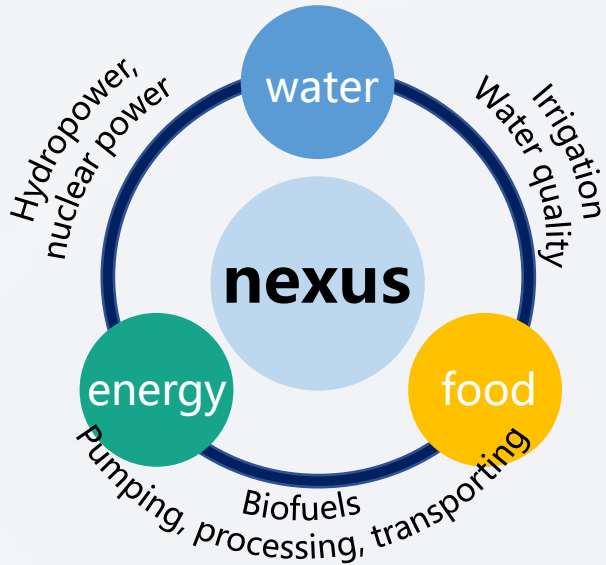


Modeling the water-energy-food- environment nexus and transboundary cooperation opportunity in the Brahmaputra River Basin

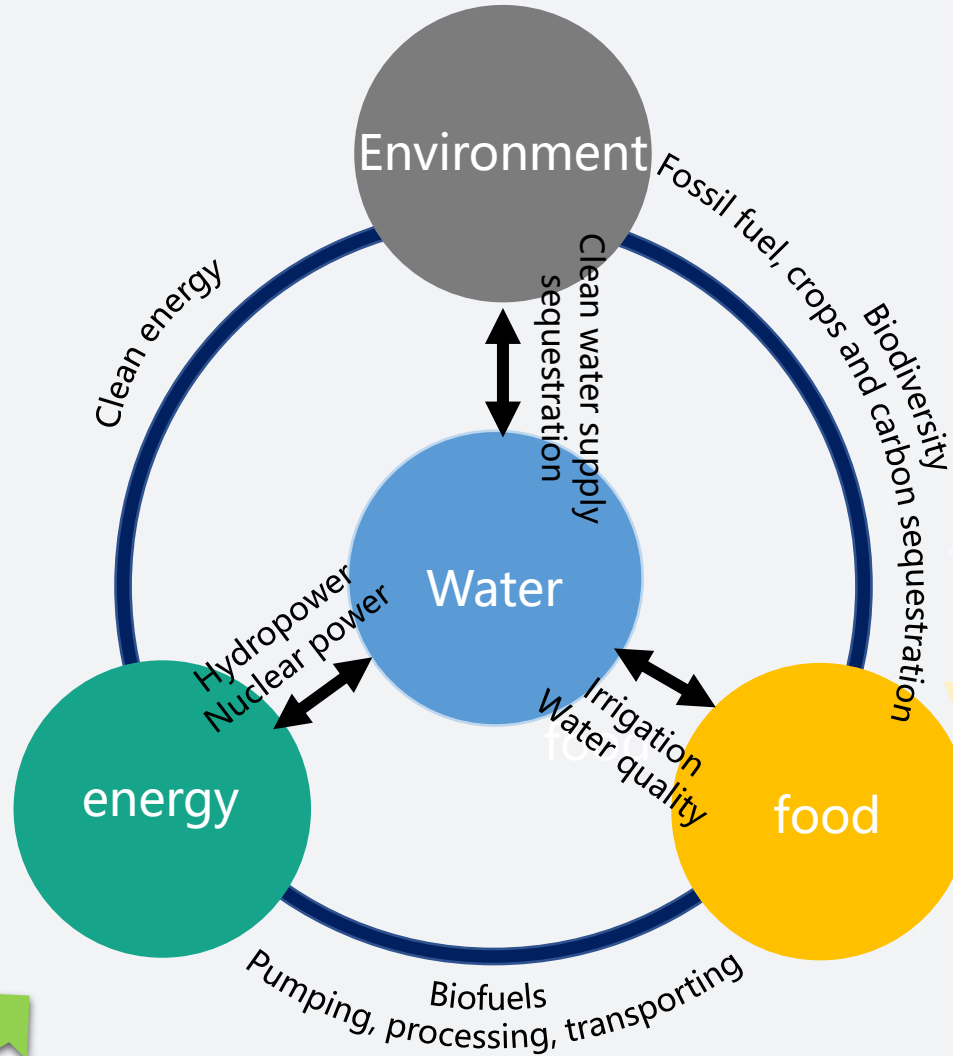
Jiaqing Wang
Tsinghua University

Content

- Background
- Methodology
- Results and Discussions
- Conclusions



WEF nexus
Economic perspective



WEFE nexus
Economic-environment perspective

Goal1: Comprehensive management

- assess synergies and trade-offs across sectors
- predict unforeseen consequences
- generate common interests
- co-optimization

Goal2: Broader solution space

- making it easier for transboundary stakeholders to accept water resource management goals
- identify cooperation opportunities

Life-supporting

130 million people
hydropower/irrigation/fishery/navigation...

Accelerating exploitation

Dam construction projects
Water diversion project (NRLP)
Irrigation area expansion (TRCMRP)...

Environment deterioration

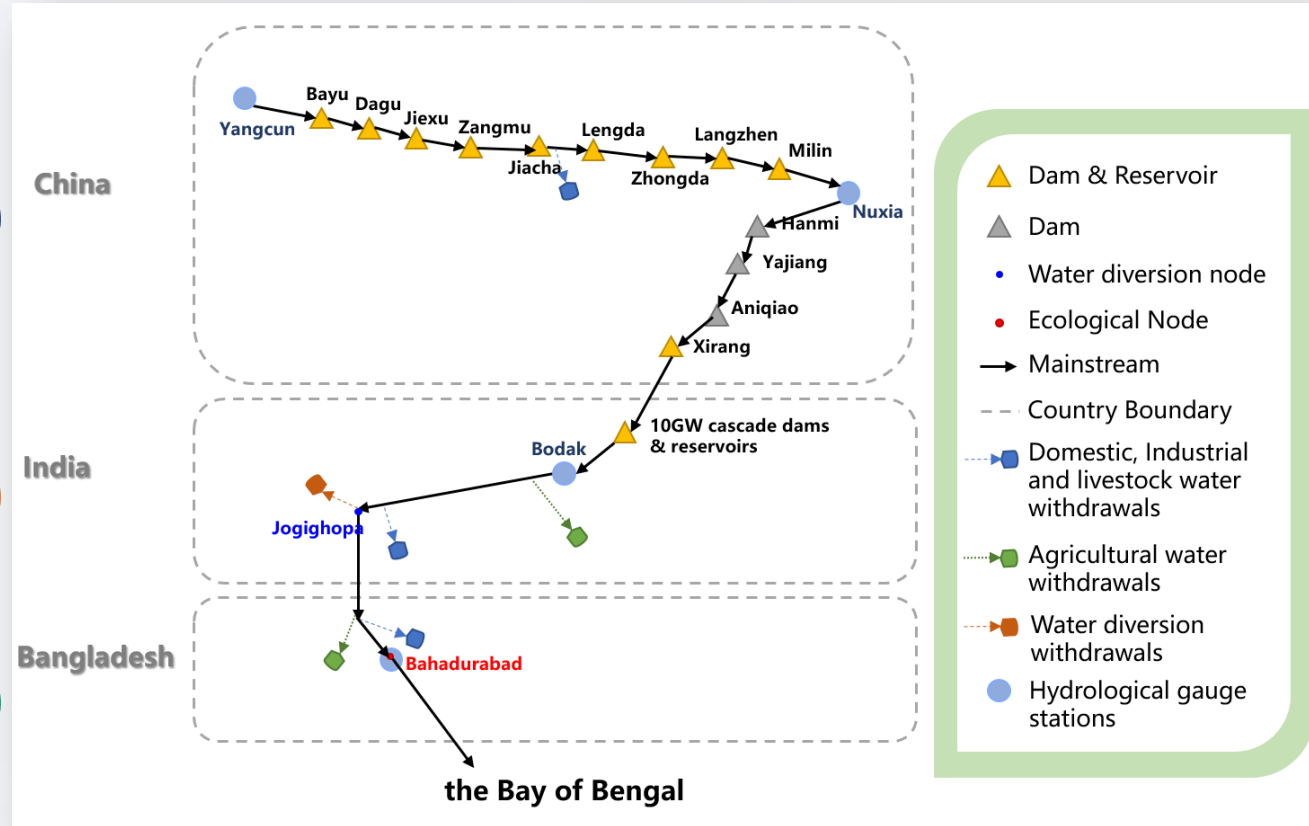
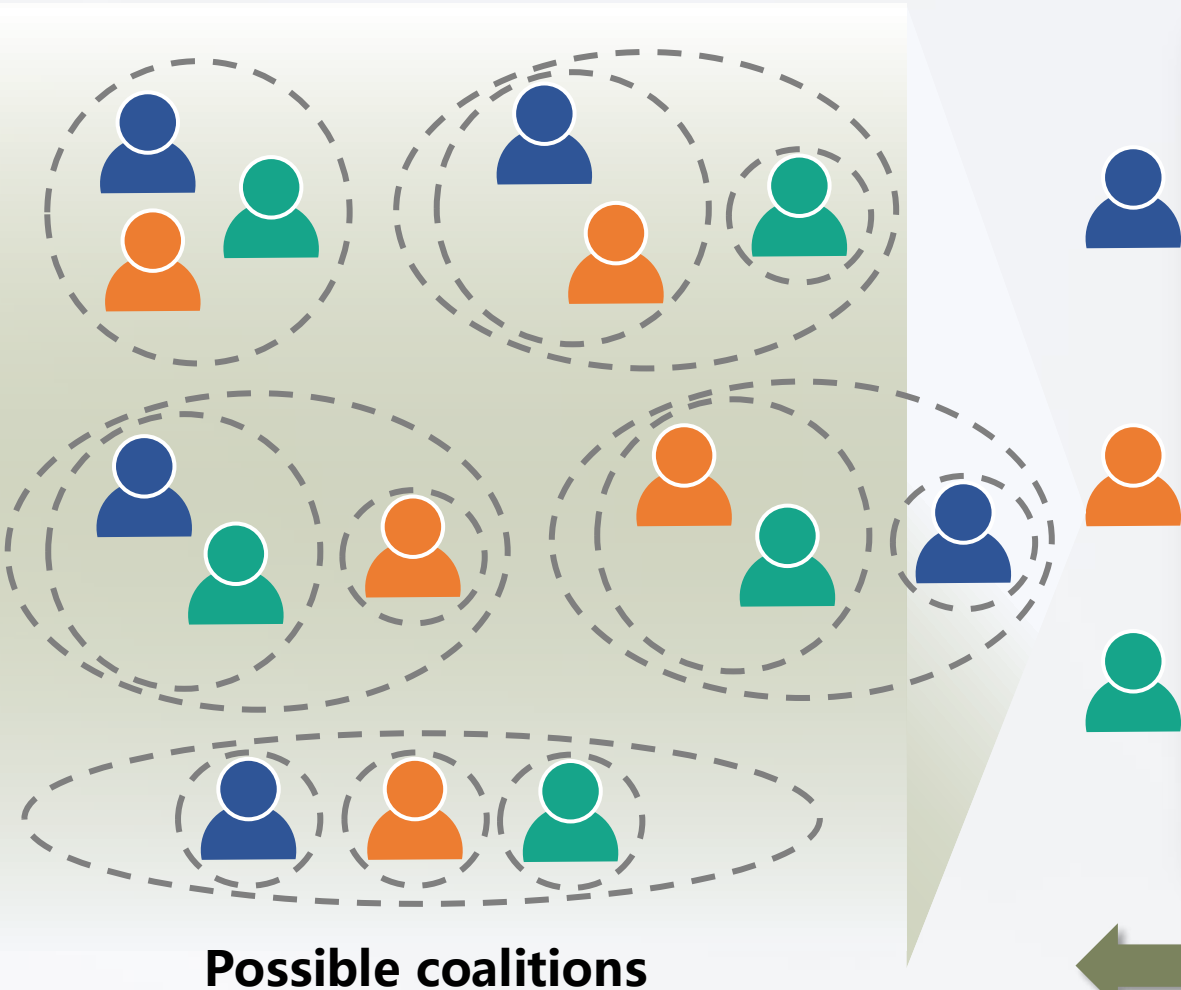
Soil erosion, silting
Decreasing fish production...

Transboundary issues

China, India, (Bhutan), Bangladesh
Cooperation and Conflicts

- ✓ how can we understand **the relationships** between various sectors and **coordinate** their water demands?
- ✓ How do these relationships influence **riparian countries' decisions**?
- ✓ What measures can promote the sustainable development of the BRB under **climate change and water infrastructure development**?

Conceptualize



The link between stakeholders within the basin

Modellize

Modeling

- Hydrological process
- Hydropower generation
- Irrigation
- Sediment transportation
- Fishery production
- navigation

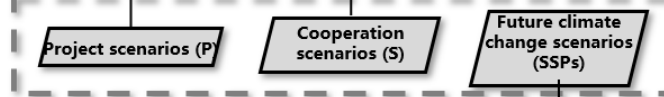
Scenario analysis

- Water infrastructure
- Climate change & Cooperation scenarios
- Environment flow requirements (daily discharge change rate, DDCR)

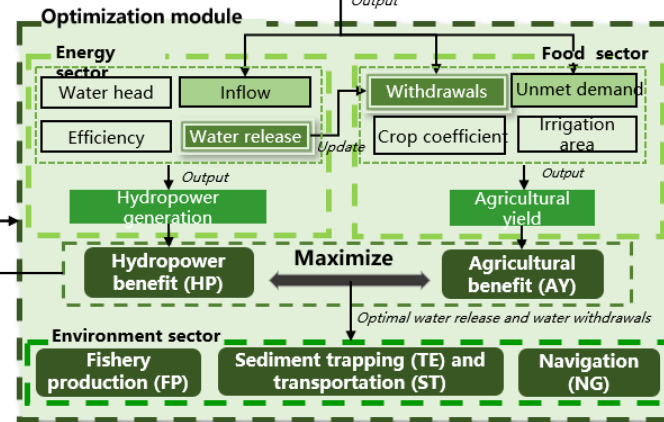
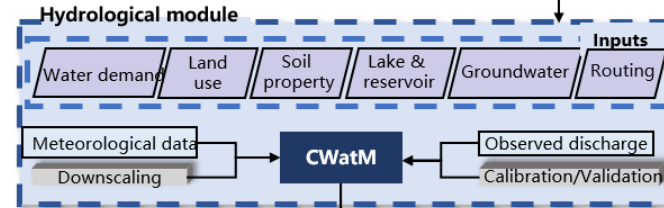
Policy implications

- Balance economic benefits and environment requirements
- Stakeholders' interests & cooperative management

Step1: Scenarios setting



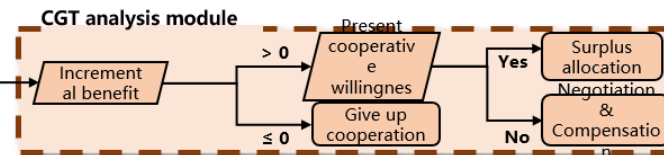
Step2: Direct water benefit calculation



Optimize benefits of various sectors in the WEF-E nexus under different scenarios

Seek for cooperation opportunity and make the cooperation stable

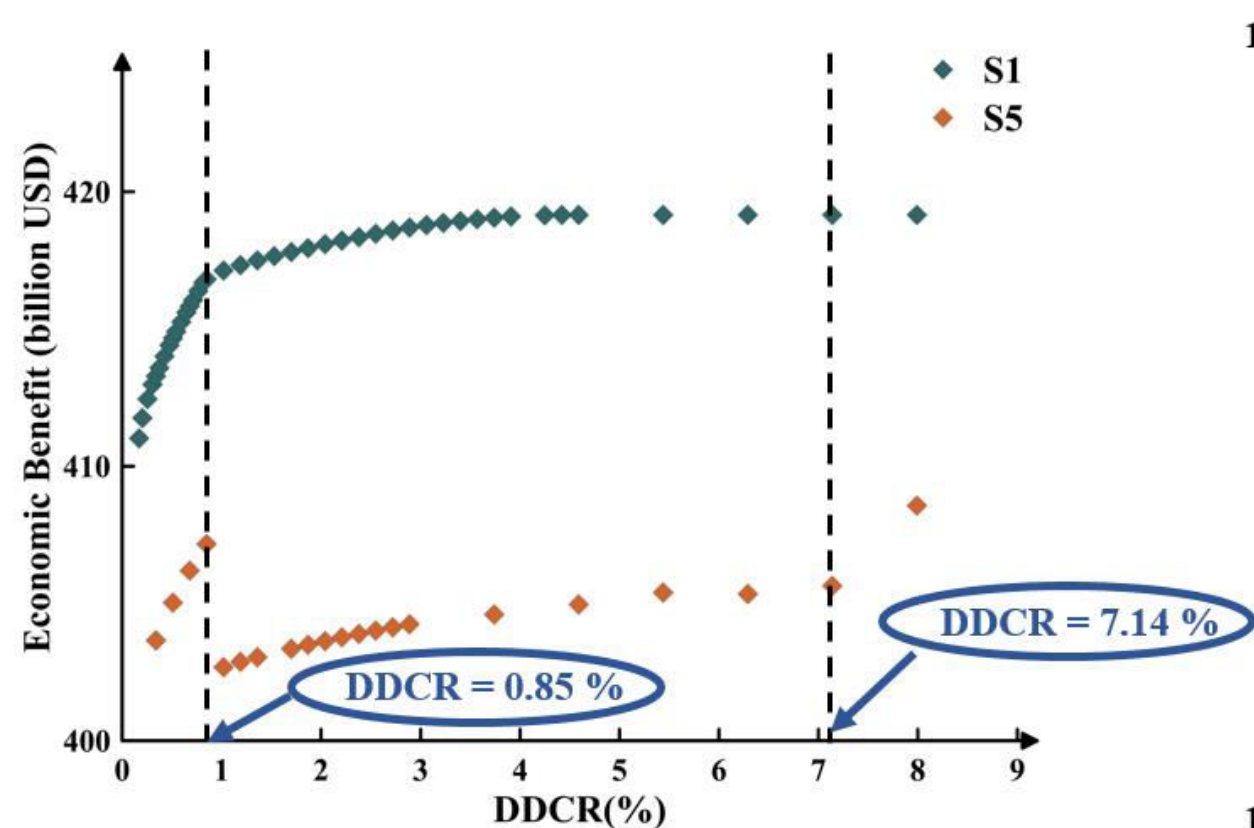
Step3: Benefit reallocation under cooperation



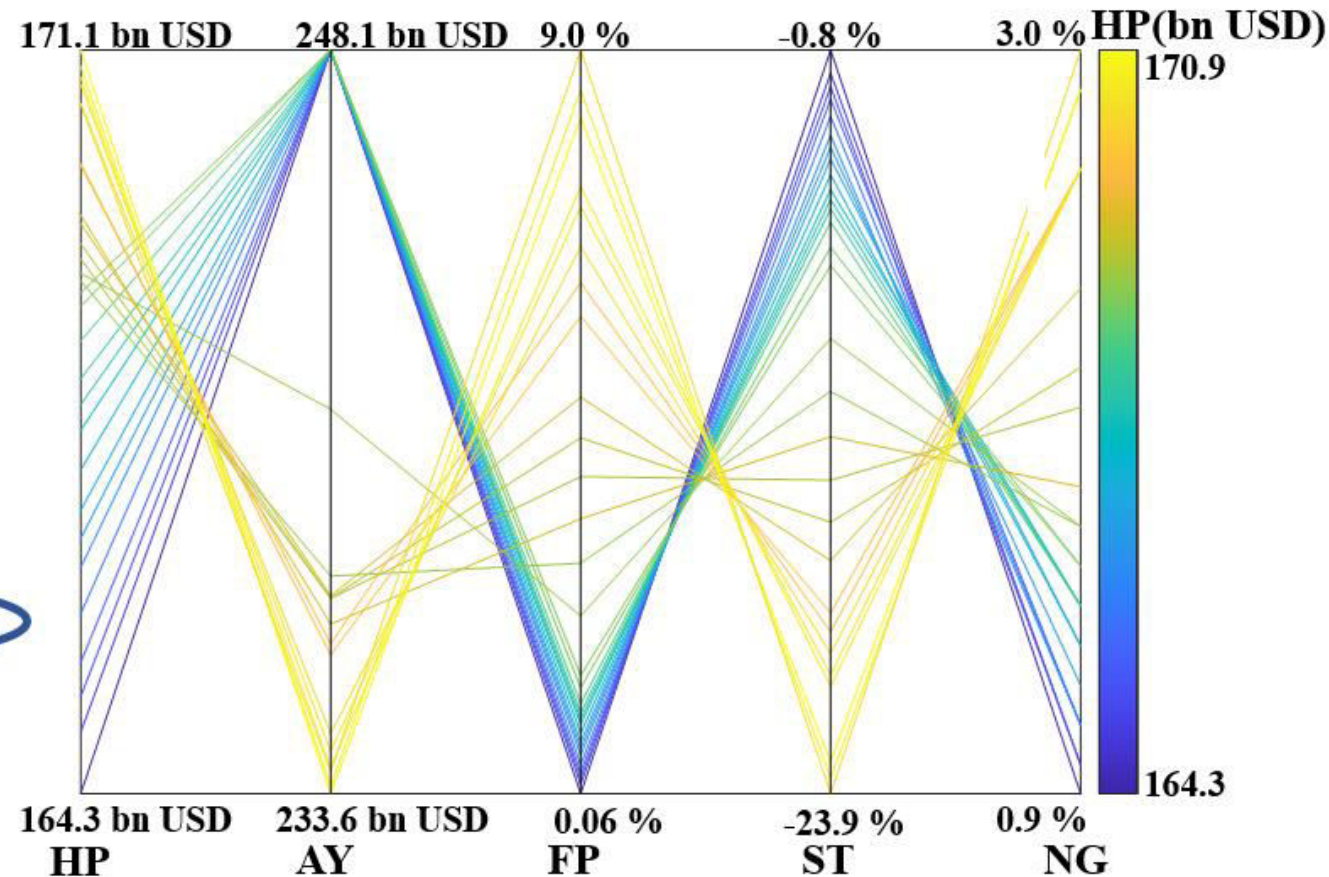
Step4: Scenarios analysis and discussion

- ✓ Impacts of climate change, projects and cooperation Propose suggestions

Implications in WEFE nexus

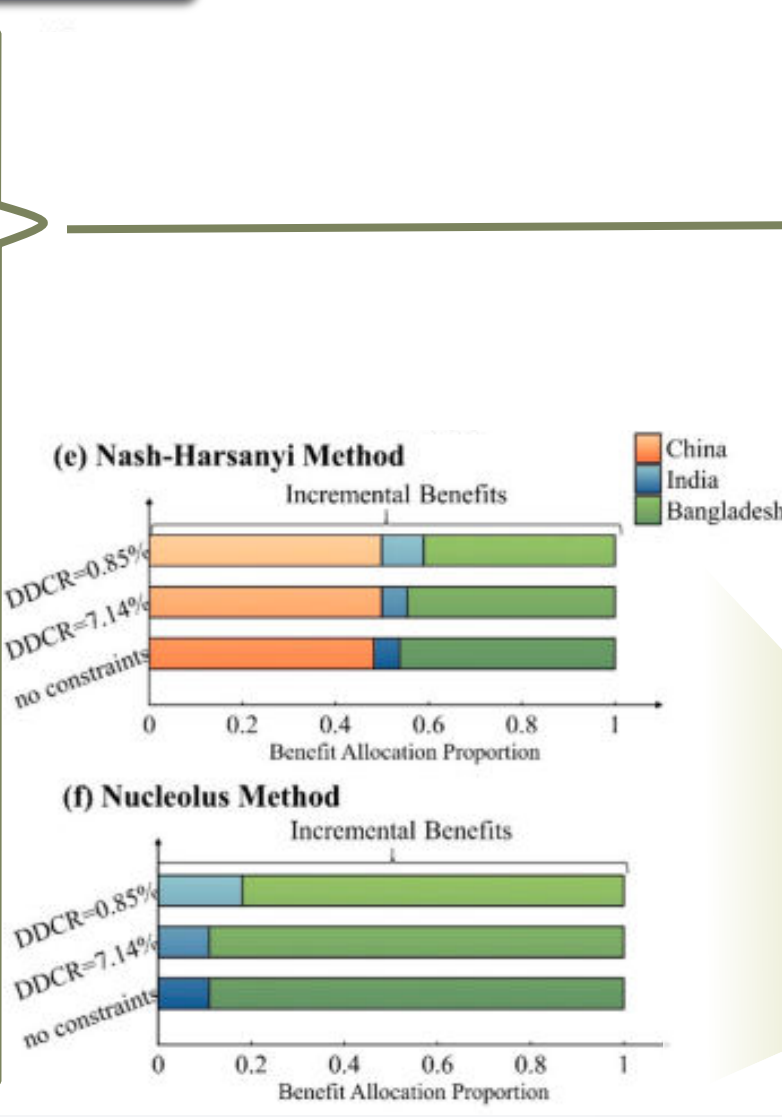
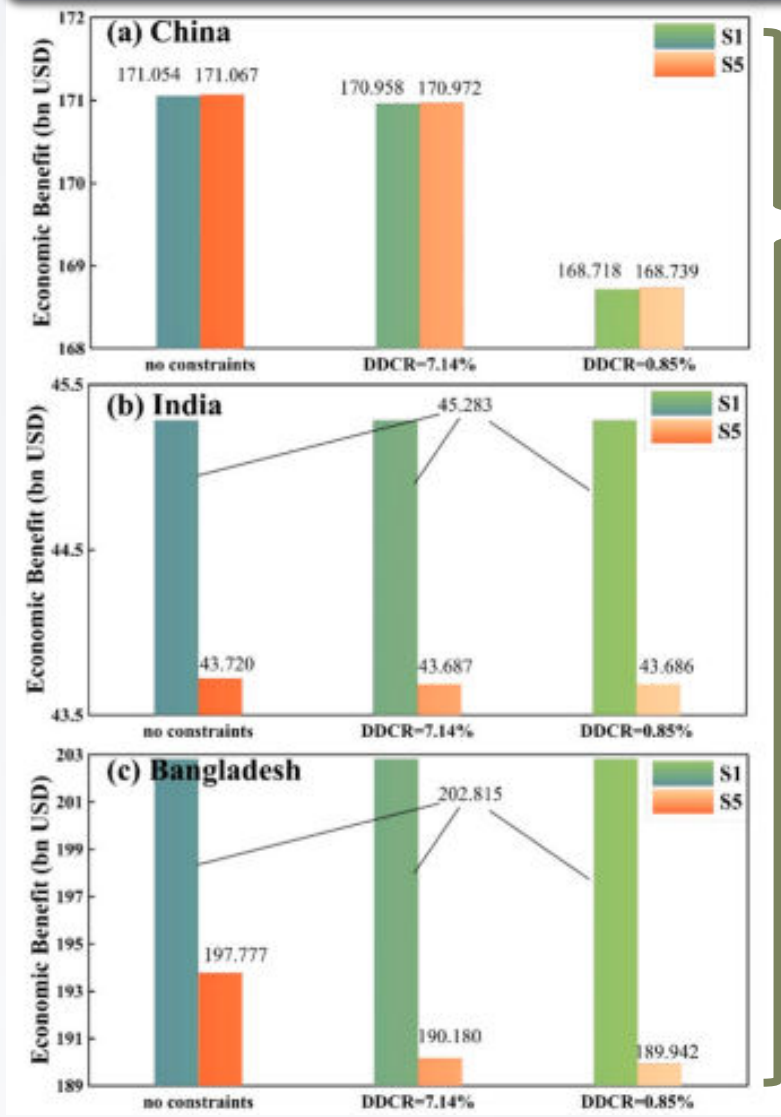


economic benefits & environmental costs
declining marginal value



Energy & Food & Environment sectors
Trade-offs and synergies

Cooperation opportunity and scheme



Total economic benefits improves

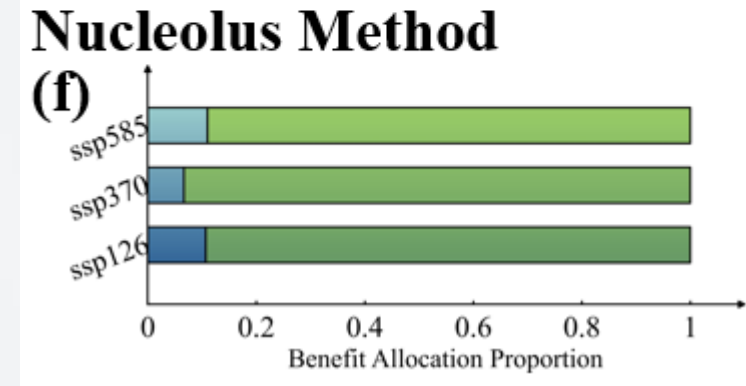
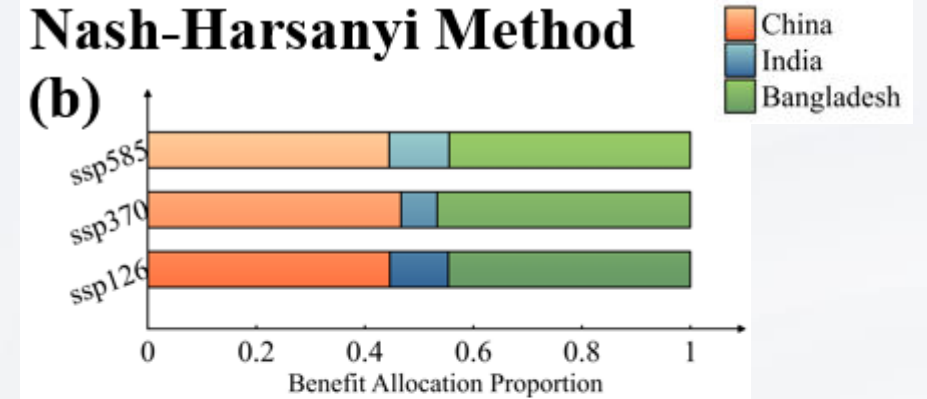
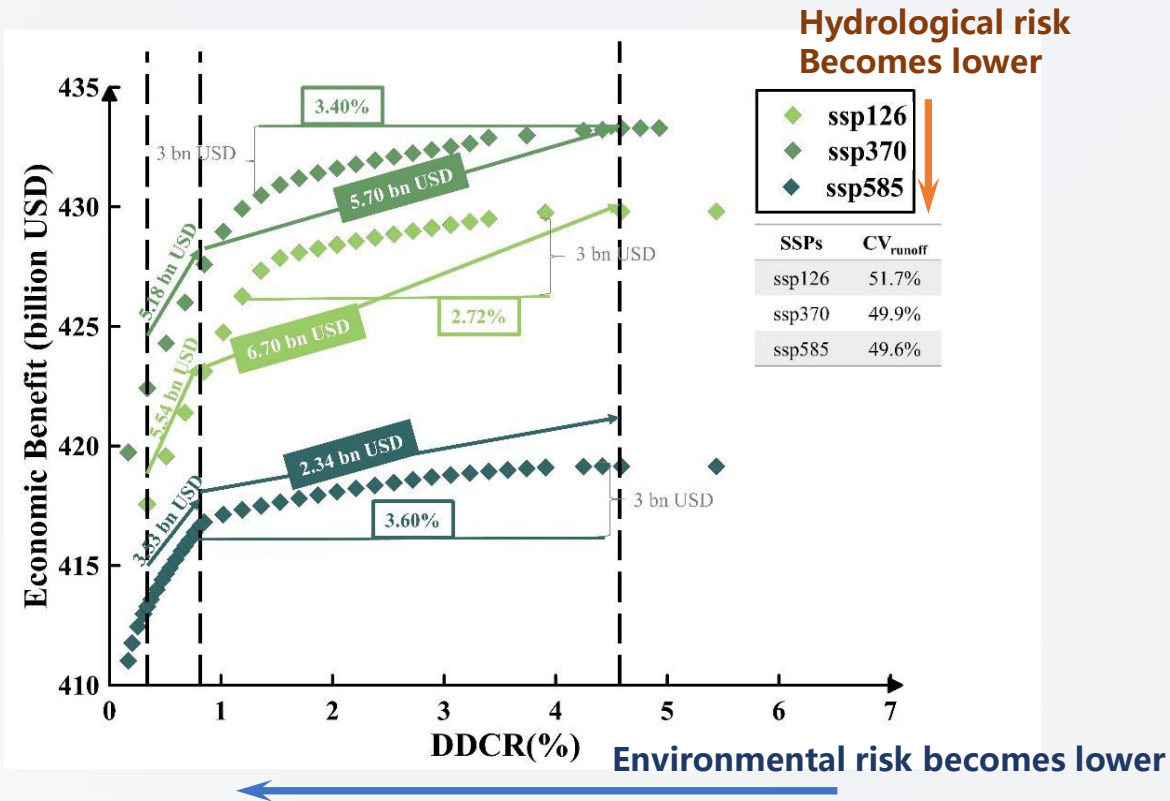
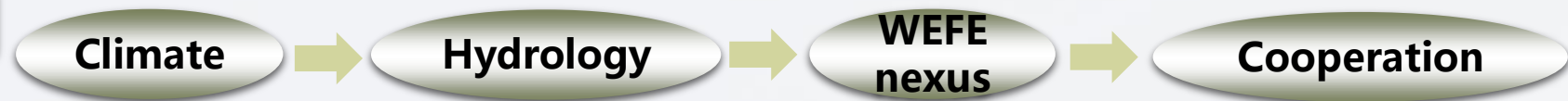
Cooperation opportunity ✓

Cooperation willingness
(not all)

Make cooperation stable

Select suitable
benefit allocation scheme

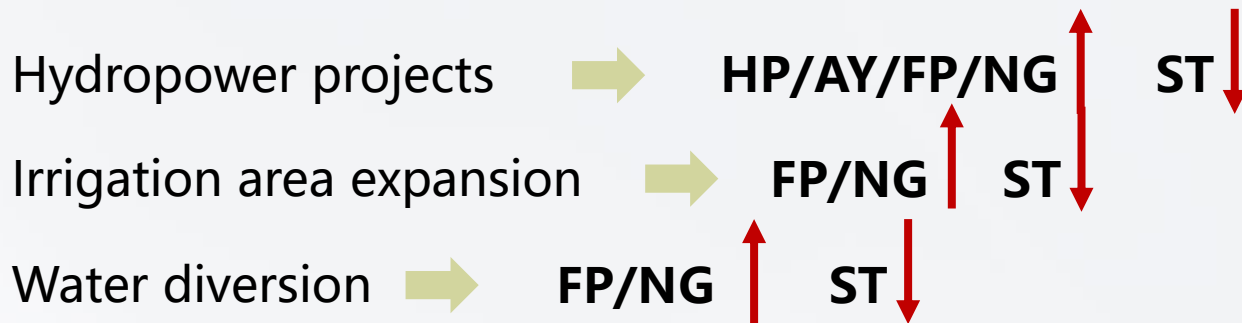
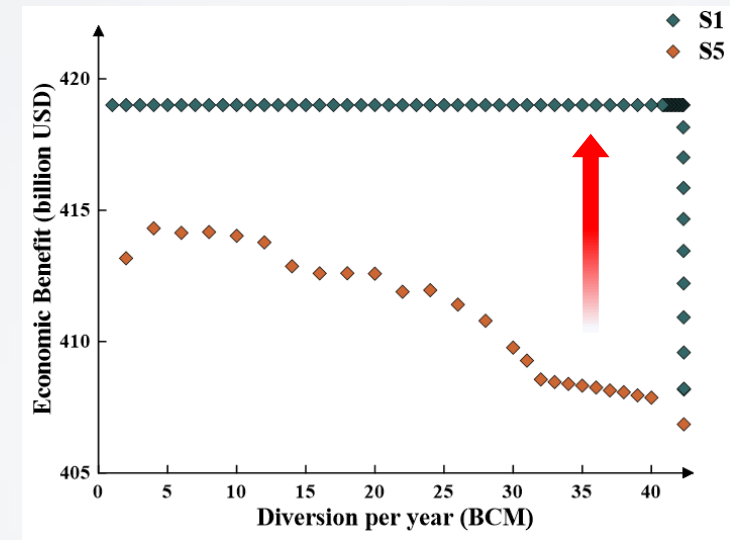
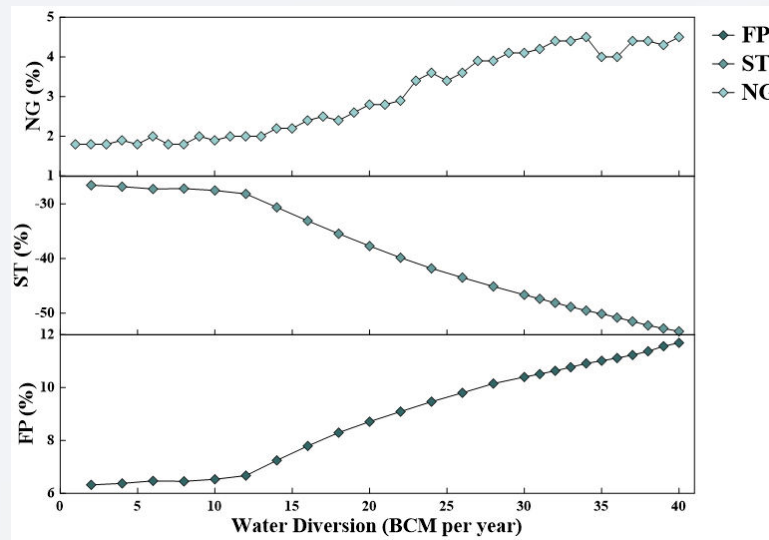
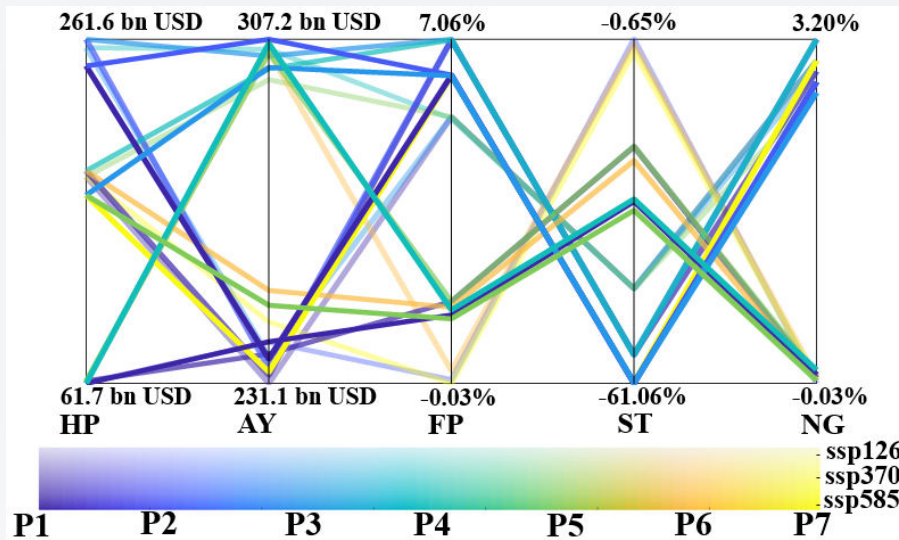
Impacts due to climate change



Hydrological risk ↑ **More money** → Environment restoration

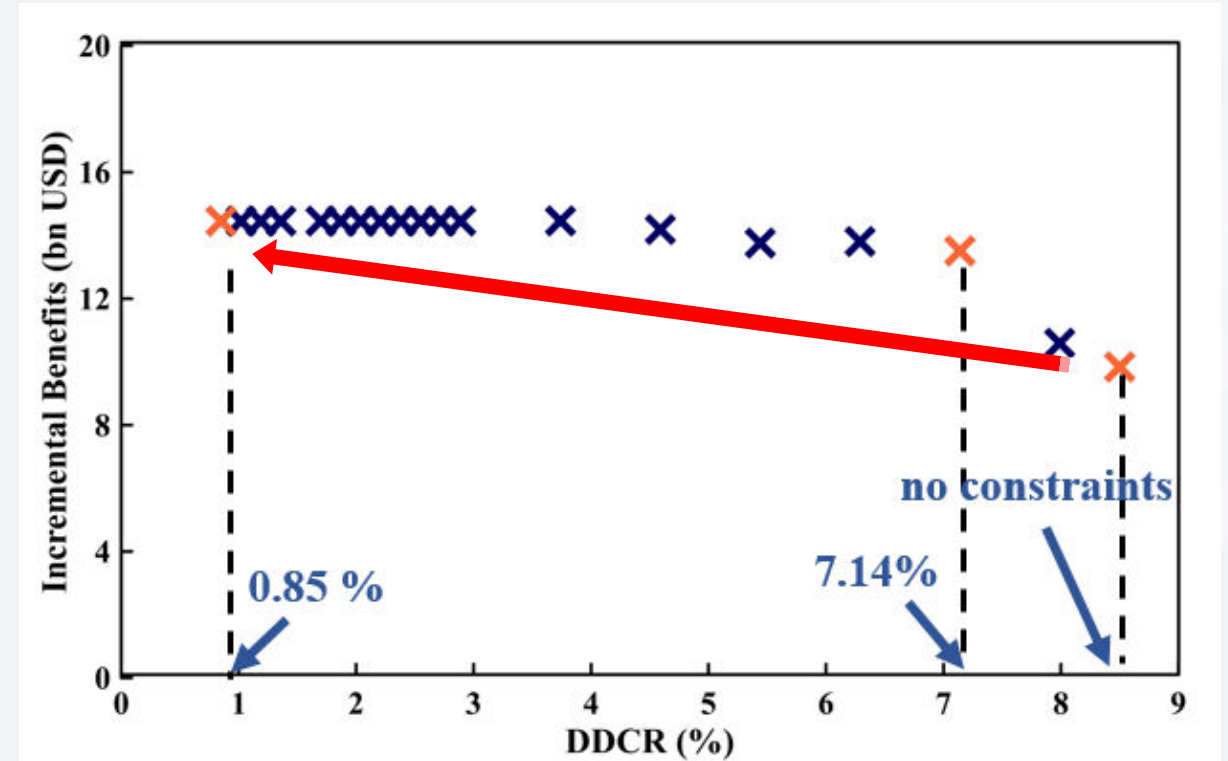
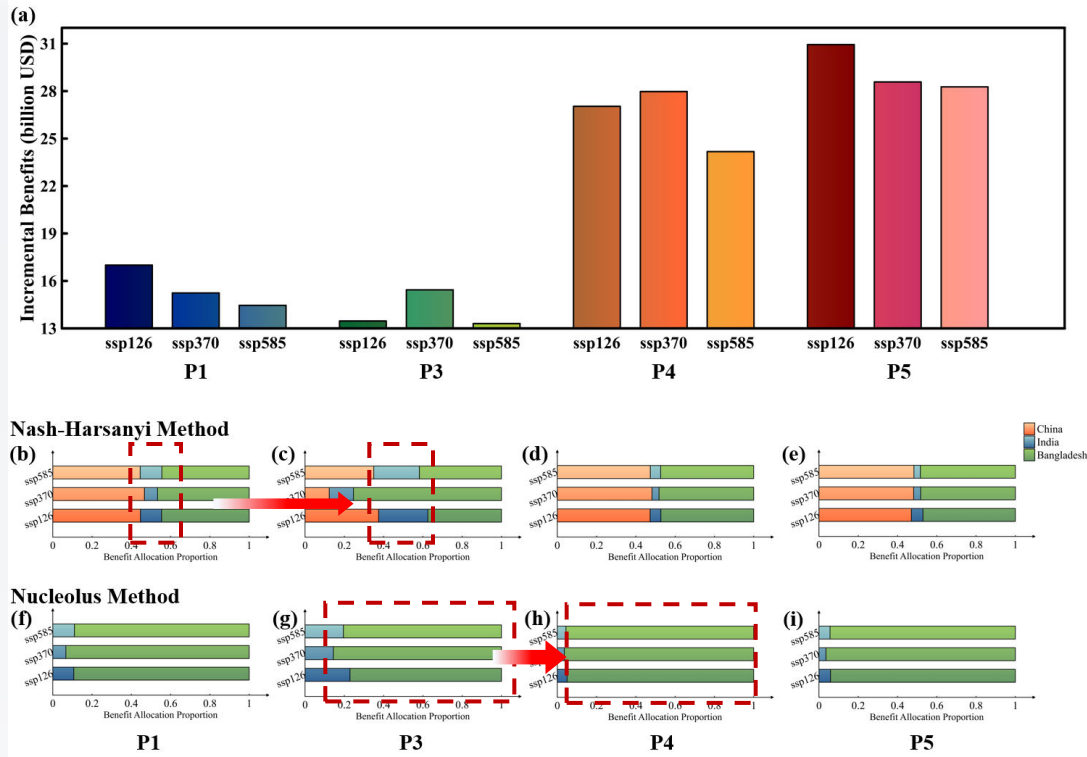
ssp370 { More proportion for **China, Bangladesh**
Less proportion for **India**

Impacts due to water infrastructure development



Basin-wide cooperation can **mitigate negative impact** from water diversion project

Policy implications



Water infrastructure development can **enhance discourse power** of the country on benefit reallocation

The improvement of environmental requirements can lead to a greater **tendency for full cooperation** among countries



Thank you!

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