Using the ecosystem services framework to link research and policy-making: a case study on Lake Tai, China

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Lake Tai (Taihu)

- 3rd largest freshwater lake in China
- **Surface area:** 2338 km^2
- **Average depth:** 1.9 m
- One of the wealthiest and most industrialised regions in China

Yangtze

SHANGHAI

Lake Tai

Multiple Stressors

Stressors	Causes
Chemical pollution	1) Industrial chemical factories 2) Municipal wastewater 3) Agricultural & aquaculture
Wetland reclamation	• Rising population & urbanisation • Increasing agriculture
Water shortage during dry season	• Shallow lake • Unsustainable water abstraction
Decrease in lake connectivity	Flood control projects

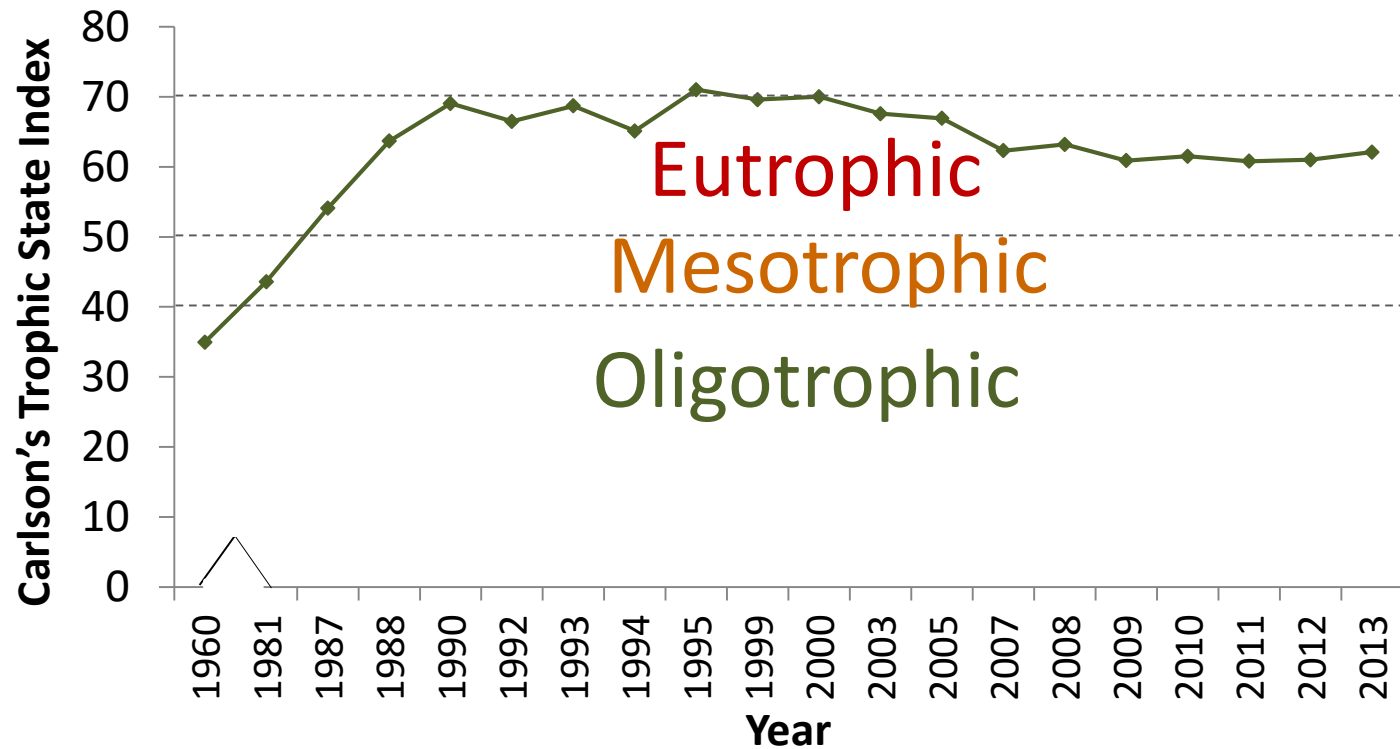# Eutrophication: temporal changes

Figure: Changes in the trophic state index of Lake Tai from 1960-2013 (<30-40: oligotrophic, 40-50: mesotrophic, 50-70: eutrophic).

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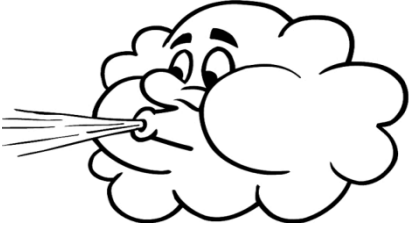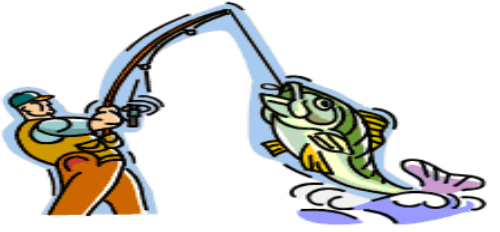
Ecosystem Services

"Benefits that we receive from ecosystems"

- Links human society to ecosystems
- Ensures what we protect is valued by stakeholders

Ecosystem services of Lake Tai

Provisioning	Regulating	Cultural
Freshwater	Flood Regulation	Tourism
Food (fish & crabs)		Religious sites
Food (aquatic plants)	Water filtration	Origin of Wu-Yue culture
Taihu pearls	Micro-climate regulation	Recreational values
Taihu rocks		

Protection Goals

1) What do we want to protect?

2) Where to protect it?

3) Over what time period?

- Chemical legislations have general protection goals
- **Specific protection goals** are vital for effective chemical risk management

- One approach is to identify ecosystem services that are valued by society

Varying ecosystem values

- Which services are required from an ecosystem?
- Who are the stakeholders?

- Different sections of society may not have the same ecosystem values

- This should be considered during the establishment of protection goals

Objectives

- Do different sections of society prioritize different ecosystem services?

- Which factors affect the prioritization of ecosystem services?

- Which ecological components provide the prioritized ecosystem services?

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Study area

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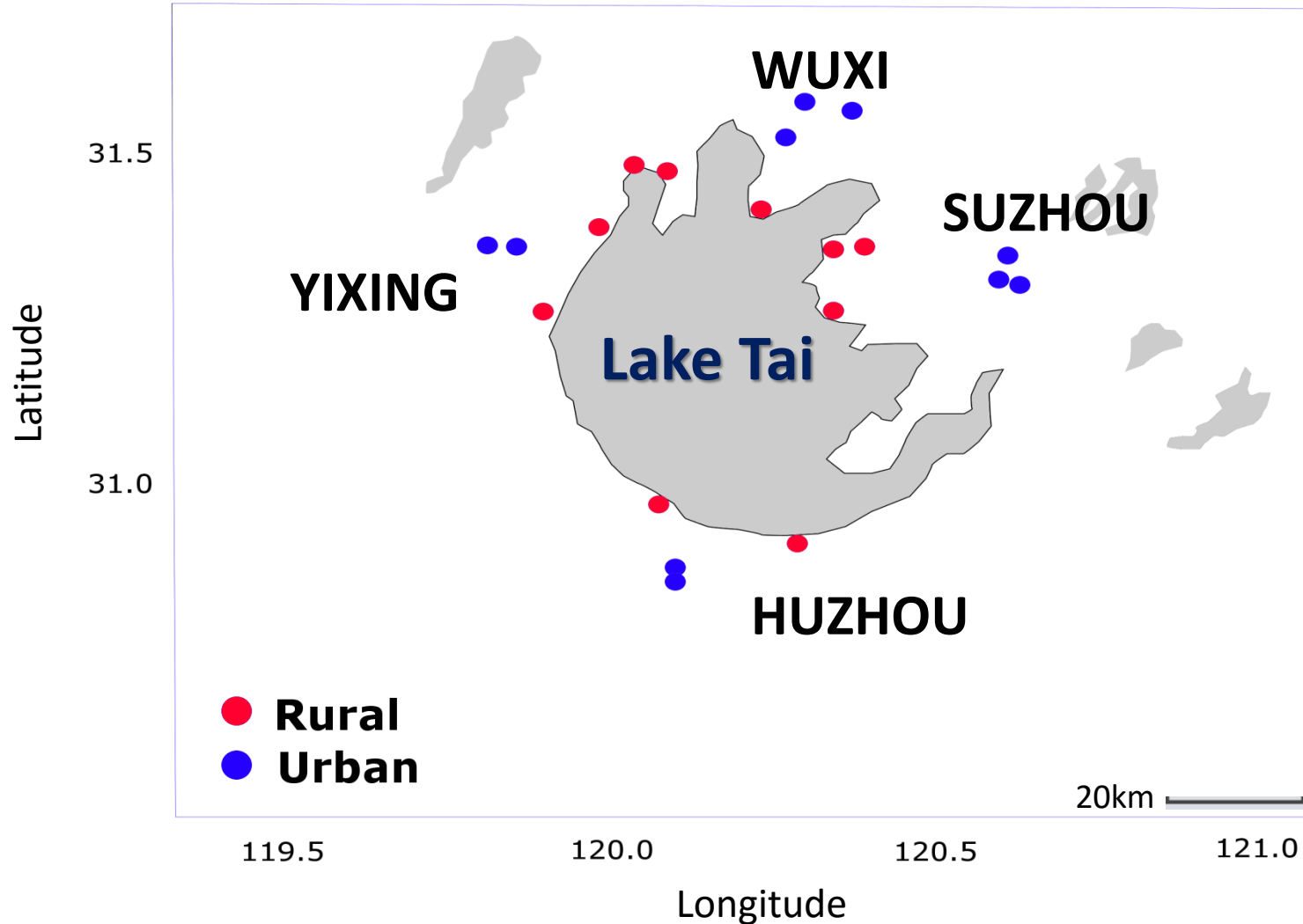
Methods

500 questionnaires across 4 cities

Questionnaire:
- Prioritization of ecosystem services
  - 1) Food
  - 2) Water
  - 3) Flood regulation
  - 4) Microclimate regulation
  - 5) Recreation
  - 6) Cultural heritage

- Used "willing to pay or not" as a prioritization tool
- Asked whether respondents are willing to pay or not for their prioritised service
- Asked whether respondents are willing to pay or not to improve the overall quality of Lake Tai

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Prioritised ecosystem services: across cities

% of respondents (y-axis: 0, 10, 20, 30, 40, 50, 60, 70)

Legend: Huzhou, Suzhou, Wuxi, Yixing

x-axis categories: microclimate regulation, cultural heritage, flood prevention, food, recreation, freshwater

Prioritised ecosystem service

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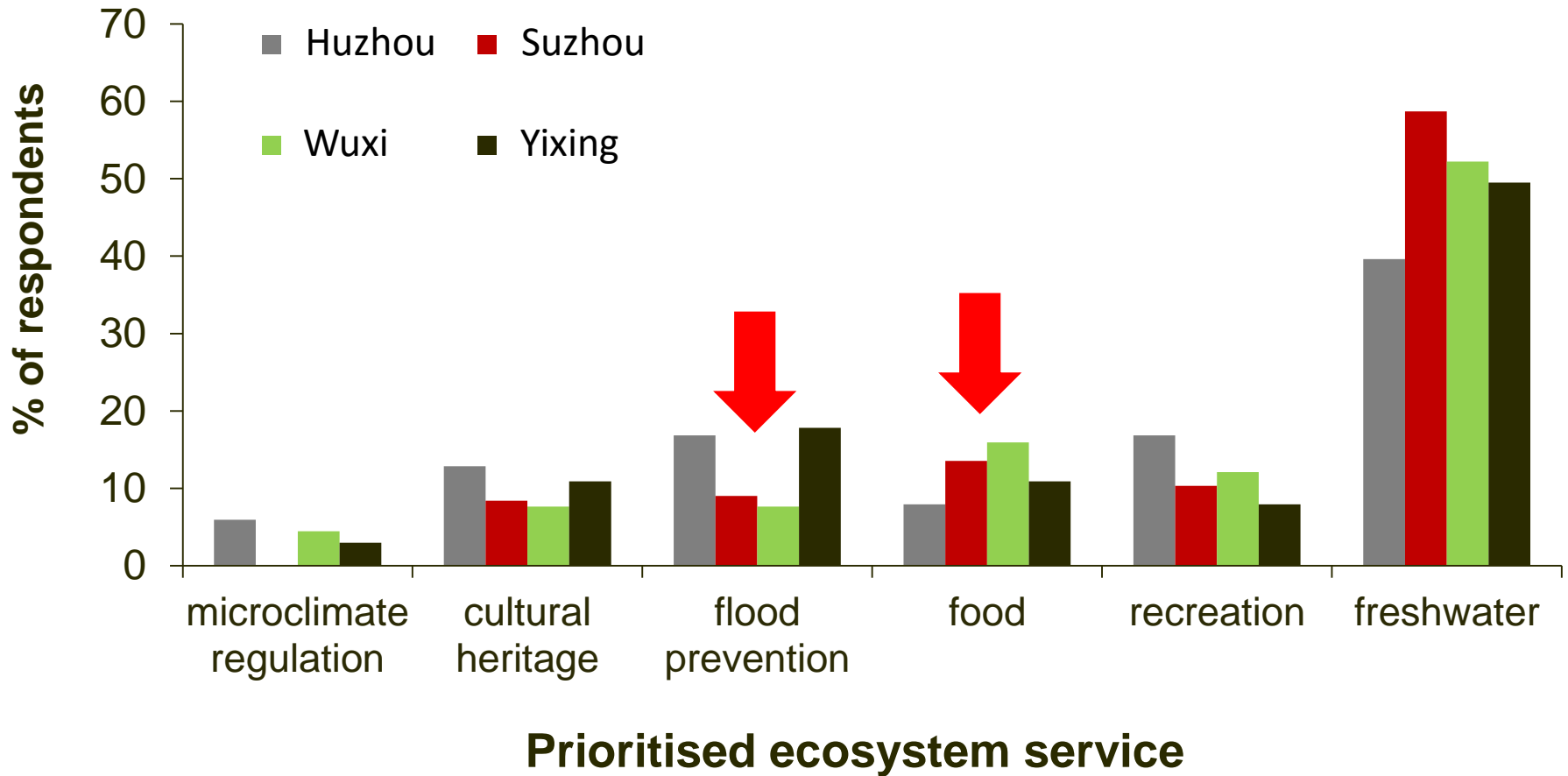
Prioritised ecosystem services: rural and urban

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Factors affecting prioritization of services

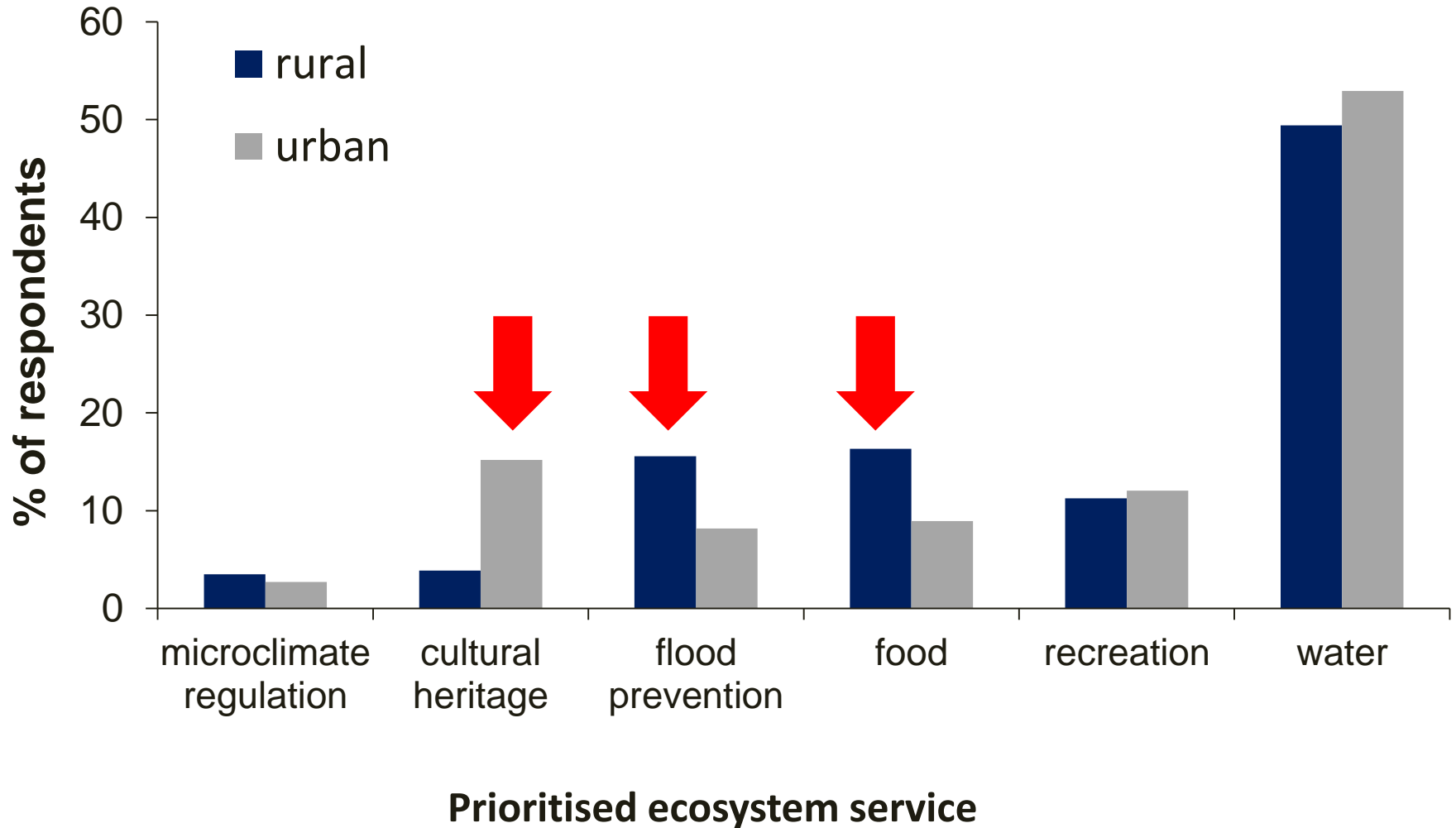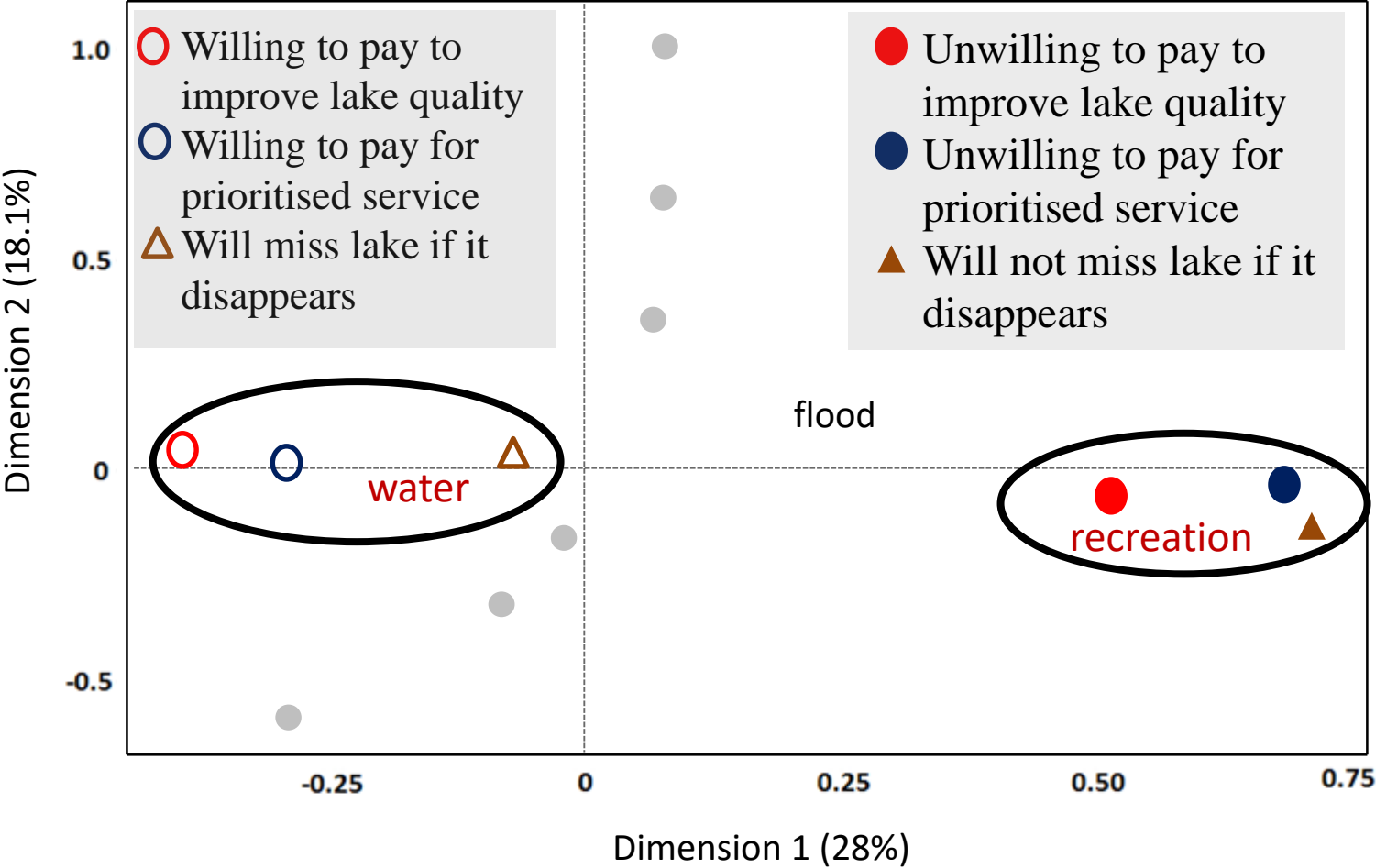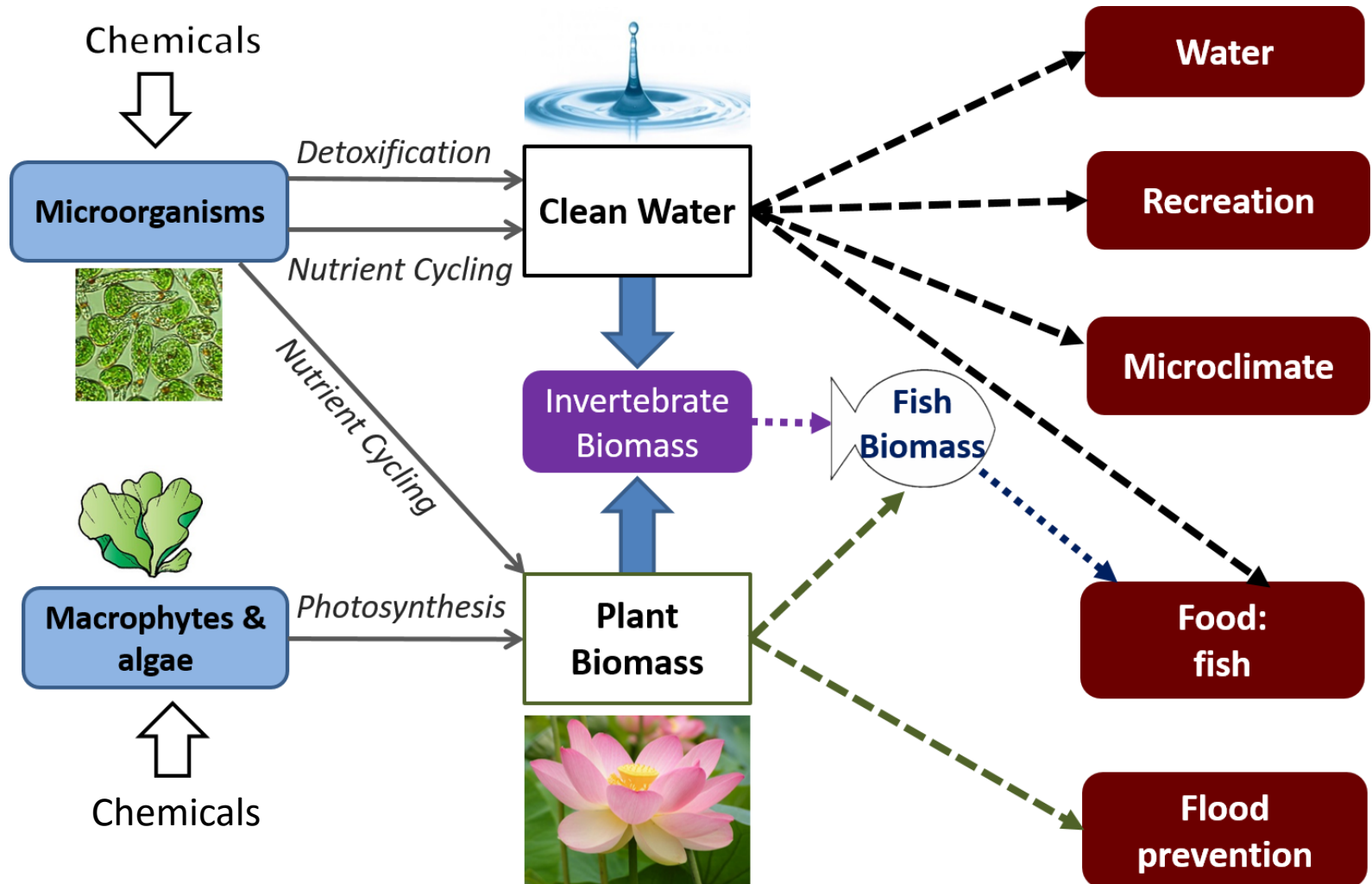# Ecological components linked to the provision of ecosystem services

Problems with chemical risk assessments

- Lacks ecological realism: do not assess ecosystem services
- Need to measure how changes in individuals affect ecosystem services
- Challenge: to go from what we measure traditionally to what people are valuing

Conclusion

- Different sections of society prioritise different ecosystem services

- By linking ecological components to the provision of prioritized services, standard test data can then be used to investigate the effects of chemical exposure on ecological components

Conclusion

What does this mean in terms of policy?

- Develop specific protection goals
- Improves ecological realism of chemical risk assessments
- Improves communication between scientists, the general public and policy-makers

But not everyone has the same ecosystem values. If so, whose values should count?

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