated in case observed data was not there), Socio-economic data (Field based surveys (FGDs/KII/HH), Spatial data, Policy documents) Qualitative and quantitative analysis

Figure- Mouza-level relative ranking of risk and vulnerability for Sagar Island, India. Bera et al., (2022) Water, 14, 823. MDPI (IF- 3.530)

# Socio-hydrology and some results

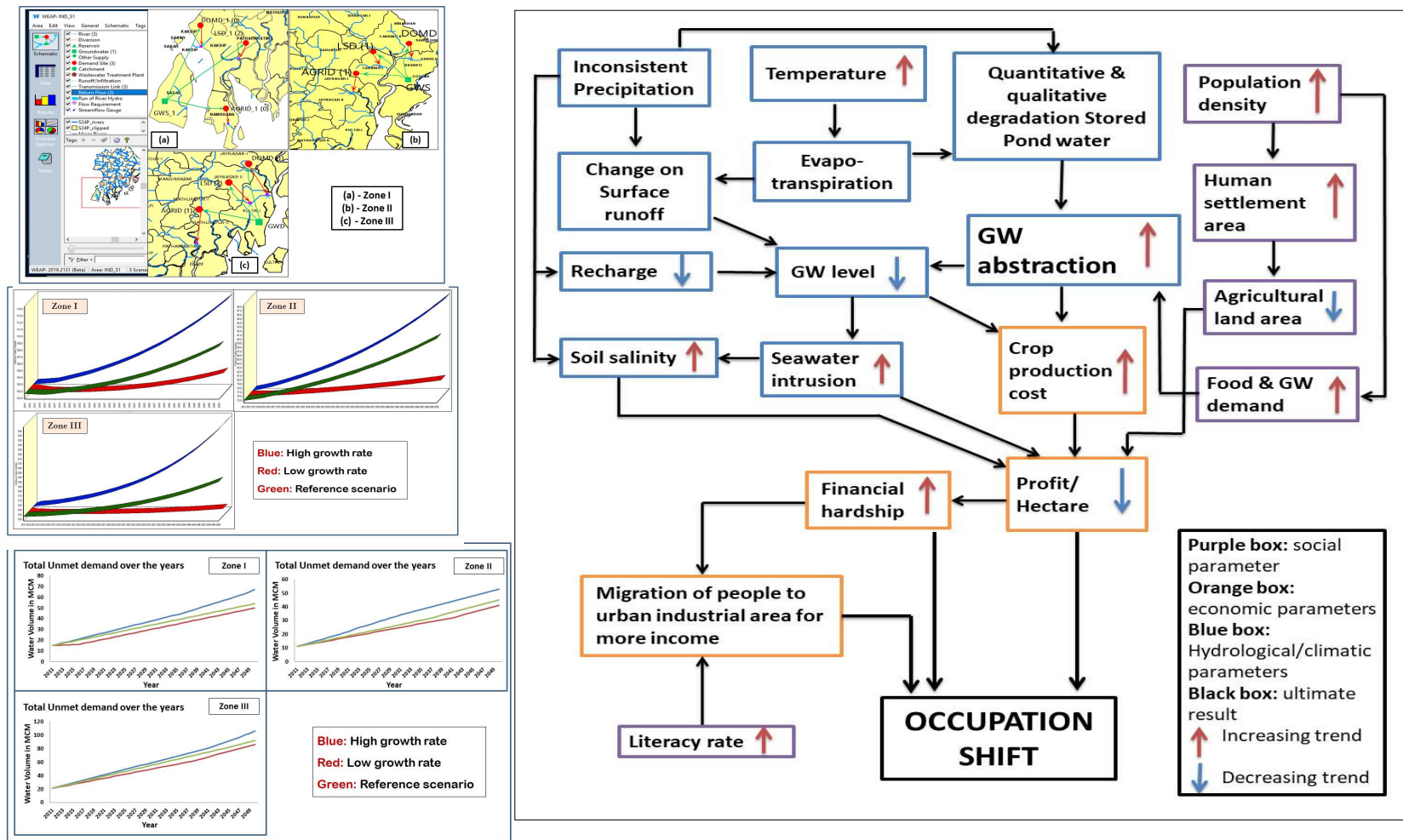
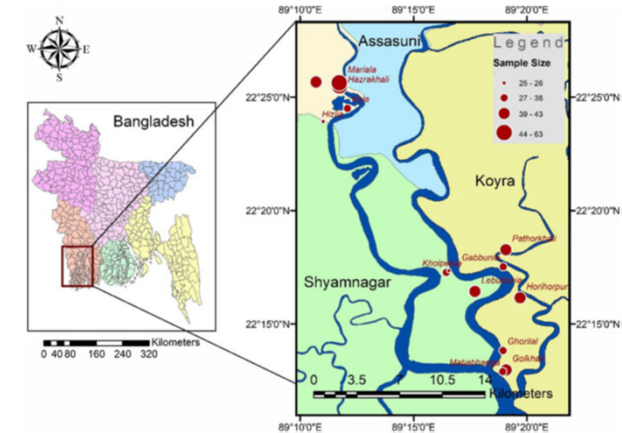
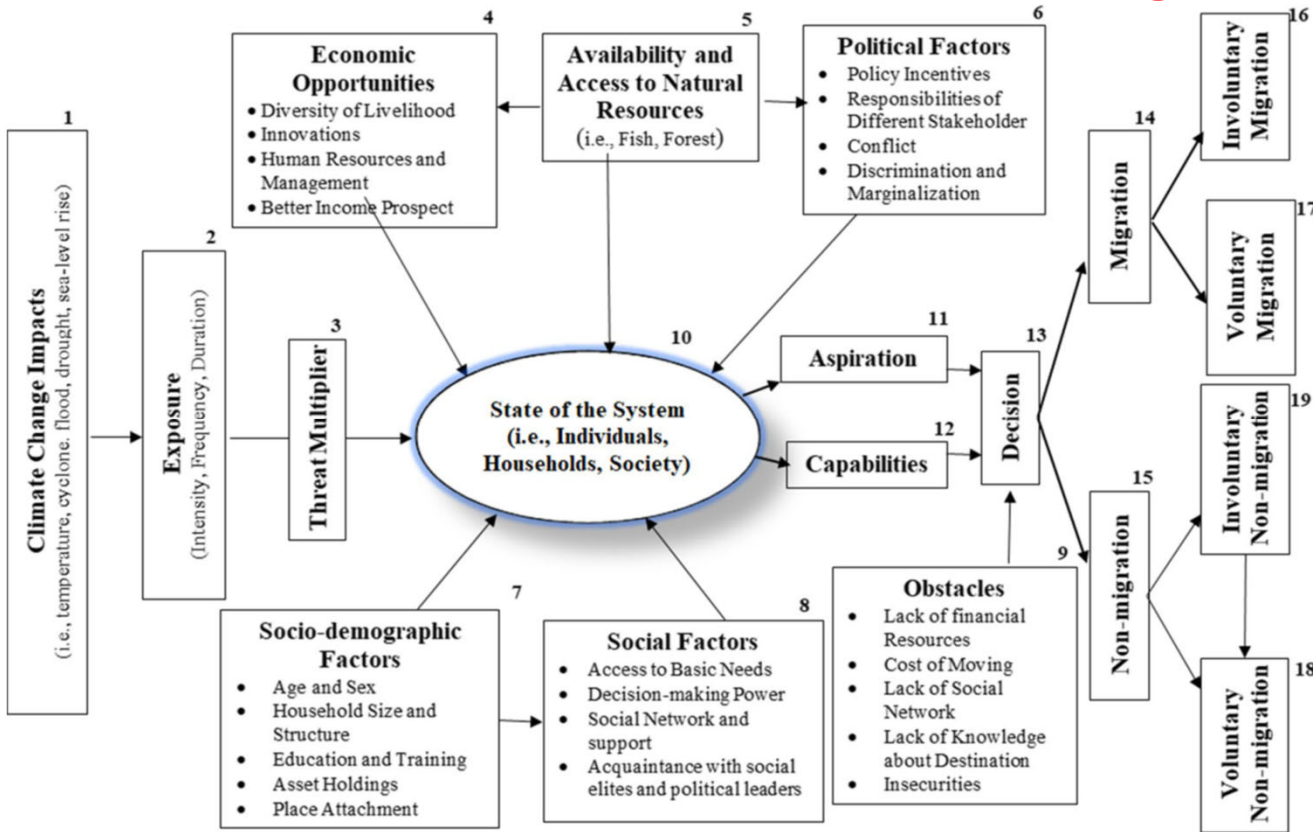


Figure - The drivers of socio-economic trend/status under hydroclimatic context in the study area.

For detail information- <https://www.mdpi.com/2073-4441/13/12/1635>

Fig- Plausible scenario based future of water resources in Indian site

# The Case of Voluntary Environmental Non-migration despite Climate Risks in Coastal Bangladesh



Khatun et al., Global Environmental Change, 77, 102610. Elsevier Publication. (IF- 11.16)

➤ Furthermore, these non-migrants enjoyed higher socioeconomic and sociopsychological advantages and availed more local support from different government and non-government organizations than involuntary non-migrants.

➤ Again, mutual assistance, connection with social groups, natural resource access, sense of secured livelihood, stable societal atmosphere, and participation in decision-making in society appeared to build their higher degree of social capital compared to involuntary non-migrants.



# Key take away message

- This project was a holistic approach first of its kind in this region, strives to addresses crucial hydrological queries regarding human–nature interaction along with socio-economic, capacity, institutional, policy related issues in riverine islands.
- It is evident that triple planetary crisis with land degradation results in water insecurity. Since water is the limiting factor to socio-economic growth, it lead to a series of **cascading effects like changes in livelihood, financial hardship, mental health, occupation shift, migration, loss of self esteem** etc.
- **Socio-hydrological an holistic approach was successfully applied to explore the nexus of human–water relations at different scales in three different study areas under different socio-economic/environmental conditions, which was further applied to improve adaptive measures to manage local water needs while mitigating undesirable changes to the hydrological cycle.**
- Result shown that **both top-down and bottom-up approach, stakeholders participations, citizen science, diligent data monitoring, data sharing, numerical simulations with retrofitting approach to answer plausible what-if questions for designing various policy measures are the key ingredients** for achieving water security and human well-being
- The research outcome was **helpful to sketch projections of alternatives that explicitly account for plausible and co-evolving trajectories of the socio-hydrological system, which will yield both insights into cause–effect relationships and help stakeholders to identify safe functioning space.**

# Overall project outputs

- **Policy output** - Established great collaborations in these three countries, generated enough robust scientific data to help policy/decision makers
- **Scientific output**- Significant outputs in terms of publication, **peer reviewed journal articles (n=13)**, **book chapters (n=2)** and **one conference proceeding**).
- **Capacity development**- Hands on training for socio-hydrological approach and some of necessary models/tools were provided to around 40 people from three countries

Progress in Disaster Science  
Cover Article  
Socio-hydrology: A key approach for adaptation to water scarcity and addressing human well-being in large riverine islands  
Pratik Kumar<sup>1</sup>, Anu Arora<sup>2</sup>, Rashmi Dasgupta<sup>3</sup>, Bin Anu Adhikari<sup>4</sup>, Ashita Mahapatra<sup>5</sup>, Md. Nurul Ahad<sup>6</sup>, Deo Gurav Dasgupta<sup>7</sup>, Vikram Chandra Varma<sup>8</sup>, Animes Kumar Mukherjee<sup>9</sup>

Abstract  
Socio-hydrology is a key approach for adaptation to water scarcity and addressing human well-being in large riverine islands. This article discusses the socio-hydrological approach to explore groundwater-human wellbeing nexus case study from Sundarbas, India.

Global Environmental Change  
Environmental non-migration on adaptation in hazard-prone areas: Evidence from coastal Bangladesh  
Pratik Kumar<sup>1</sup>, Md. Nurul Ahad<sup>2</sup>, Soim Akter<sup>3</sup>, James Warner<sup>4</sup>, Rezail Akbar<sup>5</sup>, Balrajee Mahapatra<sup>6</sup>, Pratik Kumar<sup>7</sup>

Abstract  
Environmental non-migration on adaptation in hazard-prone areas: Evidence from coastal Bangladesh. This study examines the environmental non-migration decision in coastal Bangladesh, an area highly exposed to flooding and other climate-related hazards.

Water  
Socio-Hydrological Approach to Explore Groundwater-Human Wellbeing Nexus Case Study from Sundarbas, India  
Pratik Kumar<sup>1</sup>, Anu Arora<sup>2</sup>, Rashmi Dasgupta<sup>3</sup>, Bin Anu Adhikari<sup>4</sup>, Ashita Mahapatra<sup>5</sup>, Md. Nurul Ahad<sup>6</sup>, Deo Gurav Dasgupta<sup>7</sup>, Vikram Chandra Varma<sup>8</sup>, Animes Kumar Mukherjee<sup>9</sup>

Abstract  
Socio-hydrological approach to explore groundwater-human wellbeing nexus case study from Sundarbas, India. This study examines the socio-hydrological approach to explore groundwater-human wellbeing nexus case study from Sundarbas, India.

Water  
Enhancing Water Supply Resilience in a Tropical Island via a Socio-Hydrological Approach: A Case Study in Co Dai Island, Vietnam  
Doi Quynh Nguyen<sup>1,2</sup>, Doi Quynh Nguyen<sup>1,2</sup>, Lam Thanh Van<sup>3,4</sup>, Tam Cong<sup>1</sup>, Phuc Khanh<sup>1,2,3,4</sup>, Khanh Nguyen<sup>1,2</sup>, and Tung Quan Nguyen<sup>1,2</sup>

Abstract  
Enhancing Water Supply Resilience in a Tropical Island via a Socio-Hydrological Approach: A Case Study in Co Dai Island, Vietnam. This study examines the socio-hydrological approach to enhance water supply resilience in a tropical island.

Water  
Assessment of household level adaptation strategies to water stress in southwestern coastal Bangladesh: a counter-factual analysis  
Bishwajit Halder<sup>1</sup>, Md. Nurul Ahad<sup>2</sup>, and Pratik Kumar<sup>3</sup>

Abstract  
Assessment of household level adaptation strategies to water stress in southwestern coastal Bangladesh: a counter-factual analysis. This study examines the household level adaptation strategies to water stress in southwestern coastal Bangladesh.

Water  
Integrated remote sensing and field-based approach to assess the temporal evolution and future projection of meanders: A case study on River Manu in North-Eastern India  
Jayant Choudhary<sup>1</sup>, Gaurav Mishra<sup>2</sup>, S. S. Anandha Vas<sup>3</sup>, Anurag Choudhary<sup>4</sup>, Sagar Choudhary<sup>5</sup>, Dhruvrajit Barahain<sup>6</sup>, Gaurav Choudhary<sup>7</sup>, Suresh Kumar Singh<sup>8</sup>, Rajal Choudhary<sup>9</sup>, Manoj Kumar<sup>10</sup>, Pratik Kumar<sup>11</sup>

Abstract  
Integrated remote sensing and field-based approach to assess the temporal evolution and future projection of meanders: A case study on River Manu in North-Eastern India. This study examines the integrated remote sensing and field-based approach to assess the temporal evolution and future projection of meanders.

PLOS ONE  
Quantifying spatio-temporal variation in aquaculture production areas in Satharia, Bangladesh using geo-spatial and social survey  
Rashmi Dasgupta<sup>1</sup>, Pratik Kumar<sup>2</sup>, Anu Arora<sup>3</sup>, Rashmi Dasgupta<sup>4</sup>, Bin Anu Adhikari<sup>5</sup>, Ashita Mahapatra<sup>6</sup>, Md. Nurul Ahad<sup>7</sup>, Deo Gurav Dasgupta<sup>8</sup>, Vikram Chandra Varma<sup>9</sup>, Animes Kumar Mukherjee<sup>10</sup>

Abstract  
Quantifying spatio-temporal variation in aquaculture production areas in Satharia, Bangladesh using geo-spatial and social survey. This study examines the spatio-temporal variation in aquaculture production areas in Satharia, Bangladesh.

PLOS ONE  
Promise, promise, and reality: the case of voluntary environmental non-migration despite climate risks in coastal Bangladesh  
Md. Nurul Ahad<sup>1</sup>, Fatema Khanom<sup>2</sup>, Pratik Kumar<sup>3</sup>, Rajan Dasgupta<sup>4</sup>, Brian Alan Johnson<sup>5</sup>, Raj Dasgupta<sup>6</sup>

Abstract  
Promise, promise, and reality: the case of voluntary environmental non-migration despite climate risks in coastal Bangladesh. This study examines the promise, promise, and reality of voluntary environmental non-migration despite climate risks in coastal Bangladesh.

PLOS ONE  
Integrated Approach to Quantify the Impact of Land Use and Land Cover Changes on Water Quality of Surma River, Sylhet, Bangladesh  
Abdul Karim<sup>1,2</sup>, A. A. Akbar<sup>3</sup>, Md. Mubshir Uddin<sup>4</sup>, Zhan Lu<sup>5</sup>, and Faruk Khan<sup>6,7,8</sup>

Abstract  
Integrated Approach to Quantify the Impact of Land Use and Land Cover Changes on Water Quality of Surma River, Sylhet, Bangladesh. This study examines the integrated approach to quantify the impact of land use and land cover changes on water quality.

PLOS ONE  
Assessment of household level adaptation strategies to water stress in southwestern coastal Bangladesh: a counter-factual analysis  
Bishwajit Halder<sup>1</sup>, Md. Nurul Ahad<sup>2</sup>, and Pratik Kumar<sup>3</sup>

Abstract  
Assessment of household level adaptation strategies to water stress in southwestern coastal Bangladesh: a counter-factual analysis. This study examines the household level adaptation strategies to water stress in southwestern coastal Bangladesh.

PLOS ONE  
Environmental non-migration on adaptation in hazard-prone areas: Evidence from coastal Bangladesh  
Pratik Kumar<sup>1</sup>, Md. Nurul Ahad<sup>2</sup>, Soim Akter<sup>3</sup>, James Warner<sup>4</sup>, Rezail Akbar<sup>5</sup>, Balrajee Mahapatra<sup>6</sup>, Pratik Kumar<sup>7</sup>

Abstract  
Environmental non-migration on adaptation in hazard-prone areas: Evidence from coastal Bangladesh. This study examines the environmental non-migration decision in coastal Bangladesh.

PLOS ONE  
Enhancing Water Supply Resilience in a Tropical Island via a Socio-Hydrological Approach: A Case Study in Co Dai Island, Vietnam  
Doi Quynh Nguyen<sup>1,2</sup>, Doi Quynh Nguyen<sup>1,2</sup>, Lam Thanh Van<sup>3,4</sup>, Tam Cong<sup>1</sup>, Phuc Khanh<sup>1,2,3,4</sup>, Khanh Nguyen<sup>1,2</sup>, and Tung Quan Nguyen<sup>1,2</sup>

Abstract  
Enhancing Water Supply Resilience in a Tropical Island via a Socio-Hydrological Approach: A Case Study in Co Dai Island, Vietnam. This study examines the socio-hydrological approach to enhance water supply resilience in a tropical island.

Acknowledgement – I am grateful for the support provided by the Asia Pacific Network for Global Change Research (APN) under Collaborative Regional Research Programme (CRRP) with project entitled “Socio-hydrological perspective of climate change adaptation in large riverine islands: Comparative study from India, Bangladesh and Vietnam” and project reference number CRRP2019-01MY-Kumar.

**ご清聴ありがとうございました。**  
Thank you very much for your attention.