

Socioeconomic dimension in climate vulnerability assessment

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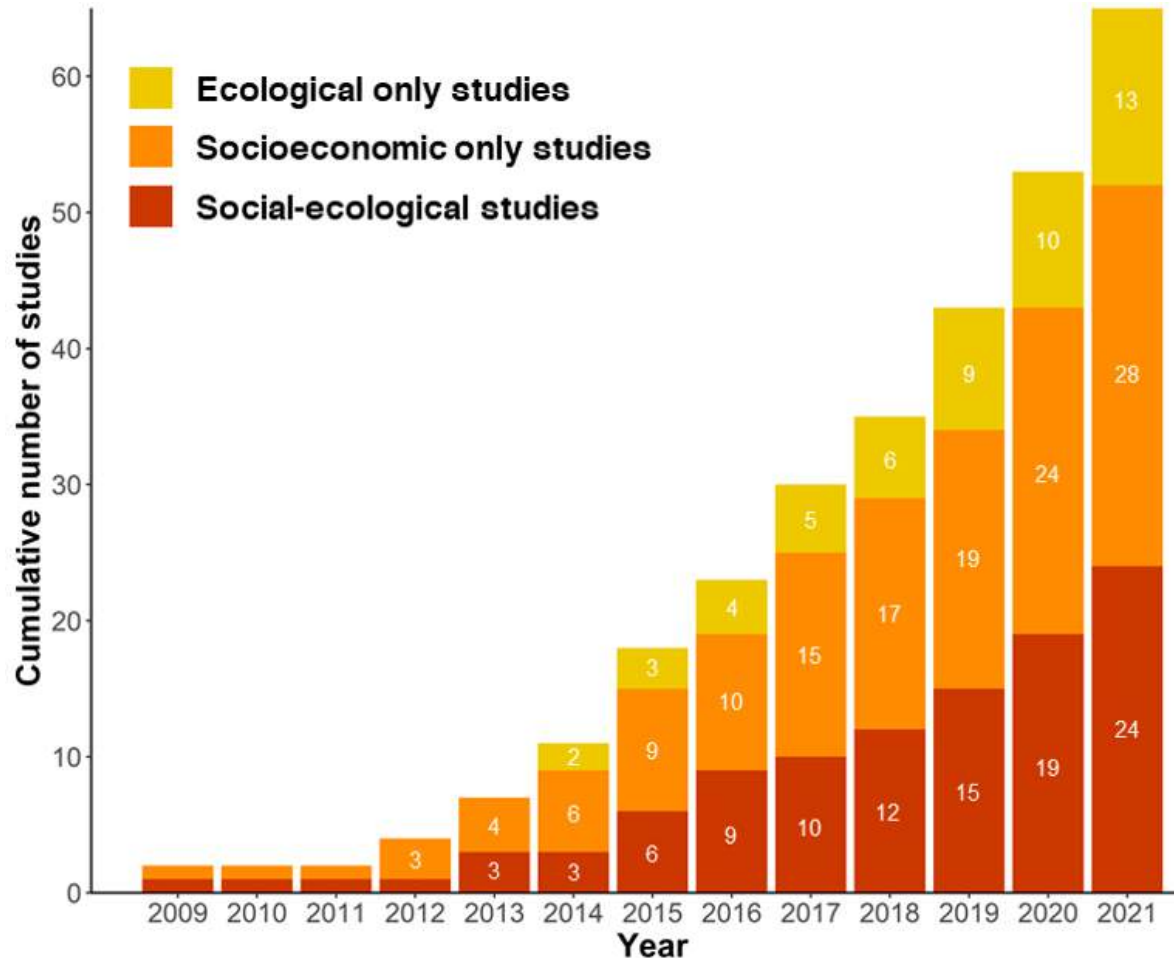


Fishery socioeconomics

- **People and livelihoods:** fishers, crew, processors, dealers, coastal communities
- **Dependence:** income, employment, market reliance, target species dependence, food security
- **Adaptive capacity:** ability to diversify, switch species/grounds/gears, access capital, knowledge, and governance support



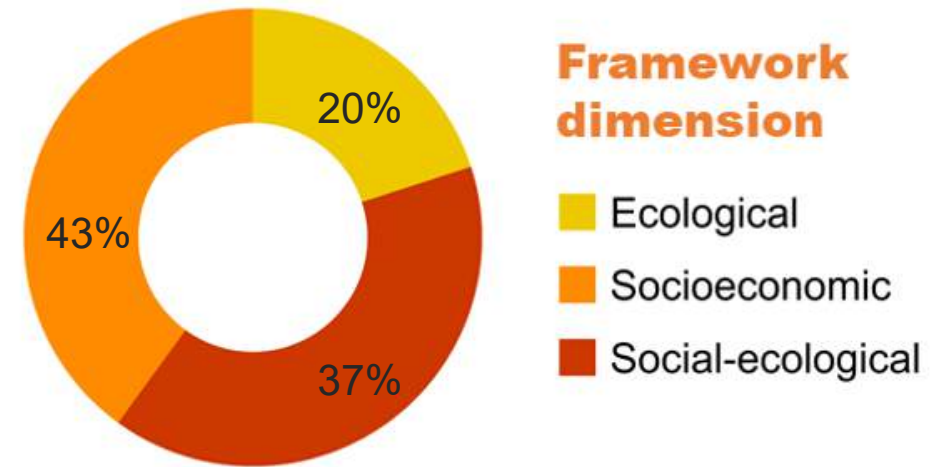
Global trends in fishery CVA



Ecological: species, stocks and habitats

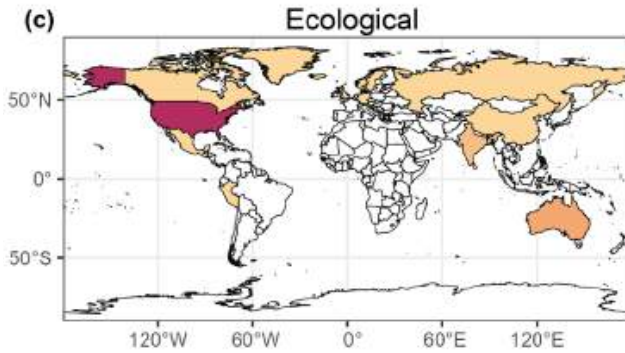
Socioeconomic: fishing communities and stakeholders

Social-ecological: complex interactions between species, resource users, and management

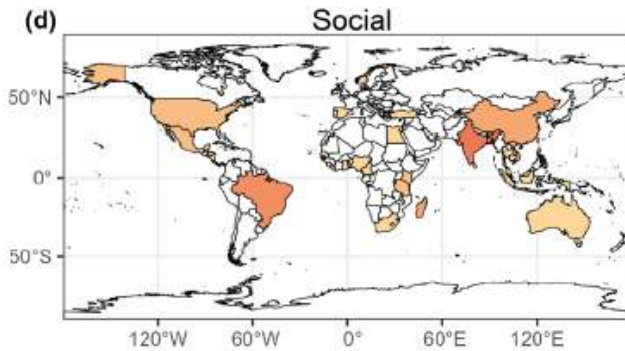


80% of fishery CVAs have a socioeconomic component!

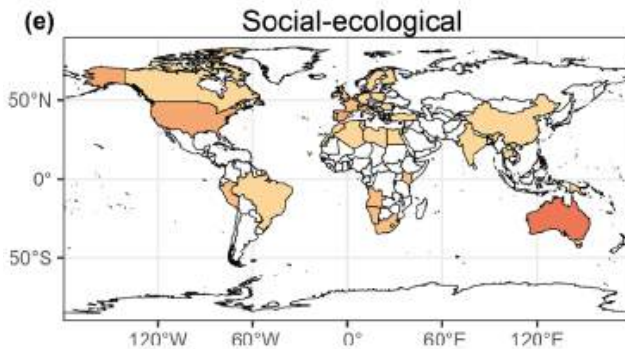
Global distribution of fishery CVAs



Primarily concentrated in temperate regions, especially the U.S. and Australia



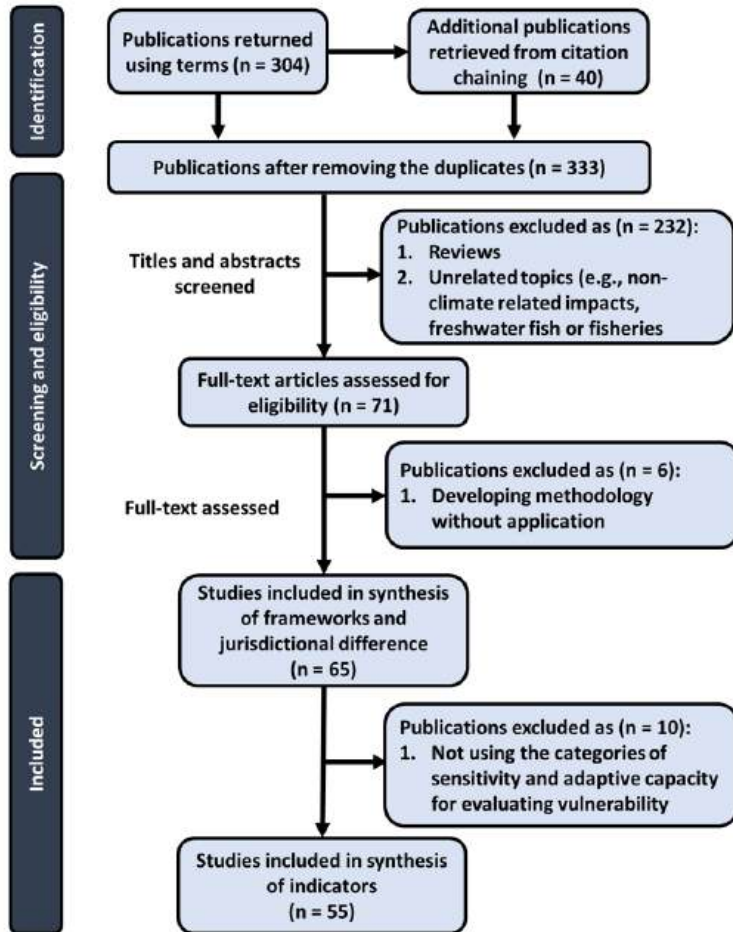
Prevalent in tropical regions and major fishing nations: the Philippines, India, Brazil, and China



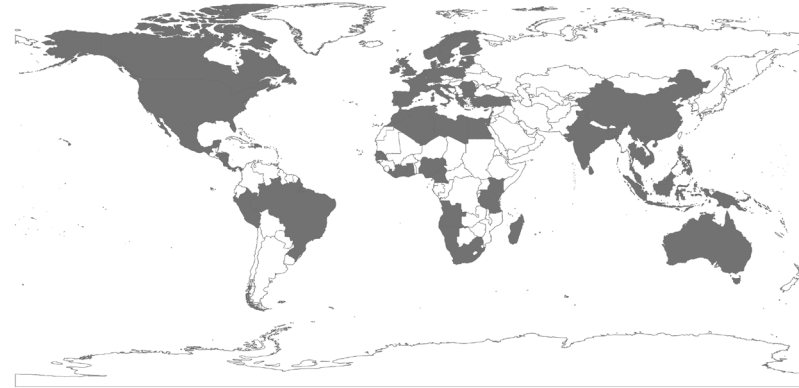
More commonly implemented in developed countries with more experience in ecological or socioeconomic CVAs: Australia, the U.S., and European countries

Global inventory of CVA indicators

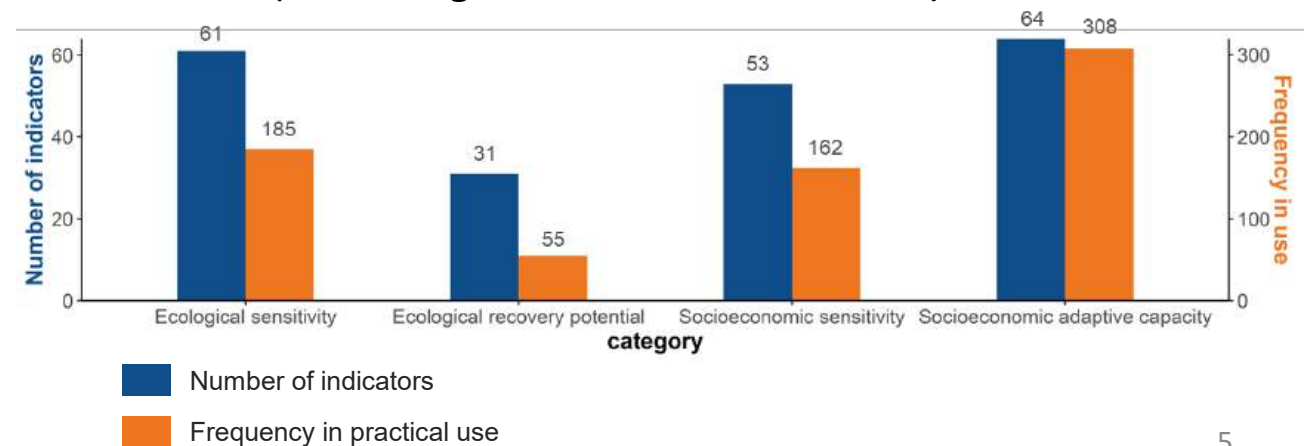
How is vulnerability measured?



Literature review of 55 studies



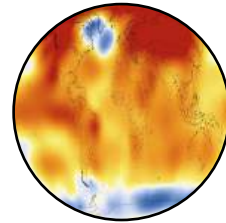
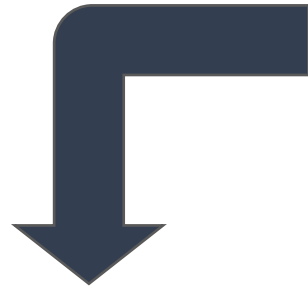
Synthesize 209 indicators and their use (92 ecological, 117 socioeconomic)



Use of socioeconomic indicators

Climate hazards

(Oceanographic)



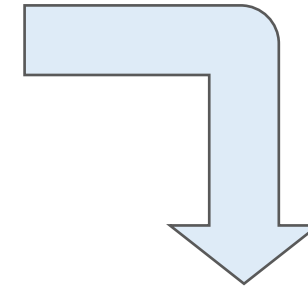
Warming



Sea level rise



Extreme weather



Ecosystem/species/habitat

(Ecological)



Changes in marine ecosystems and species

Country/region/community

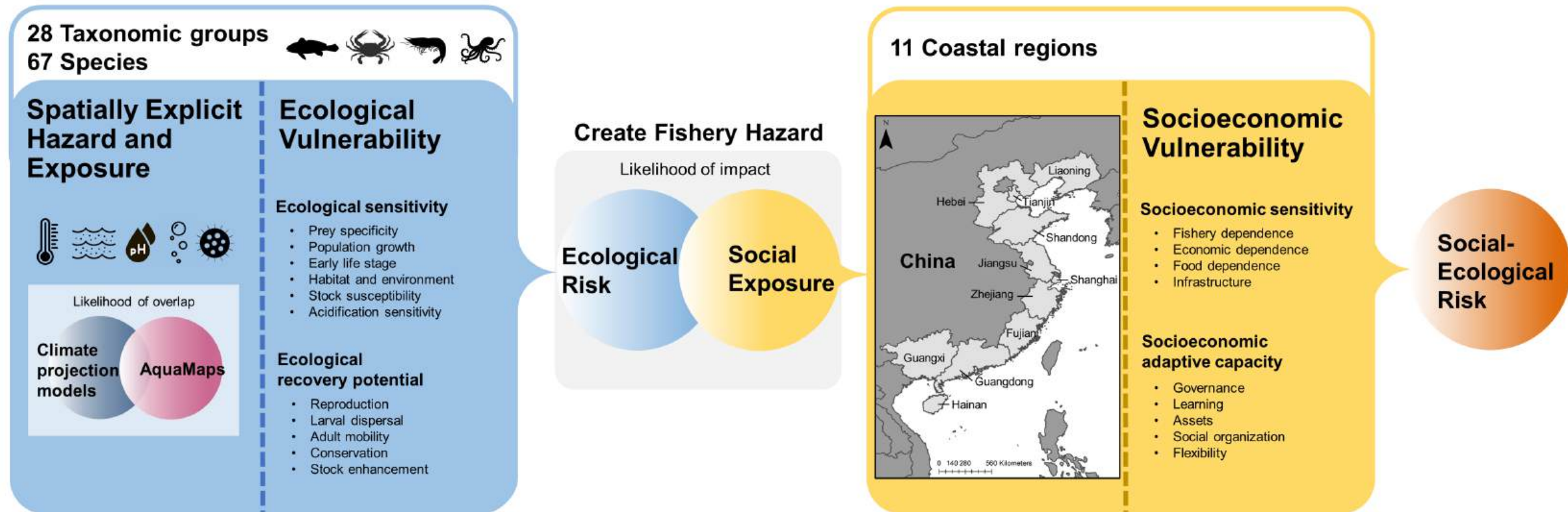
(Socioeconomic)



Vulnerability of fisheries and livelihoods

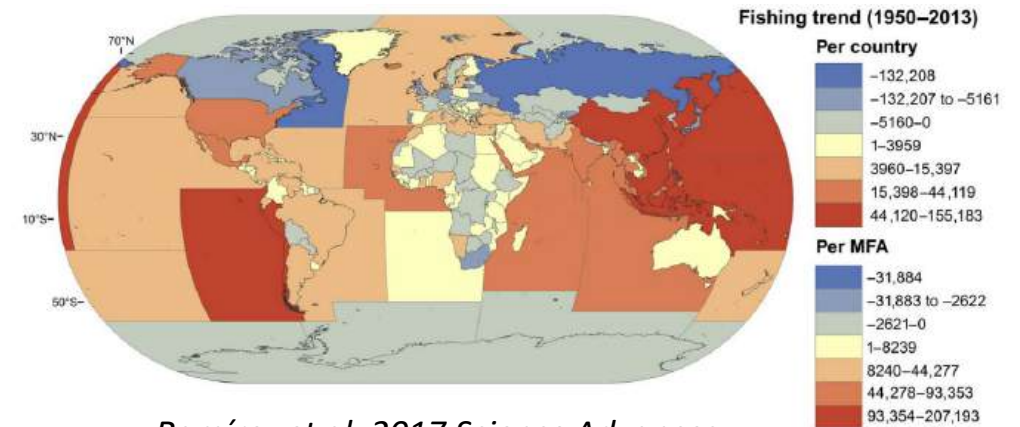


Fishery Social-ecological Climate Risk Assessment



Brief overview of the Chinese fishery

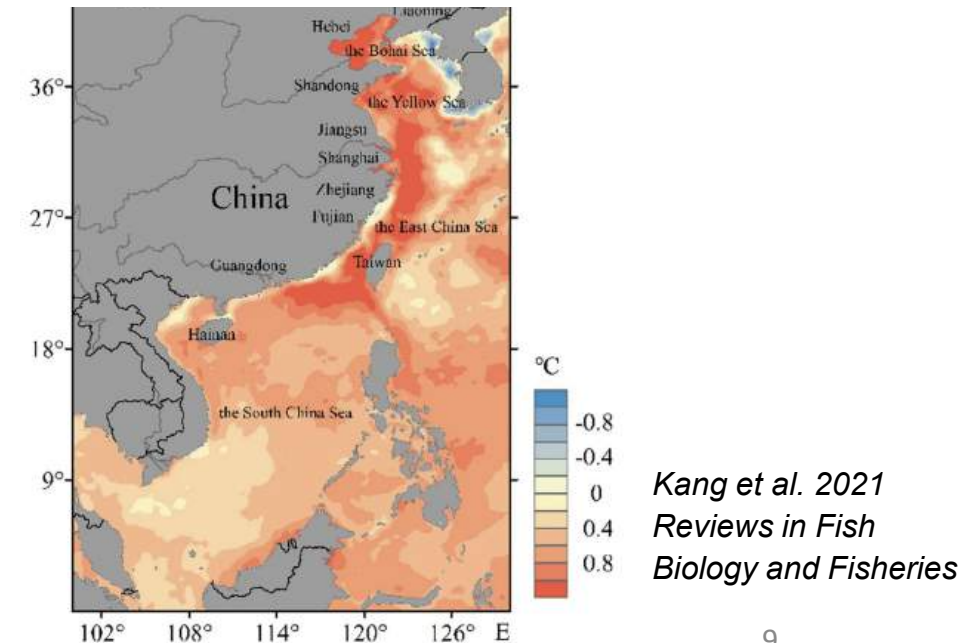
- World's largest producer and exporter of marine fish and fishery products
- Declining stocks due to overfishing, habitat loss, and marine pollution, with roughly 57% of fish stocks overexploited or collapsed (Cao et al. 2017)
- China's coastal large marine ecosystems are climate-impact hotspots, experiencing long-term warming, species distribution shifts, and catch composition changes
- Climate change impacts have not been taken into account in fisheries management and decision-making



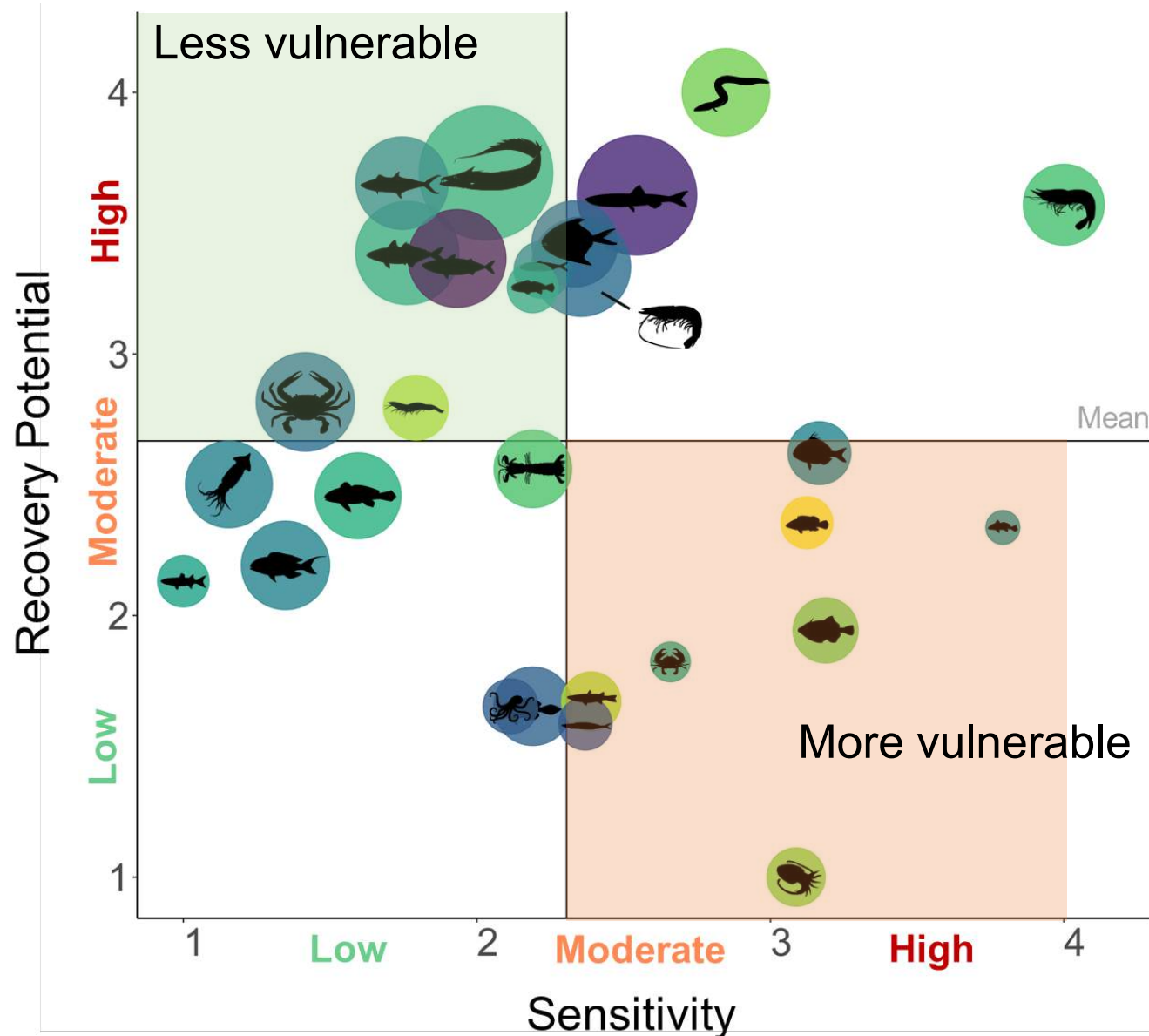
Ramírez et al. 2017 Science Advances

What this framework offers:

- A holistic evaluation of ecological, socioeconomic, and governance components
- Benchmark social and ecological risk of fishery systems
- Identify the strengths that boost resilience and/or weaknesses that cause vulnerability in the system
- Support decision-making on adaptation planning and prioritization



Ecological: Varied species vulnerability

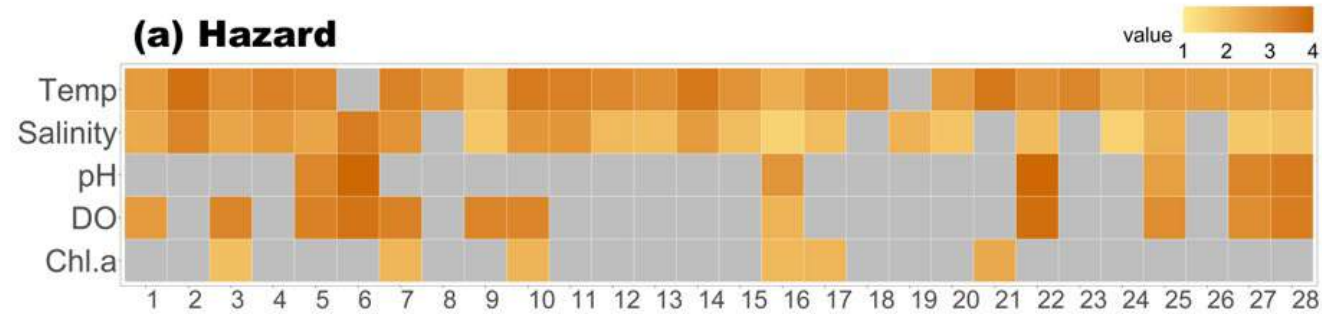


Species that have managed to survive the stress of overfishing **also** demonstrate a remarkable ability to adapt to climate change

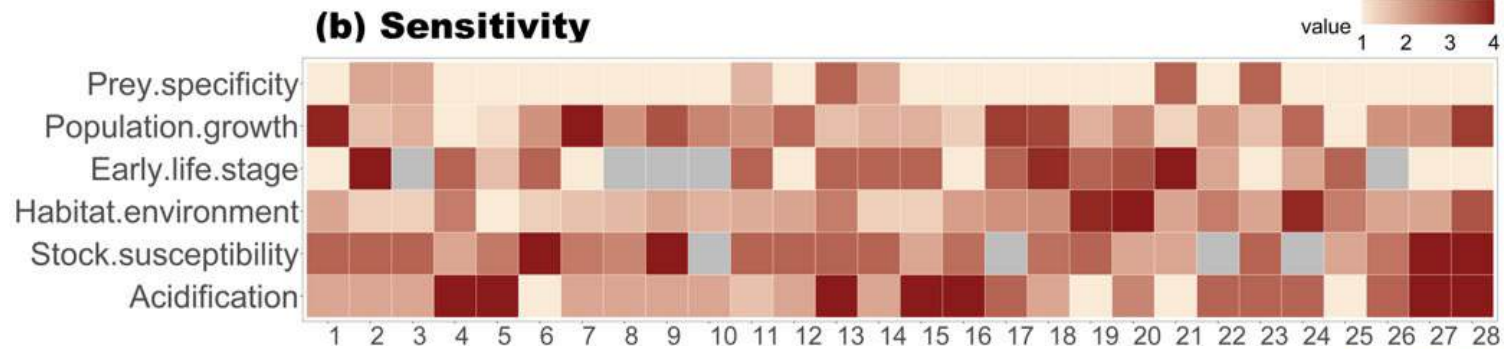
Resilient biological traits

More conservation attention

Ecological: Multiple factors contribute to ecological risks



→ Major hazard

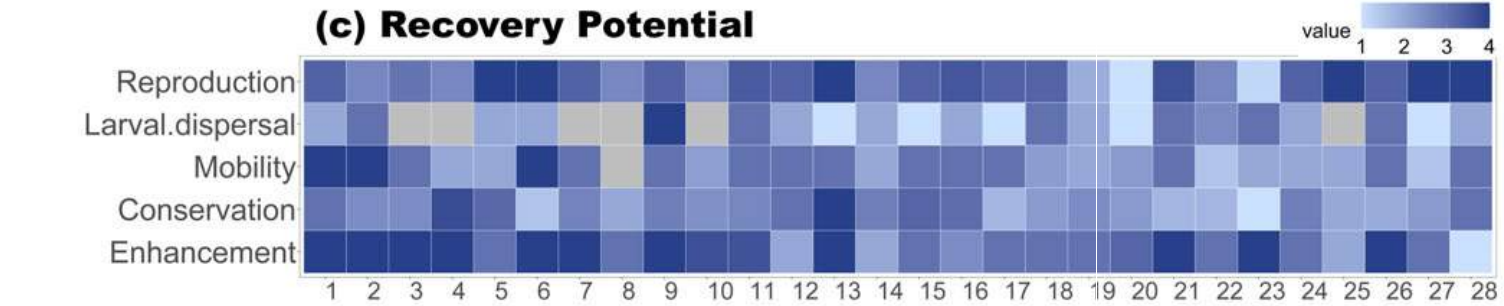


→ Resilience

→ Data gap

→ Vulnerability

→ Vulnerability



→ Resilience

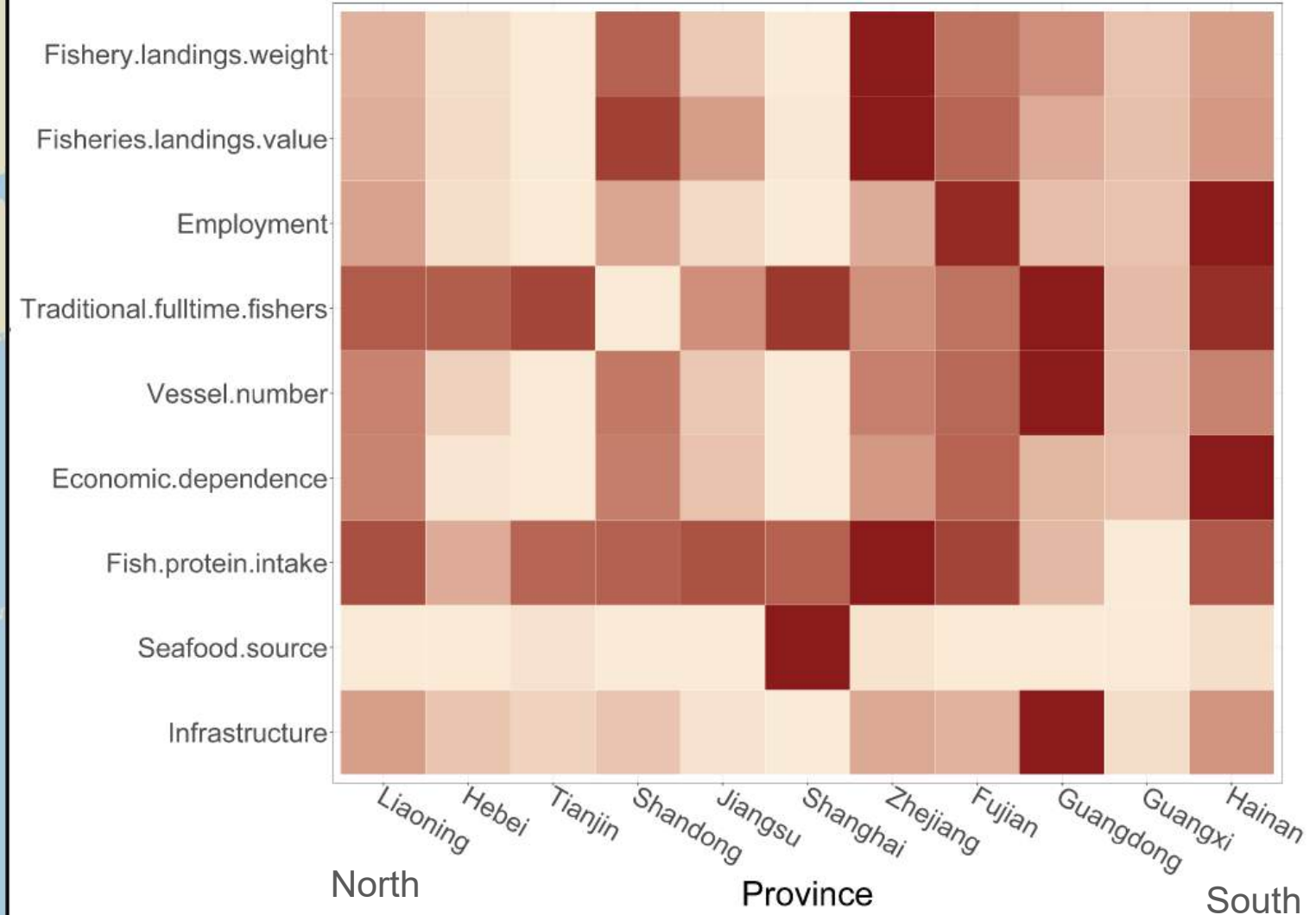
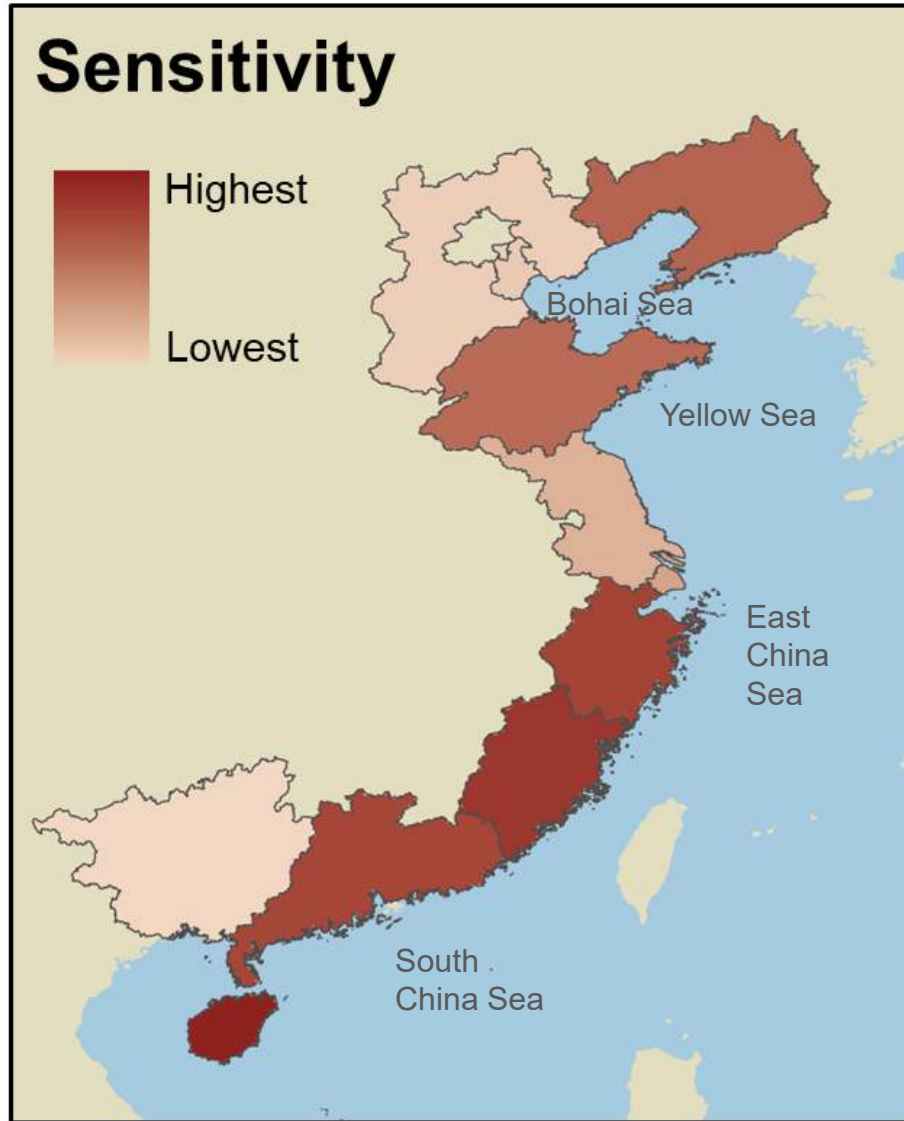
→ Data gap

→ Resilience

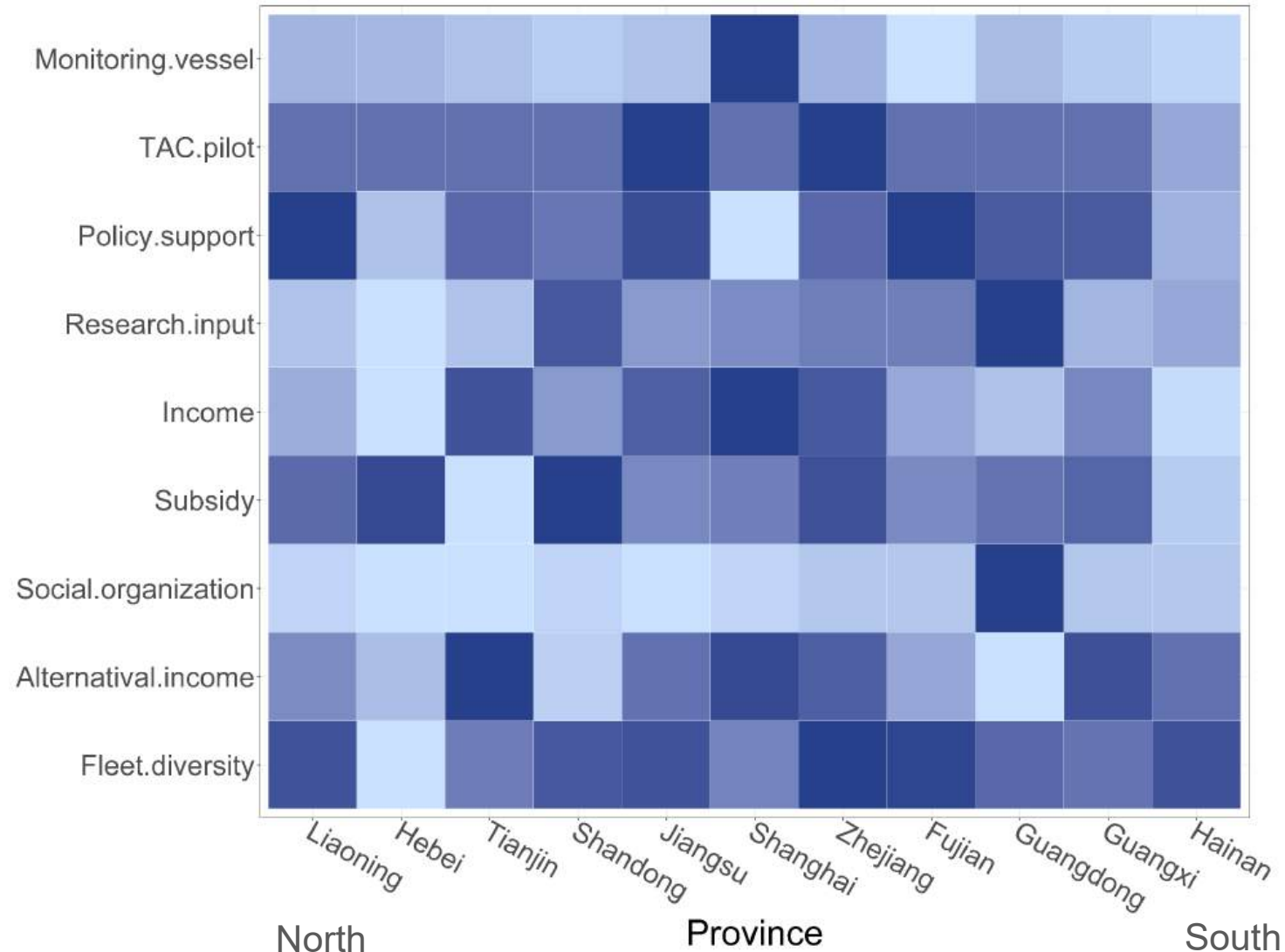
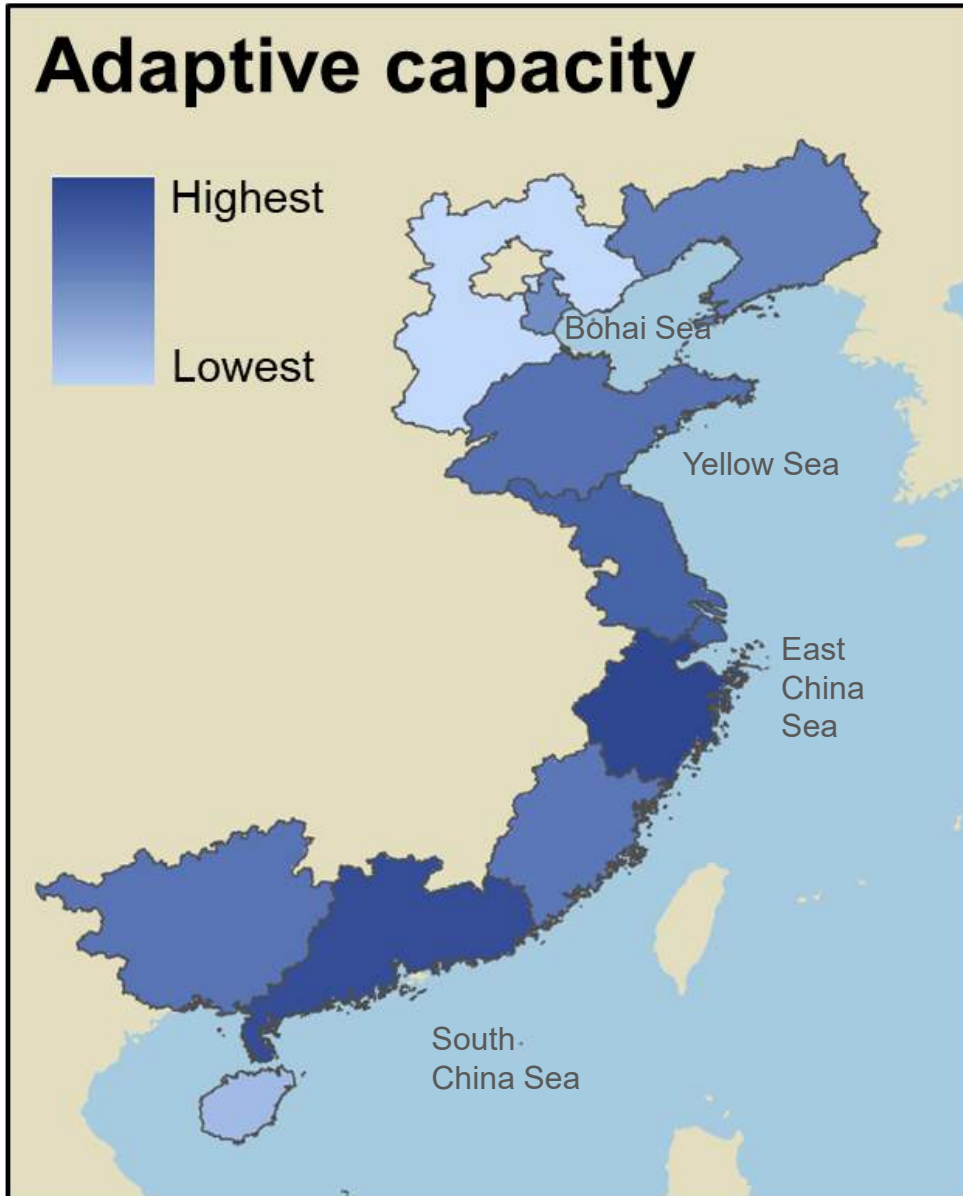
→ Resilience

→ Resilience

Socioeconomic: Regional variations in fishery dependence



Socioeconomic: Regional variations in adaptation challenges



Policy: Institutional challenges

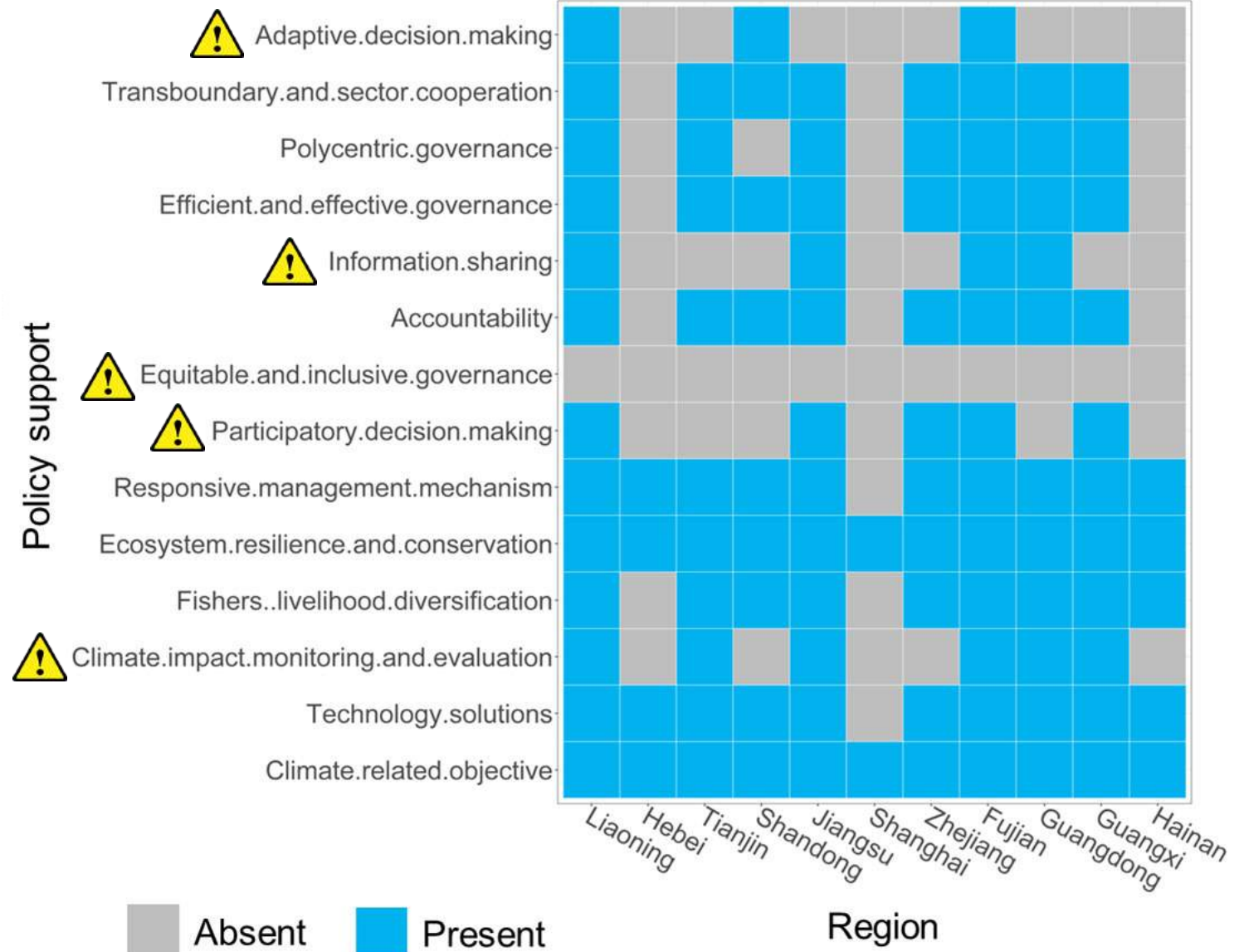
Governance attributes

(Mason et al. 2022. Fish and Fisheries)



- **Potential areas for improving fisheries governance to support climate-resilient fisheries**

Review of regional policy documents



Thank you!

Global Change Biology

REVIEW |  Open Access |  

A global synthesis of climate vulnerability assessments on marine fisheries: Methods, scales, and knowledge co-production

[Yunzhou Li](#)  [Ming Sun](#), [Kristin M. Kleisner](#), [Katherine E. Mills](#), [Yong Chen](#)

PNAS

RESEARCH ARTICLE | SUSTAINABILITY SCIENCE



Social-ecological vulnerability and risk of China's marine capture fisheries to climate change


[Yunzhou Li](#)^{a,b,1} , [Ming Sun](#)^{a,b} , [Xiangyan Yang](#)^{a,b} , [Molin Yang](#)^a, [Kristin M. Kleisner](#)^c, [Katherine E. Mills](#)^d, [Yi Tang](#)^e, [Feiyan Du](#)^f, [Yongsong Qiu](#)^g 
[Yiping Ren](#)^h, and [Yong Chen](#)^{a,b} 

FISH and FISHERIES



ORIGINAL ARTICLE

Climate Vulnerability Assessments in Marine Fisheries: Taking Stock and Looking Ahead

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