

Ecosystem services in river basins



B.Sc on Biology (Autonomous University of Barcelona)

M.Sc on Ecology (University of Barcelona)

PhD on Environmental Science and Technology, specialisation on Ecological Economics (Autonomous University of Barcelona)

Thesis: Water Flows to Multiple Stakeholders – An ecosystem services-based approach to conflicts in the Ter River basin

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Ecosystem services (ES) are:

“the conditions and processes through which natural ecosystems, and the species that make them up, sustain and fulfil human life”
(Daily, 1997)

“the benefits people obtain from ecosystems” (MA, 2003)

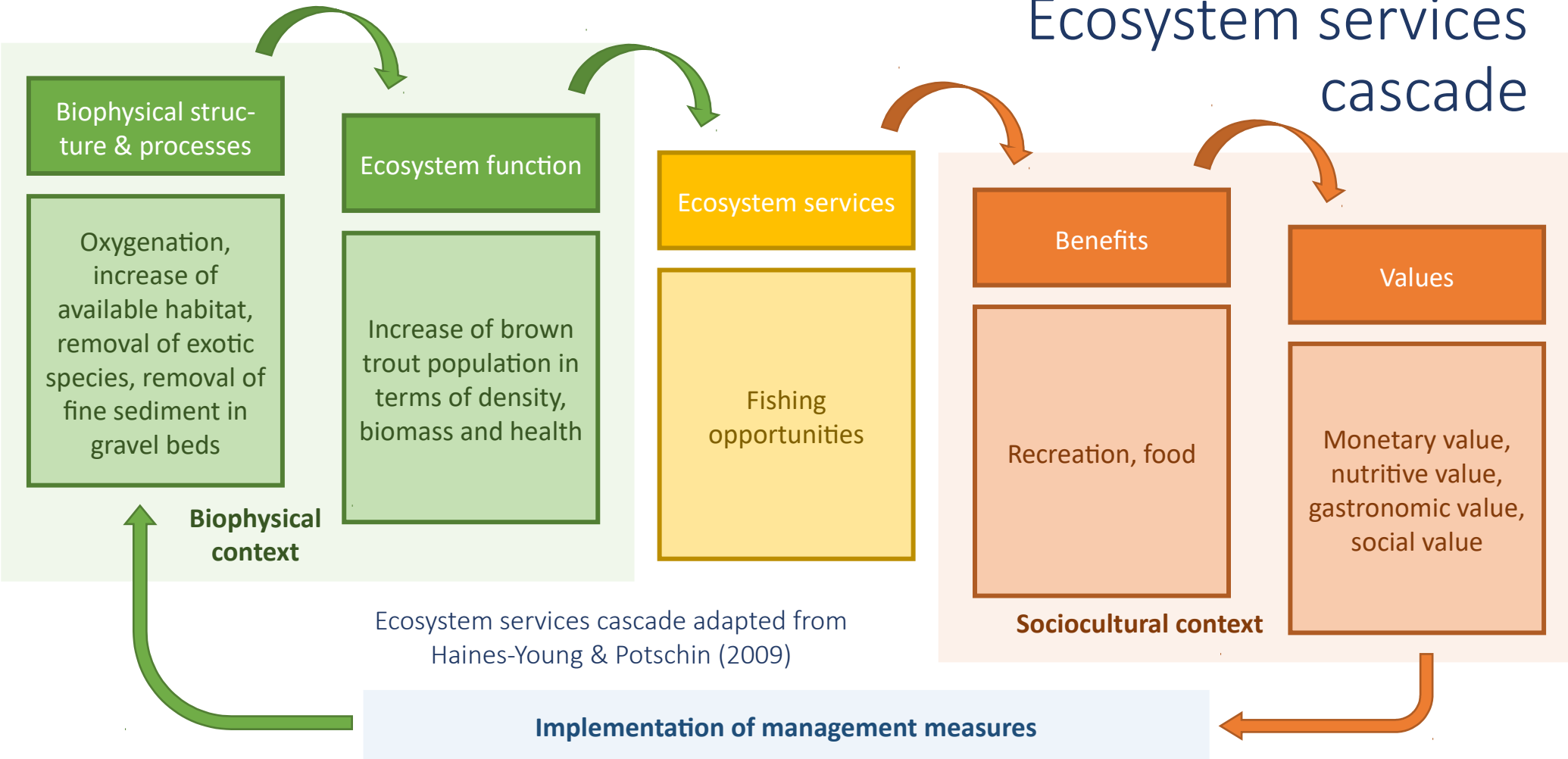


@Anemone (Instagram)

Costanza *et al.* (1997) set the ambitious goal of assigning a monetary value to the world’s ecosystems and estimated an aggregated value of the entire biosphere.

Postel and Carpenter (1997) estimated that freshwater ecosystems provide benefits whose notional economic value could add up to several trillions of dollars.

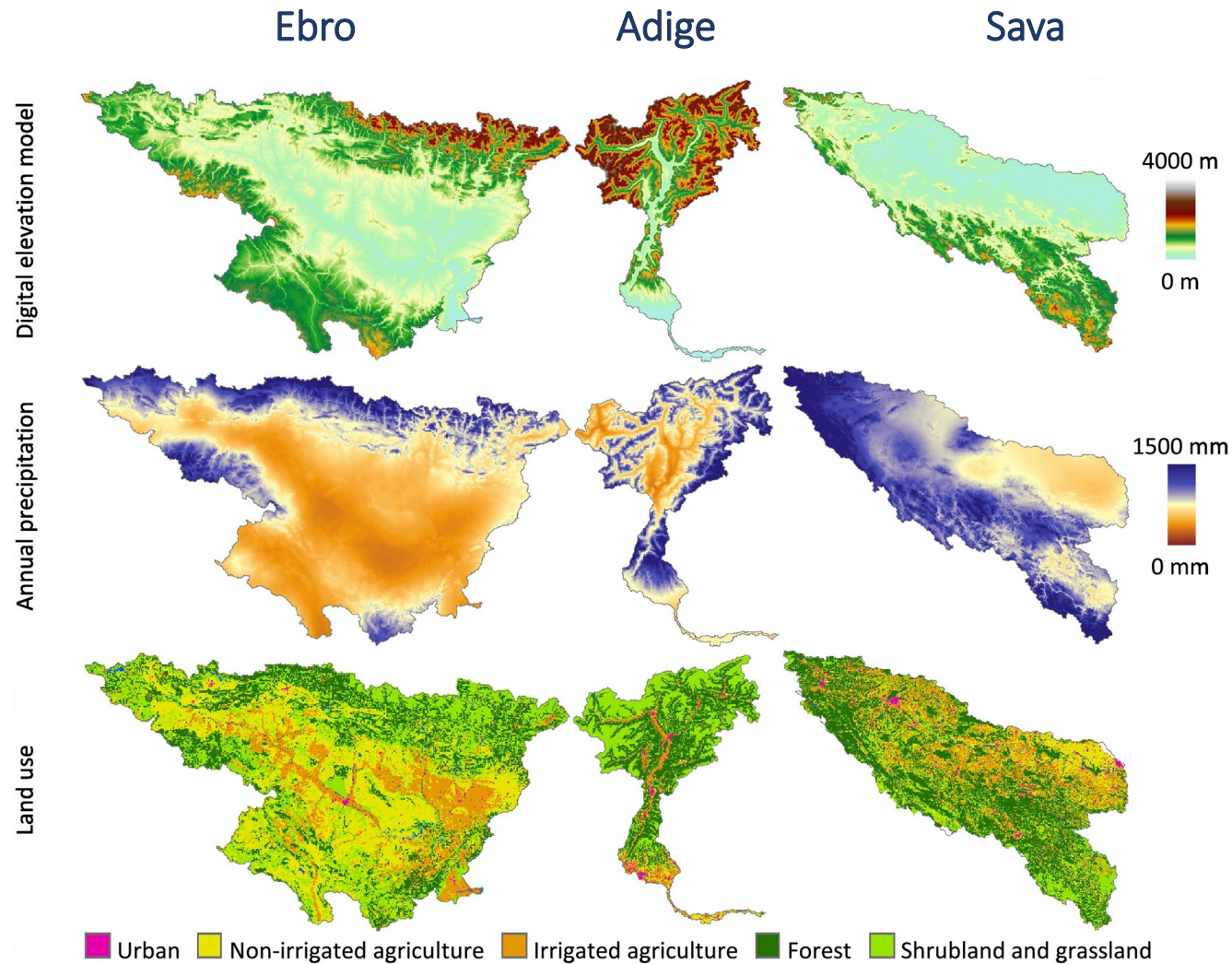
Ecosystem services cascade



In the different river basins we evaluated freshwater-related ecosystem services in order to foresee plausible future scenarios under the global change.

Our results show clear differences among river basins, being more impacted by climate change the Mediterranean (Ebro) than the Alpine (Adige) and Continental basins (Sava).

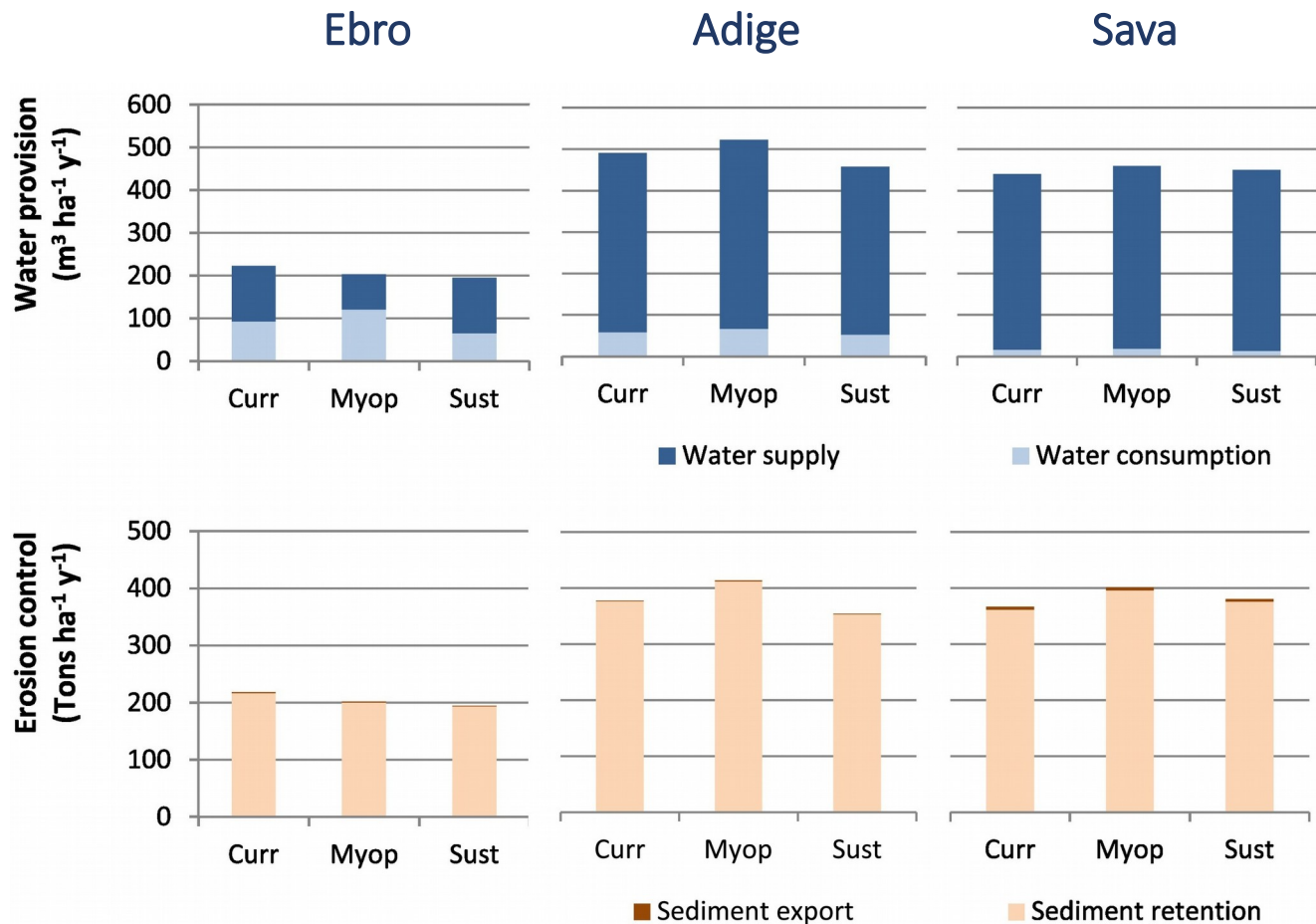
Jorda-Capdevila, D. et al. "Impact and mitigation of global change on freshwater-related ecosystem services" STOTEN (2019) 651(1): 895-908.



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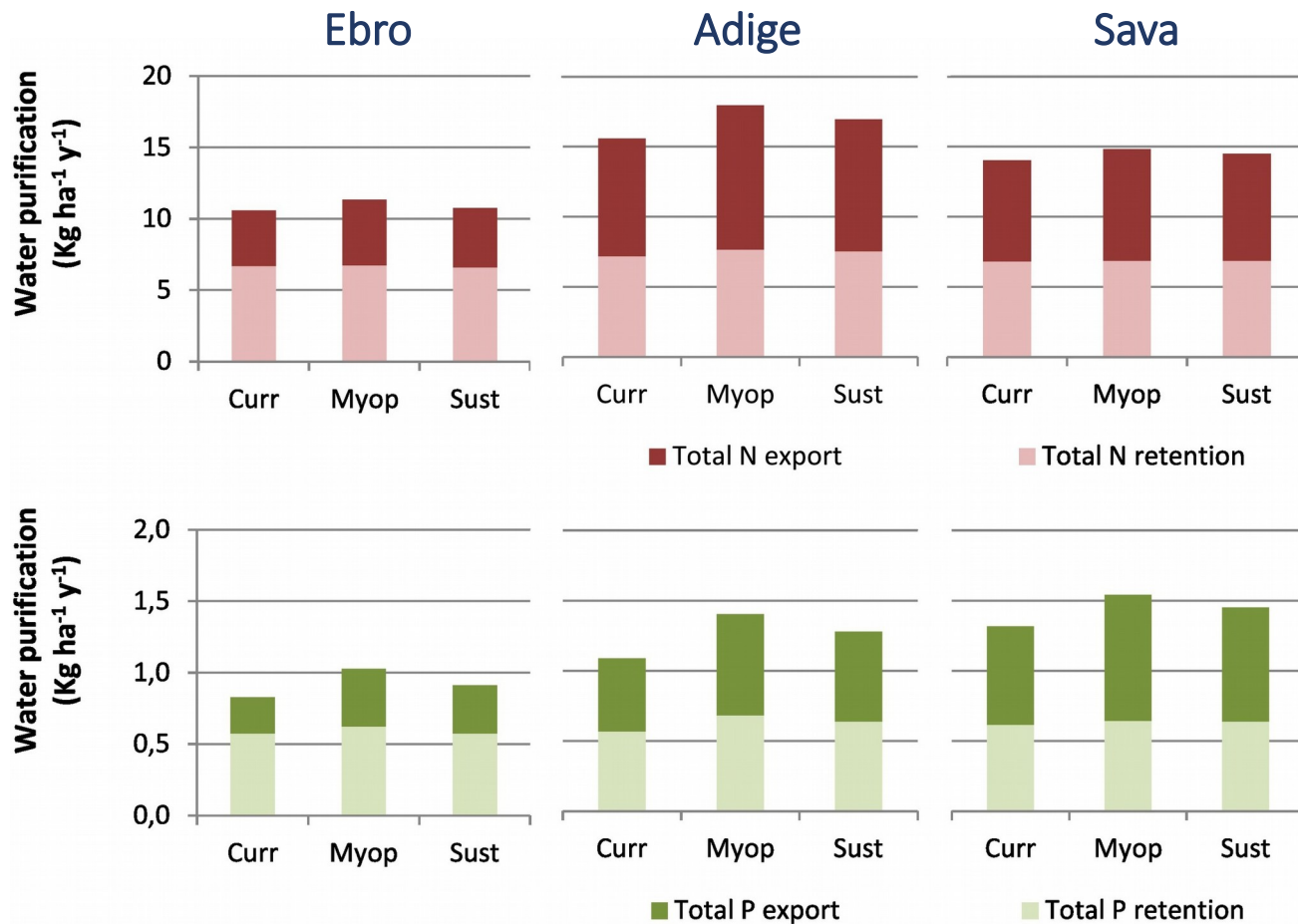
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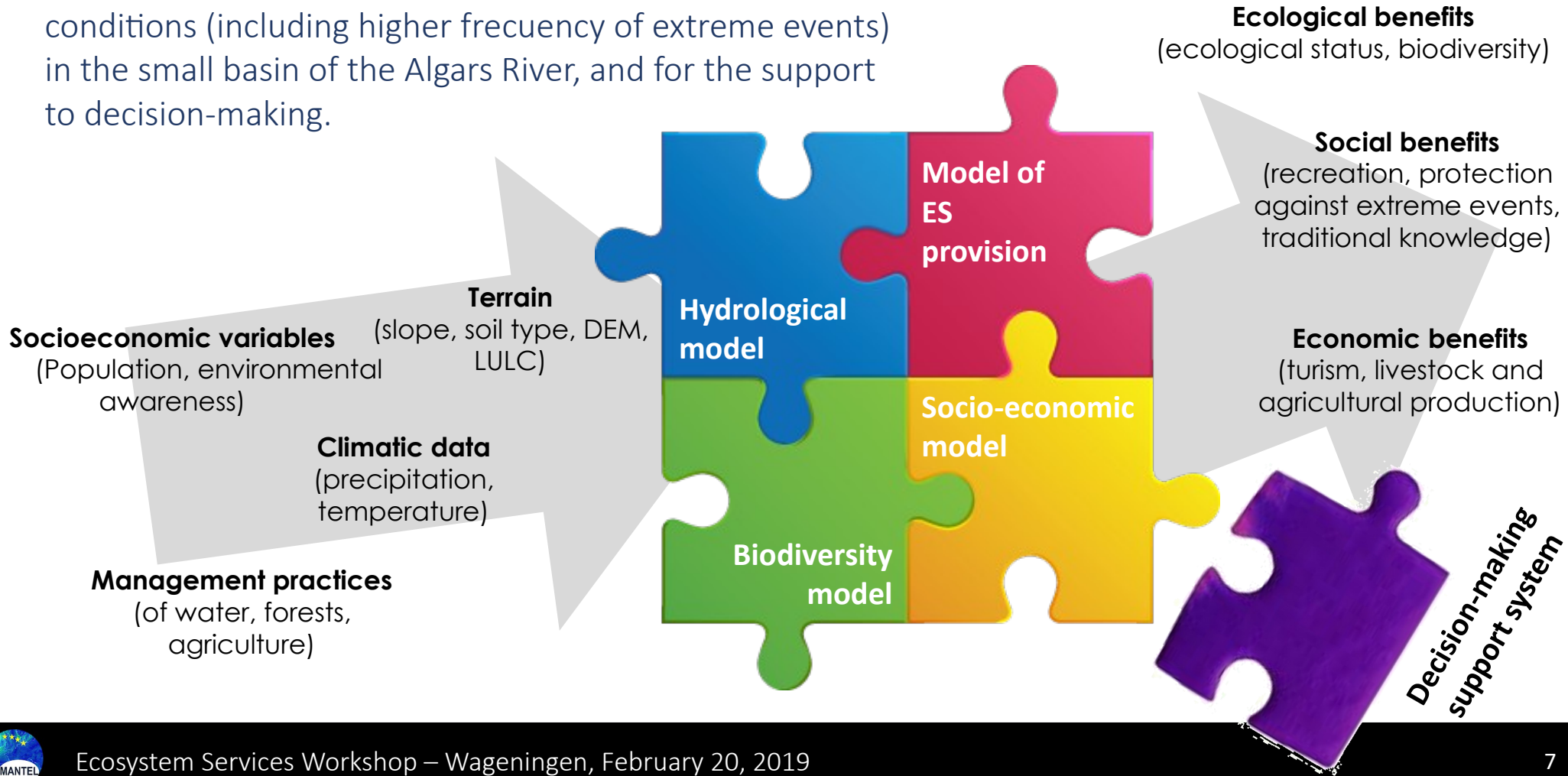
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A socio-environmental model is being developed for the assessment of ecosystem services under global change conditions (including higher frequency of extreme events) in the small basin of the Algar's River, and for the support to decision-making.



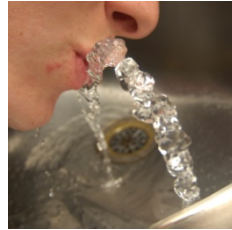
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List of ecosystem services
(percentage of people that consider them preferential)

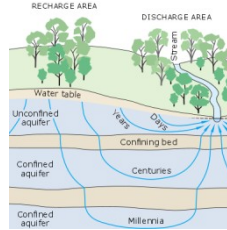
Biodiversity
(72,7%)



Supply of drinking water
(51,5%)



Aquifer recharge
(48,5%)



Water purification
(27,3%)



Mitigation of peak storms and floods
(21,2%)



Identity and traditional knowledge
(57,6%)



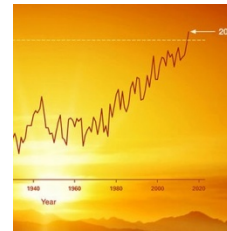
Supply of water for the agriculture
(48,5%)



Recreation for a physical and mental health
(30,3%)



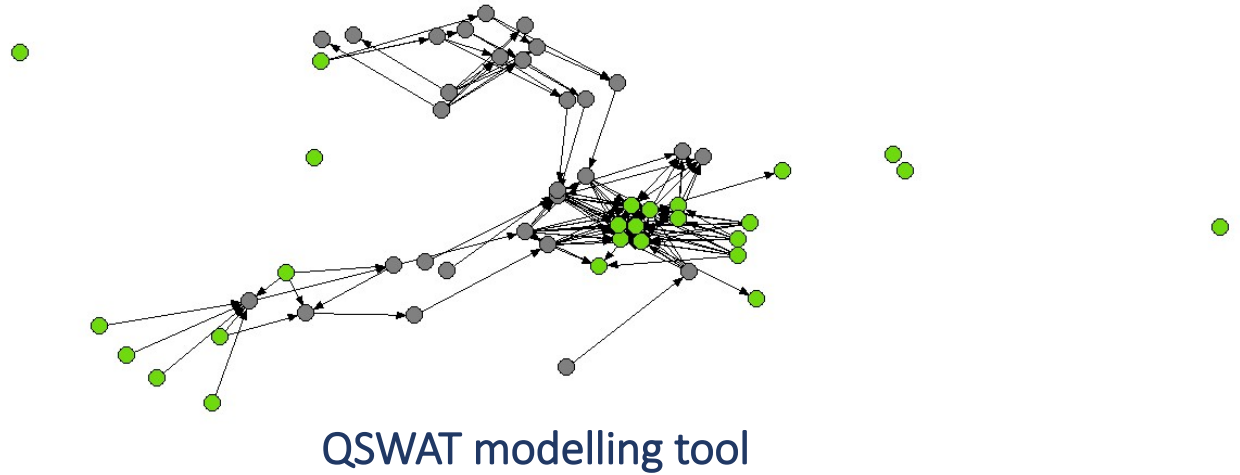
Climate and air quality regulation
(24,2%)



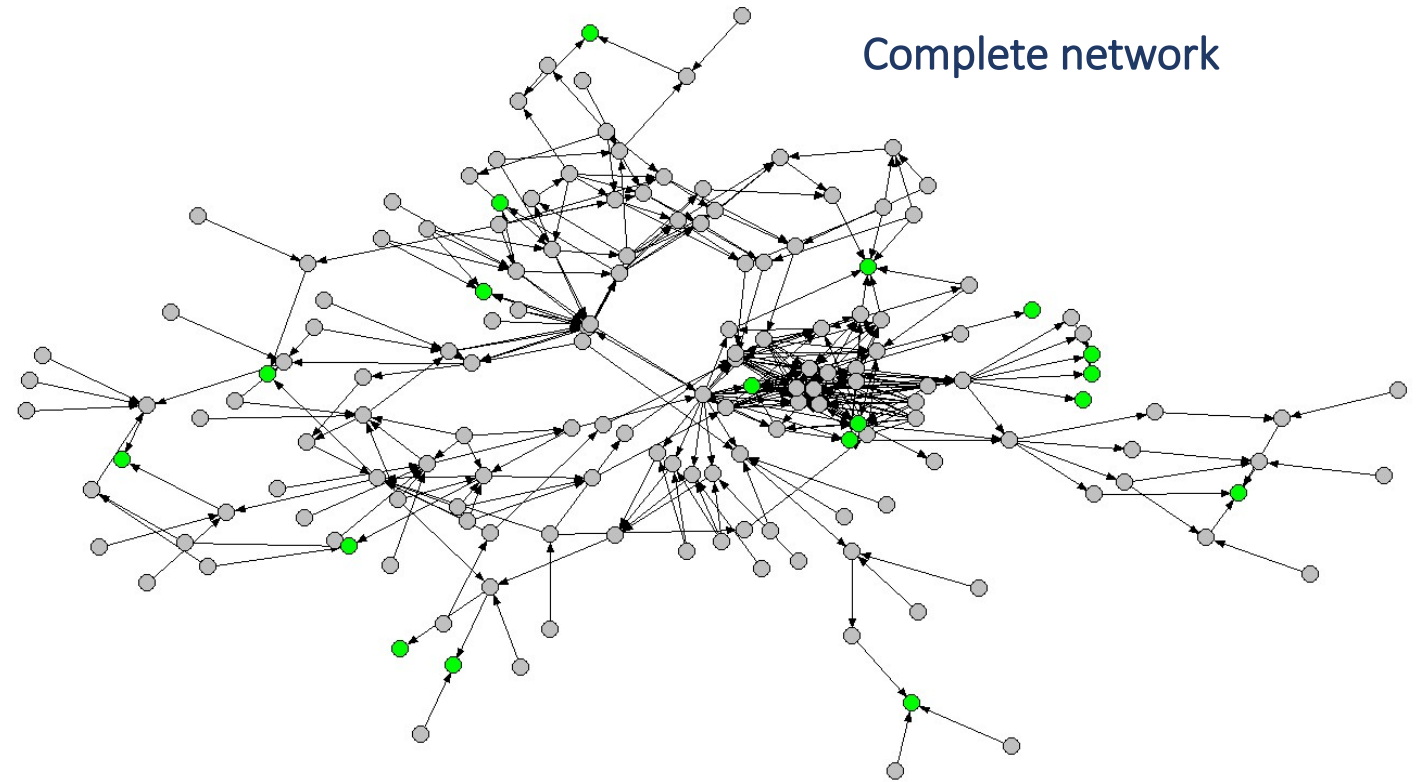
Aesthetics and inspiration
(21,2%)



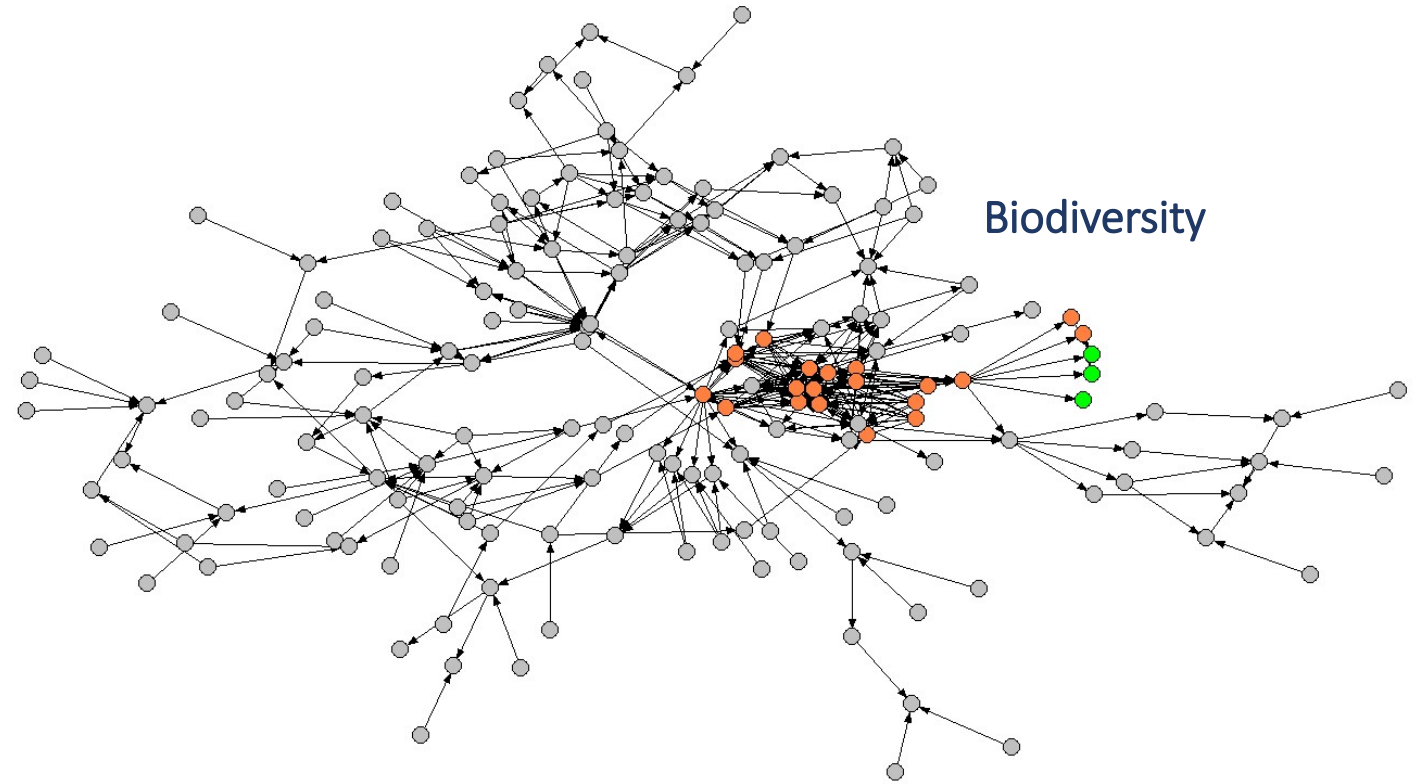
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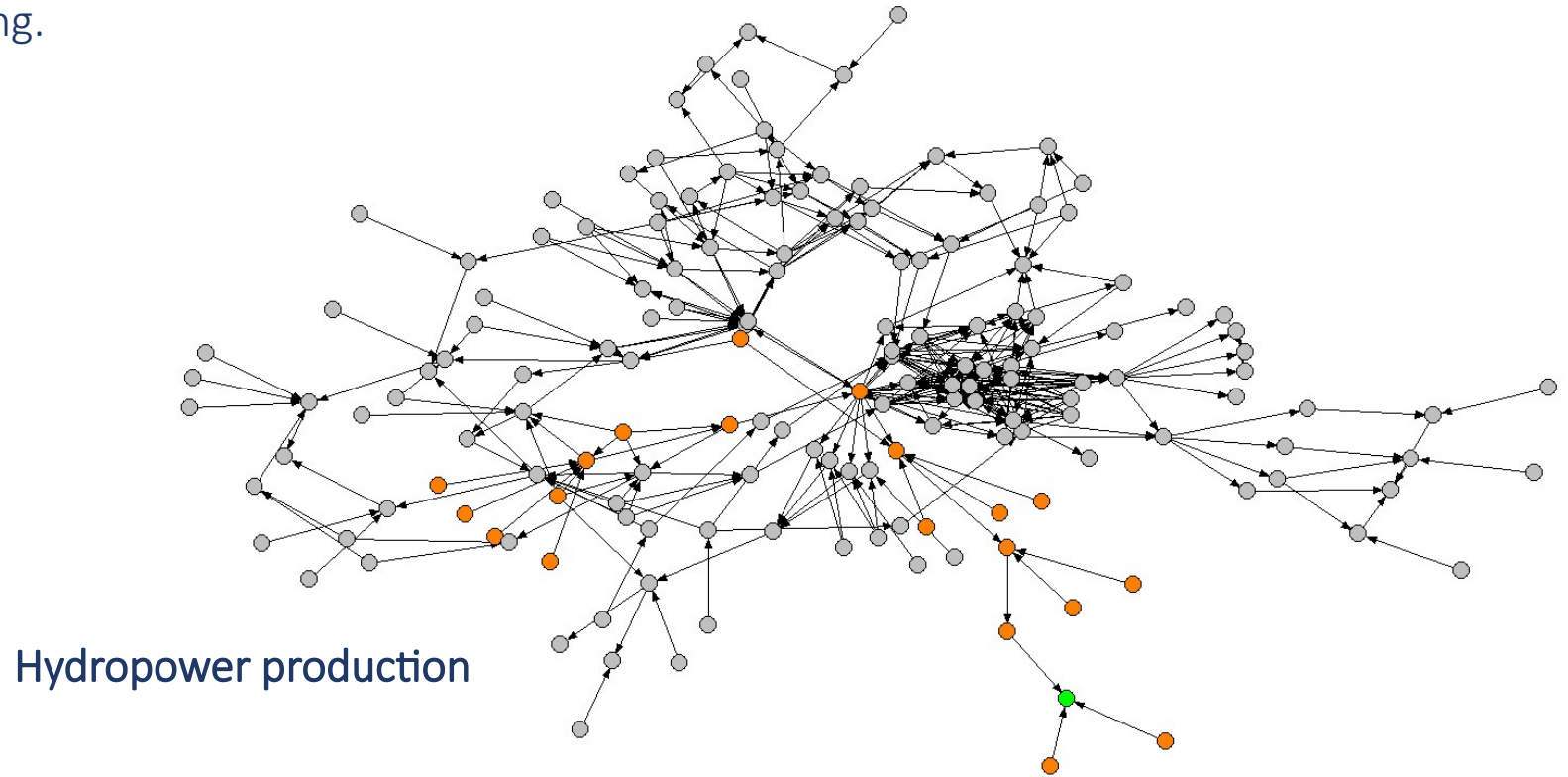
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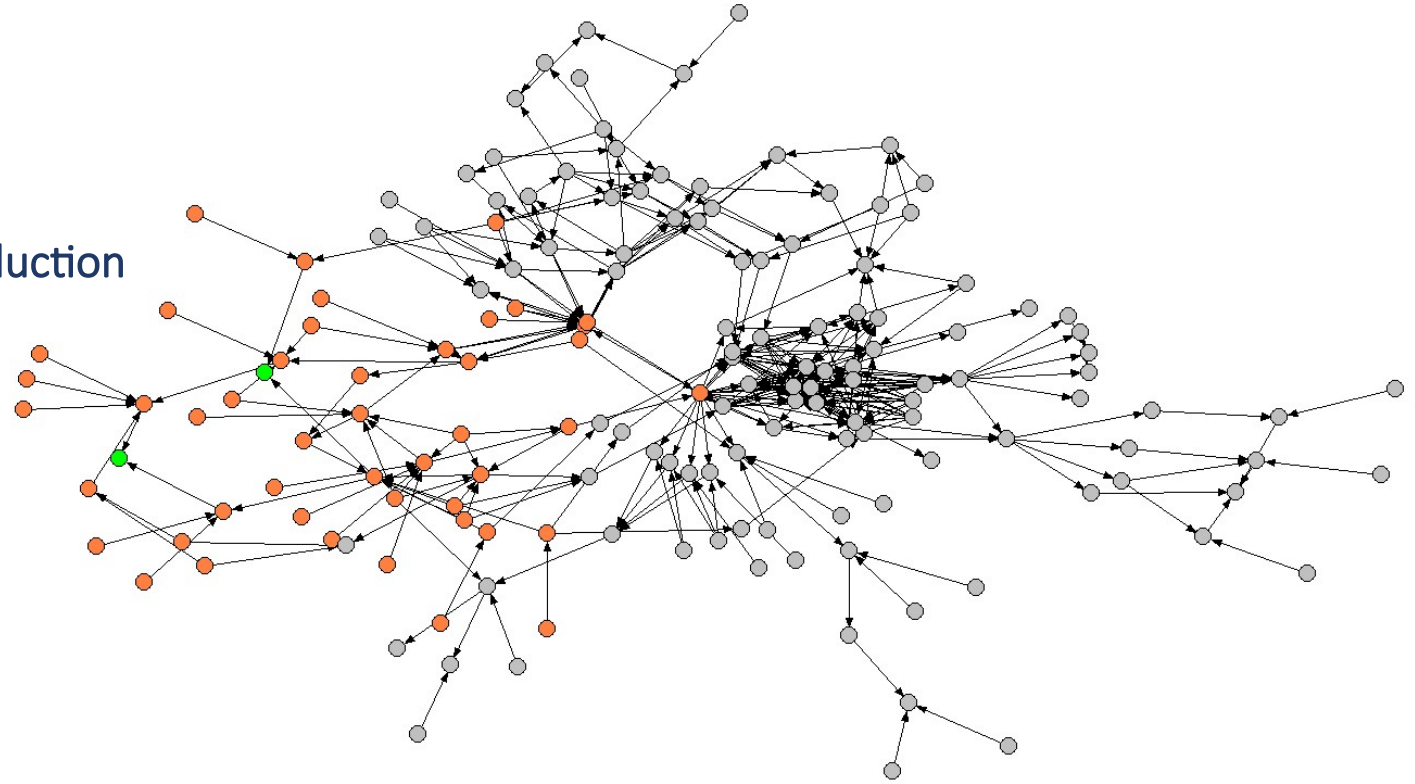


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Food production



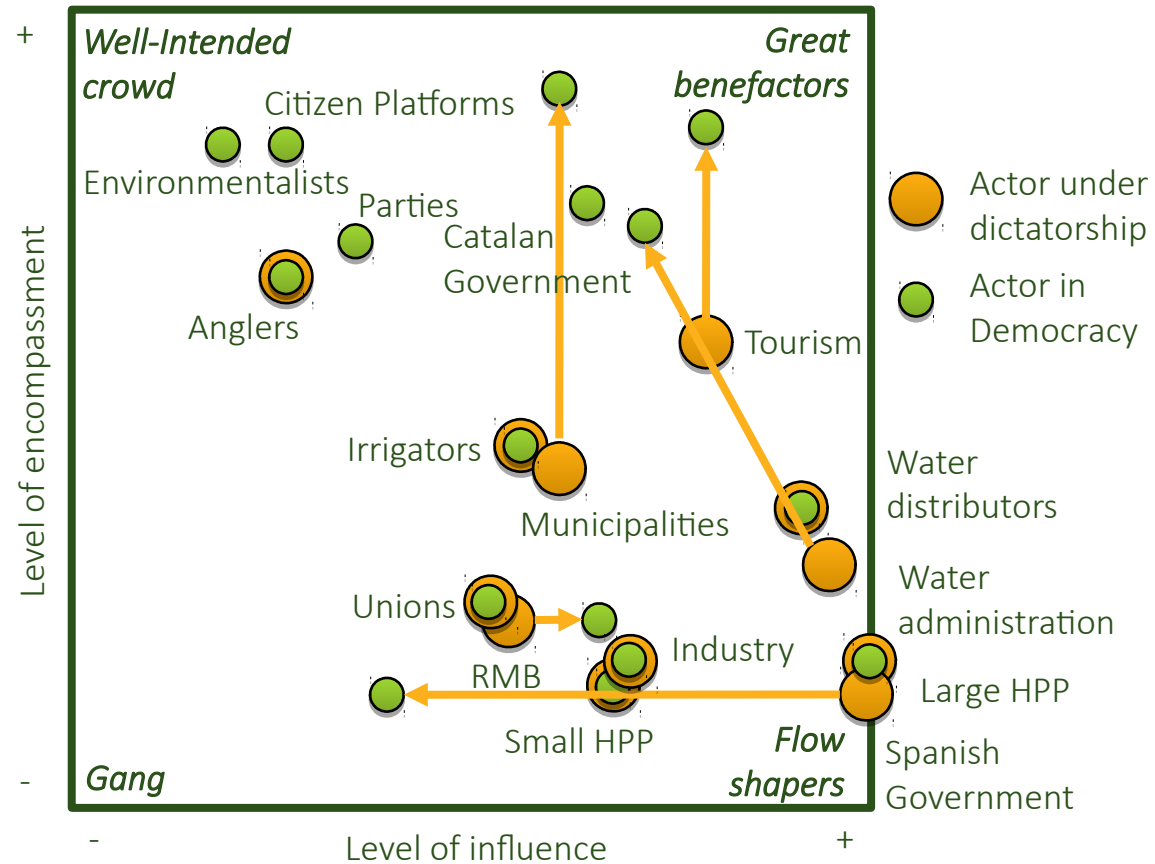
In the Ter River (Catalonia, Spain) tradeoffs and synergies among multiple ES are evaluated in order to understand inter-stakeholder tensions. For example, kayakers take profit from dam discharges for irrigation in summer, while bother anglers.

Jorda-Capdevila, D. and Rodríguez-Labajos, B.
“An ecosystem service approach to understand conflicts on river flows: local views on the Ter River” *Sustainability Science* (2015) 10: 463-477.



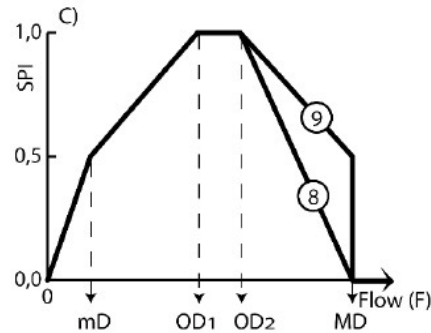
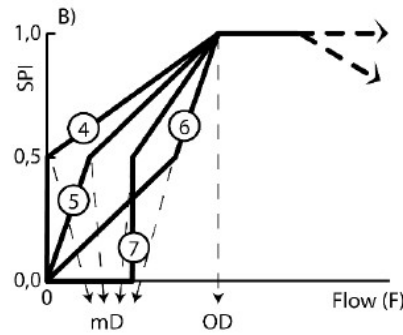
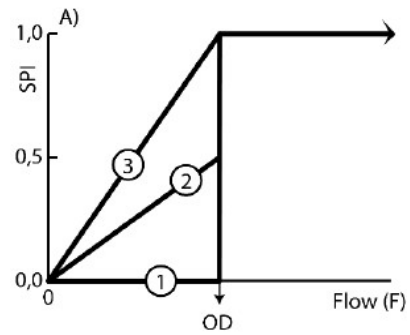
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Jorda-Capdevila, D. et al. "Access to water flows through the history of the Ter management and the provisioning of its ecosystem services (1950-2015)" (unpublished)

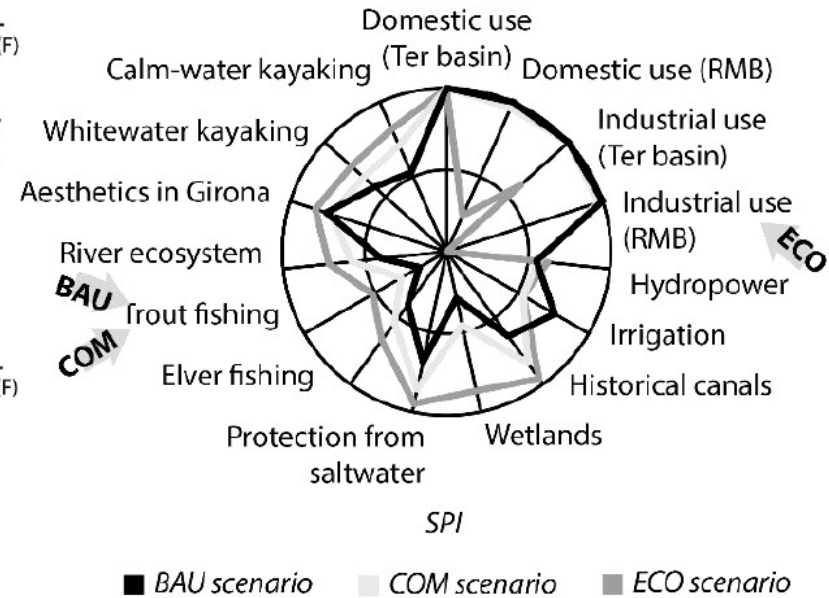


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E) In dry years, what ES will have the lowest performance under each management scenario?



Four principles for an ecosystem services-based approach

1. The focus on the status of the ecosystems, and the recognition of their effects on the human wellbeing.



Provisioning



Regulating



Support

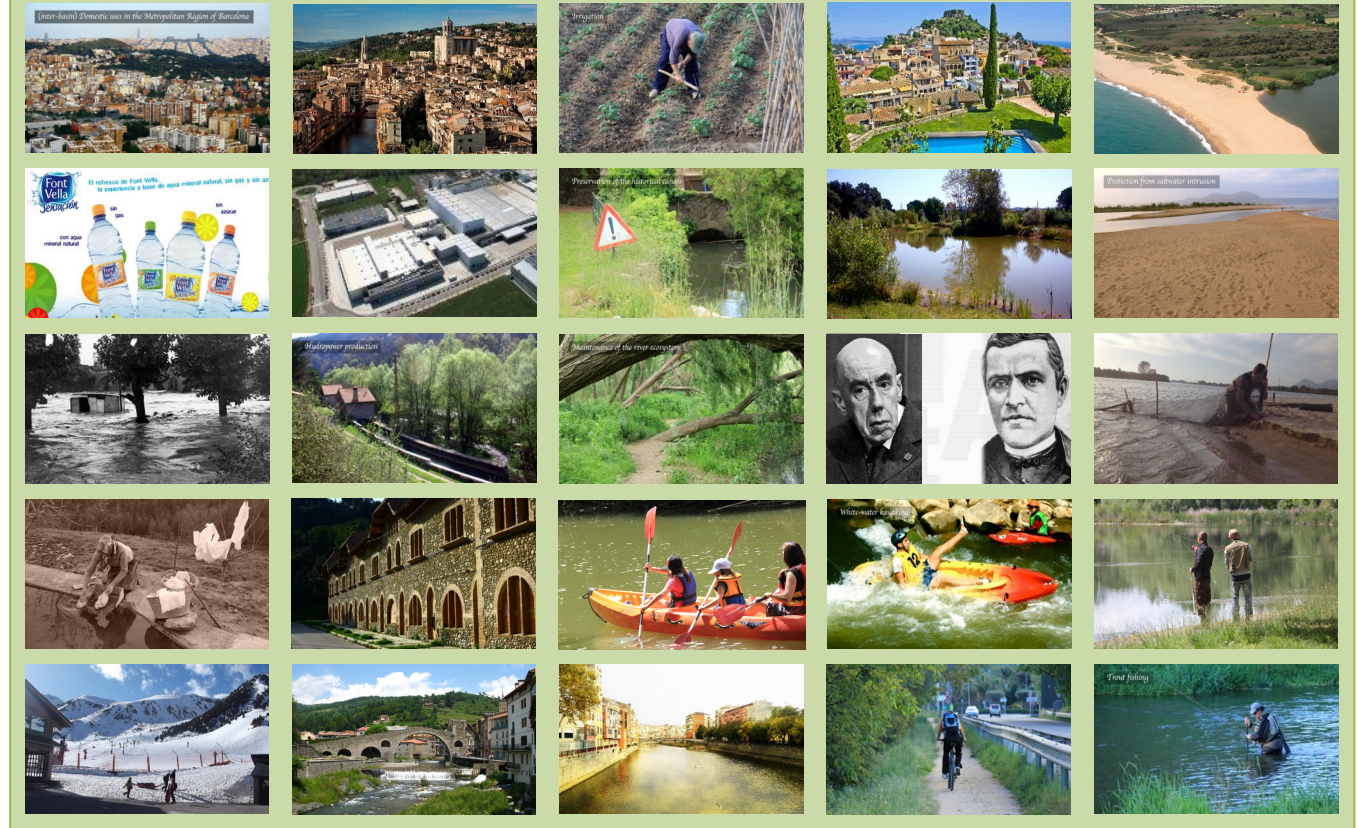


Cultural

Source: adapted from Martin-Ortega *et al.* (2015)

Four principles for an ecosystem services-based approach

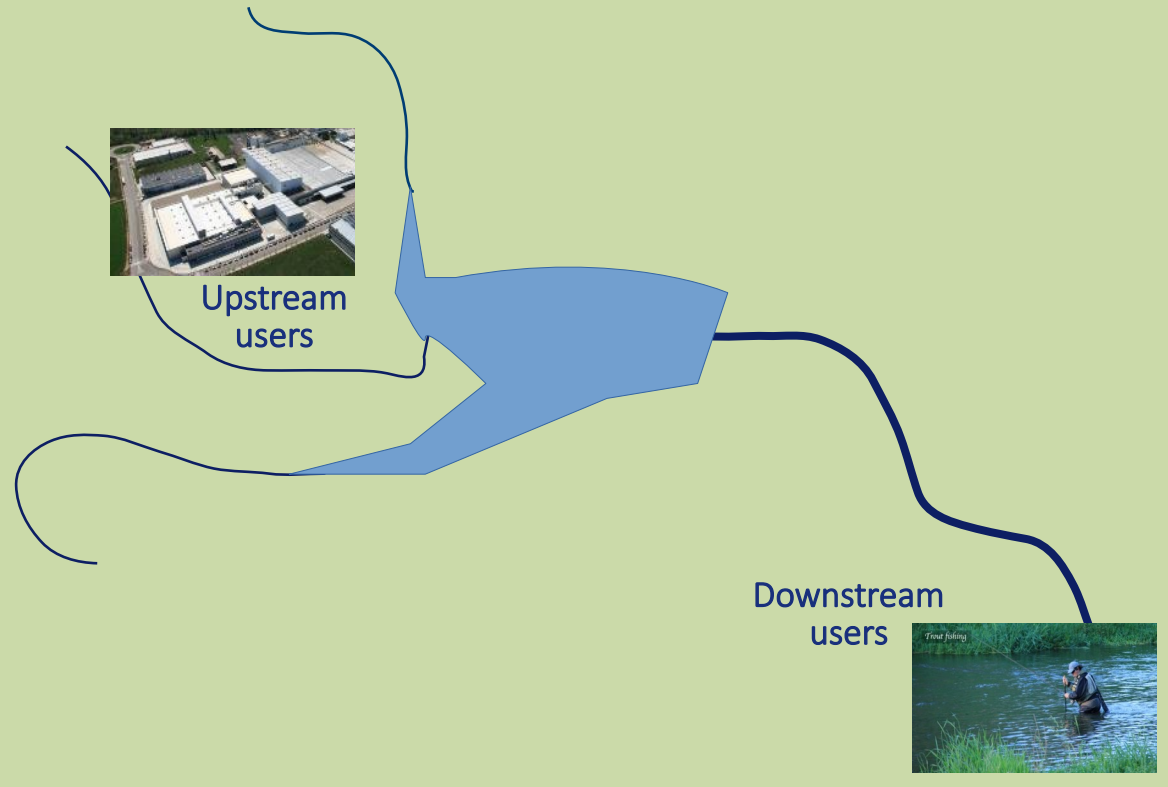
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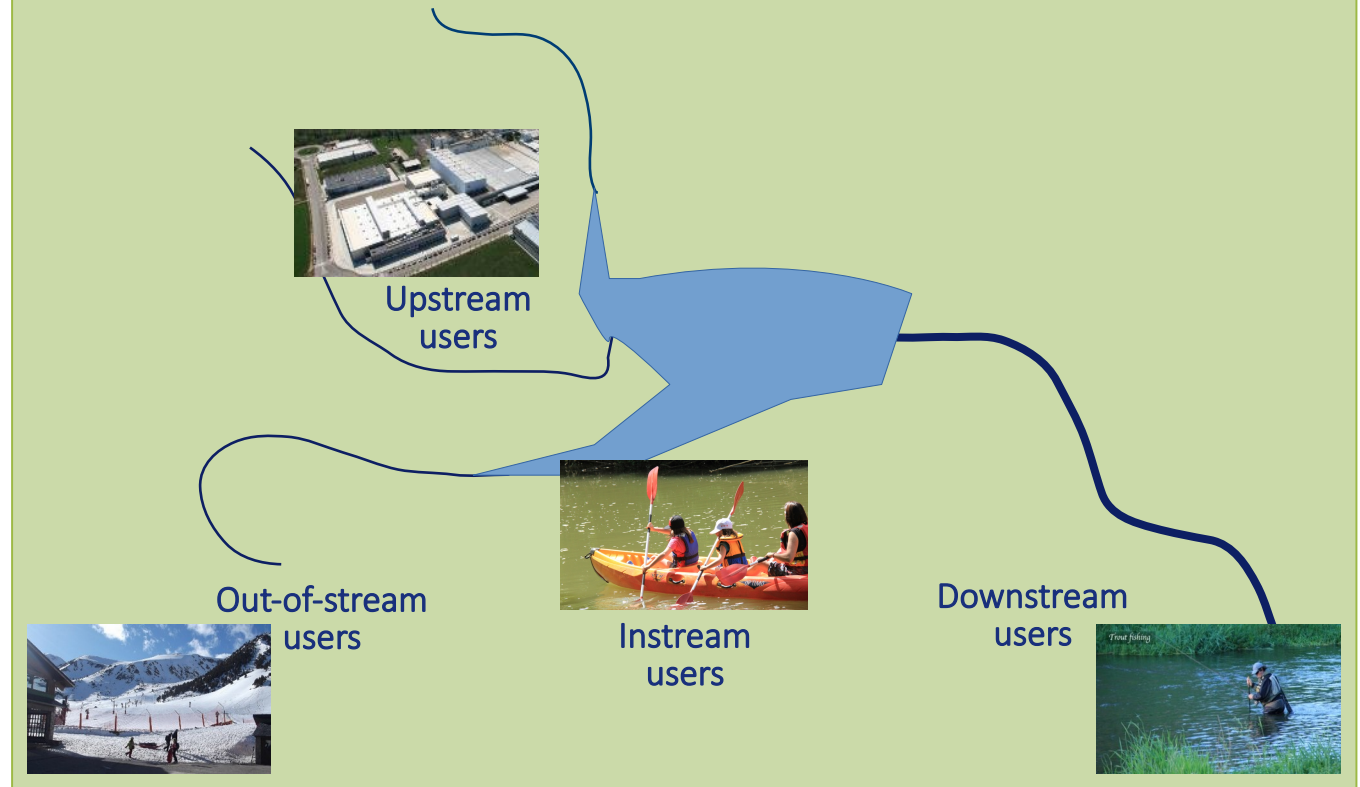
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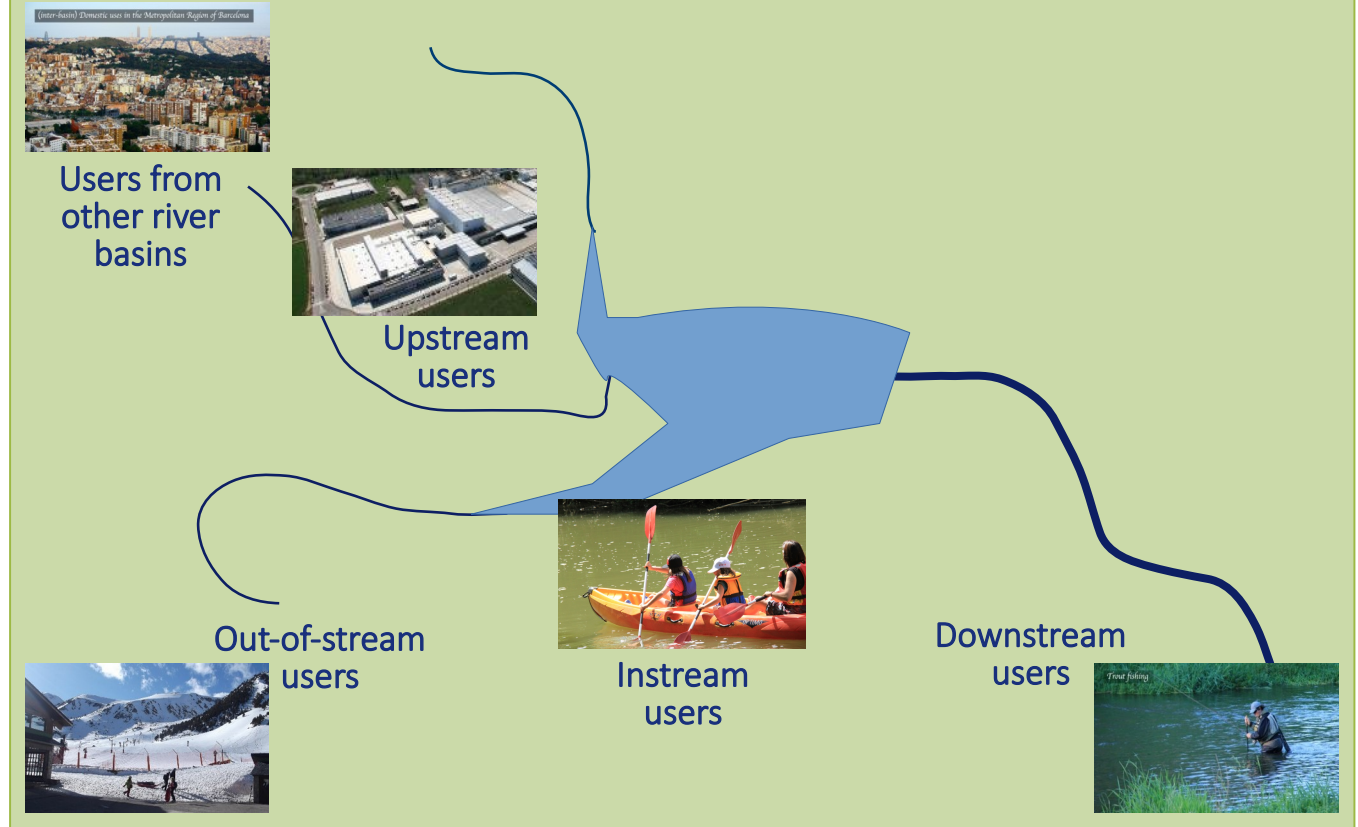
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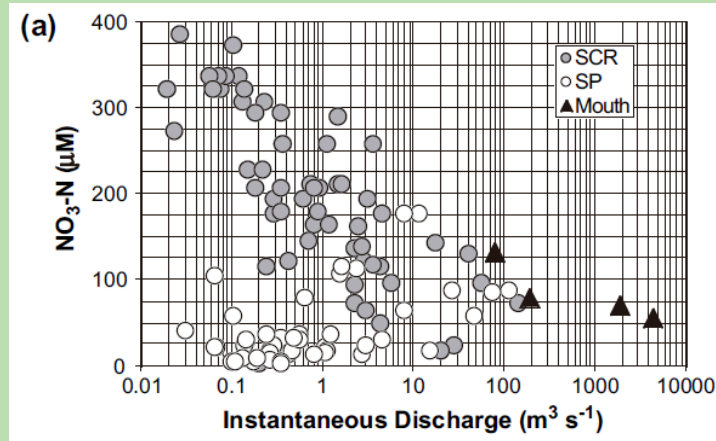
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Four principles for an ecosystem services-based approach

1. The focus on the status of the ecosystems, and the recognition of their effects on the human wellbeing.

2. The understanding of the biophysical relationships of the ecosystem for the provision of the service.

- ▶ Specific or generic relationships
- ▶ Based on measurements or models



Source: Warrick et al. 2004

Same service,
different
biophysical
condition



Source: adapted from Martin-Ortega *et al.* (2015)

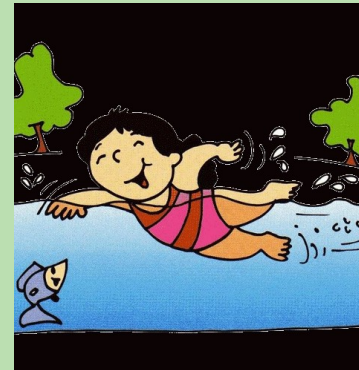
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From 3 to 30 y.o.

Not compatible with angling



Conservation of aesthetically pleasant setting

Morphologically diverse: with pools, waterfalls, beaches, etc.

Certain depth, velocity, temperature and physicochemical quality of water

Source: adapted from Martin-Ortega *et al.* (2015)

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Consideration of:

- ▶ Spatial distribution (upstream, downstream, instream...)
- ▶ Spatial scale (mesohabitat, reach, landscape, basin)
- ▶ Temporal distribution (summer, spring,...)
- ▶ Temporal scale (daily, monthly, yearly,...)

Source: adapted from Martin-Ortega *et al.* (2015)

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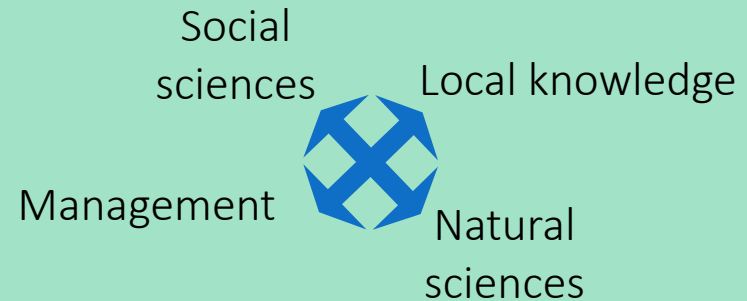
2. The understanding of the biophysical relationships of the ecosystem for the provision of the service.

3. The integration of natural and social sciences and other strands of knowledge for a comprehensive understanding of the processes of service provision.

► Levels of interdisciplinary integration

► Static or dynamic and adaptive

► Consulting or constructing



Source: adapted from Martin-Ortega *et al.* (2015)

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3. The integration of natural and social sciences and other strands of knowledge for a comprehensive understanding of the processes of service provision.

4. The valuation of services provided by ecosystems for their incorporation to decision-making.

QUALITATIVE



Wealth

Cooperation



Security



Integrity

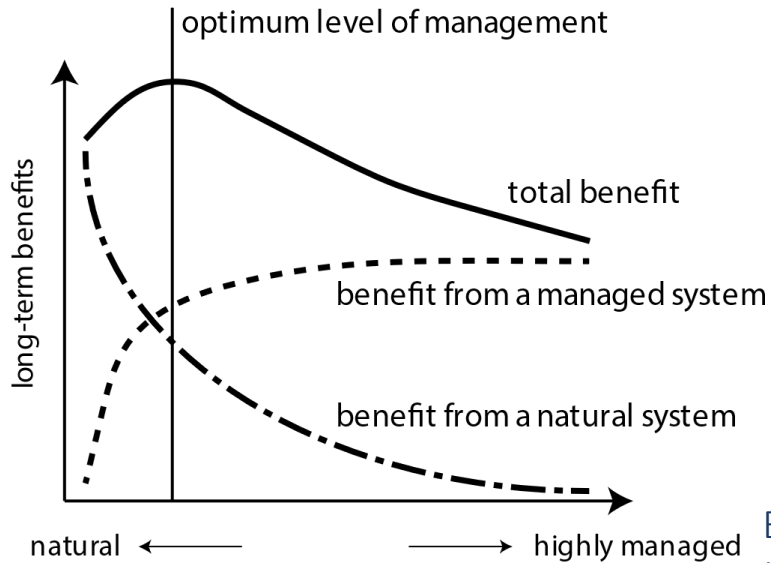
Love



QUANTITATIVE

Source: adapted from Martin-Ortega *et al.* (2015)

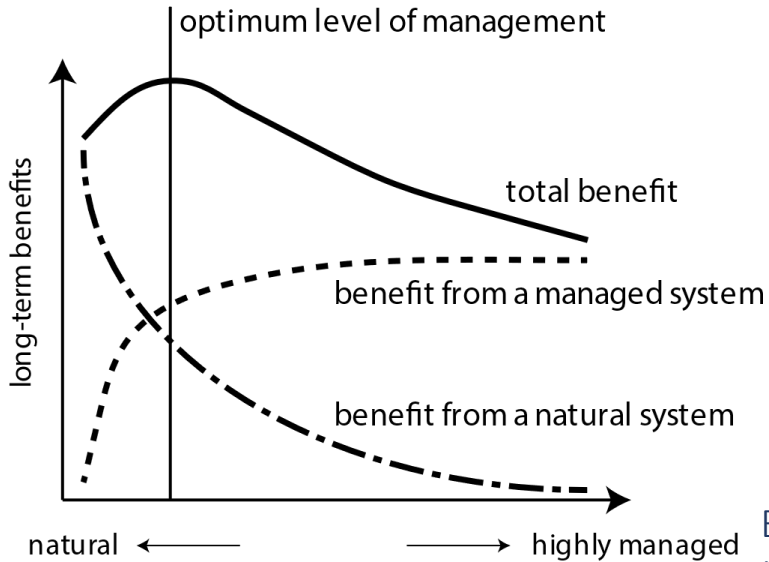
Maximisation of benefits from freshwater ecosystems



Based on
Wallace et al.
(2003)

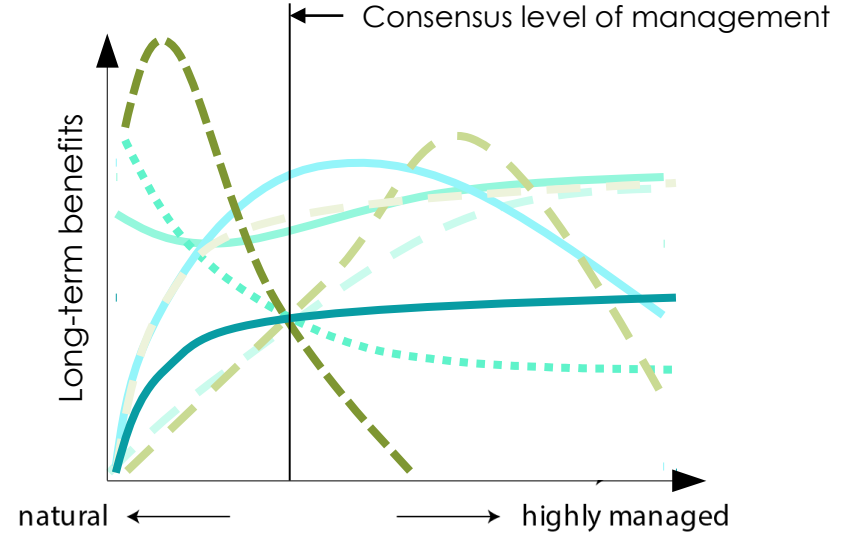
“Economic methods for the monetary valuation of ecosystem services are being developed, but valuation should and must not be limited to monetary approaches to make the ecosystem services concept operational. Methods of multi-criteria analysis and the combination of quantitative and qualitative approaches can raise awareness about the multiple roles and values of ecosystem services. This can support deliberative processes and help to identify and negotiate complex trade-offs between different water demands, including those of aquatic ecosystems.” (*Pahl-Wostl et al.* 2014)

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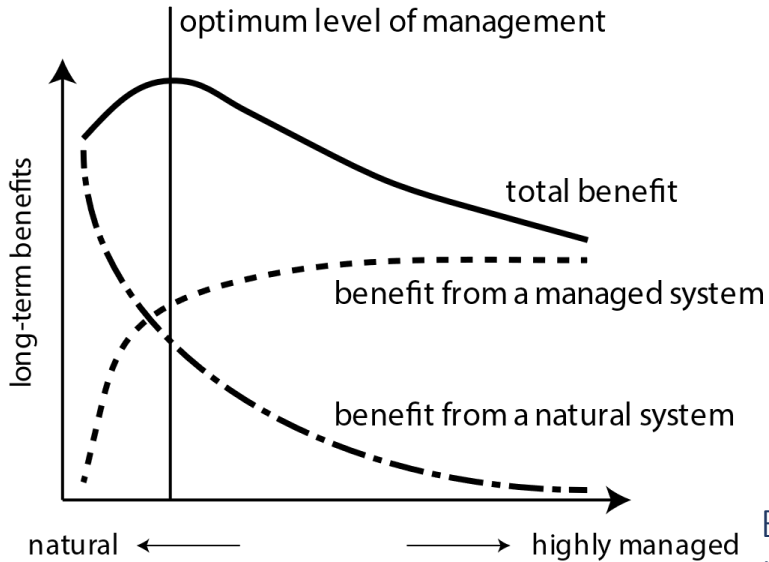
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Safe minimum standard of freshwater ecosystems-related benefits



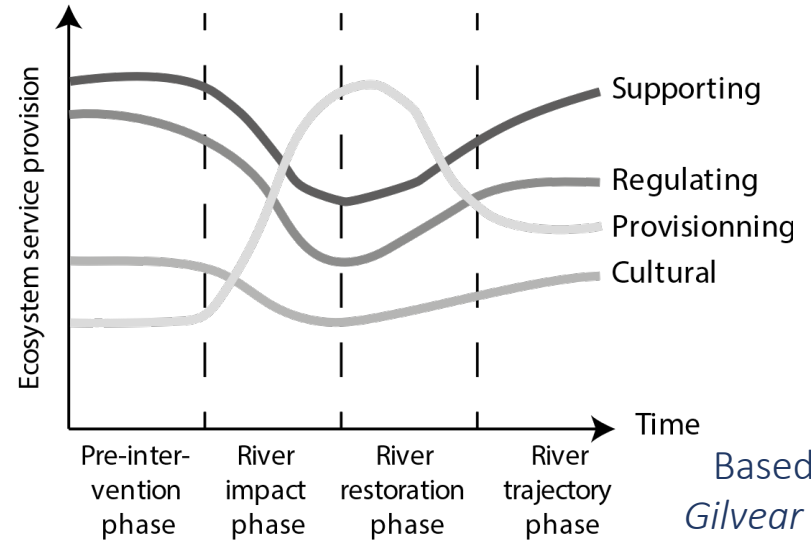
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A conceptual timeline model illustrating the relationships between ecosystem services changes and tradeoffs and river rehabilitation activity



Based on
Gilvear et al.
(2013)

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Take home messages

- An ecosystem services-based approach is a way of understanding the complex relationships between nature and humans.
- There is a plurality of values associated to freshwater ecosystems and a good understanding of them is necessary to avoid stakeholders being neglected.
- Tradeoffs and synergies among ecosystem services appear in different spatial and temporal distributions and scales.
- An assessment of ecosystem services should create potential for cooperative management decisions and give room for socially accepted policies.

Ecosystem services in river basins



Thanks!

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