



The Water Biodiversity nexus

Integrating natural and social sciences: An assessment framework for the complex and adaptive dynamics of social-ecological aquatic systems

Carlos Mario Gómez

mario.gomez@uah.es

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AQUACROSS Concept Model

thinking differently to act differently



AQUACROSS is based upon a holistic approach to sustainability: Resilience thinking (RT)

Holistic framework that consider people and nature as two interdependent systems (and see social and ecological systems' dynamic as mutually dependent)

RT focuses on:

Persistence (the ability to stay within critical thresholds), **adaptability** (the ability to respond to change) and **transformation** (the ability to change in order to find a new equilibrium or development paths).

To support an innovative management approach Ecosystems based management (EBM)

Restore and protect ecosystems in order to maximize and sustain the production of ecosystems services in the long term.

EBM shifts the focus to:

Enhance and restore **regulation and support environmental services** rather than specific **provisioning services, activities or impacts**

Preserve **the common assets** (natural capital) rather than maximize the **flows of commercial services** in order to ensure sustainability.



The AQUACROSS Conceptual Model: Why RT and EBM?



To overcome traditional management approaches that:

- **Focus on flag species, hot spots, single pressures, specific impacts**, etc. (and despite getting measurable outcomes risk to degrade resilience and increase ecosystems' vulnerability).
- Deal with **uncoordinated policies** (water, energy, climate change, food, land use,...), that pursue partial objectives at the expense of worsening prospects in other policy realms and result in unsustainable cumulative pressures.
- **Maximize the provision of some environmental services** (such as drinking water, water for irrigation, urban soil, dilution of pollutants,), at the expense of impairing the capacity of the ecosystem to provide other valuable services in the present and the future (including those services linked to ecosystems self regulation and support)

Why then EBMs are not widely accepted?

- EBMs involve **complex social choices and trade-offs** (as for example: short term opportunity costs vs long term benefits; reduced pressures and lower provision of commercial services vs enhanced security, reduced risk, better adaptation prospects, etc.)
- They imply **multiple benefits** and compete badly with specialised traditional alternatives. Opportunities are linked to synergies of multiple benefits across stakeholders and policy domains **that can only be reaped by cooperation** instead of competition.
- EBMs **require institutional changes**: in order to build cooperation to foster collective action and share the array of EGS obtained across different stakeholders and policy domains (and break institutional silos along with disciplinary borders and myopic short term commercial interest).

The Aquacross Conceptual model: Taking the best of *DPSIR* and *EGS* frameworks



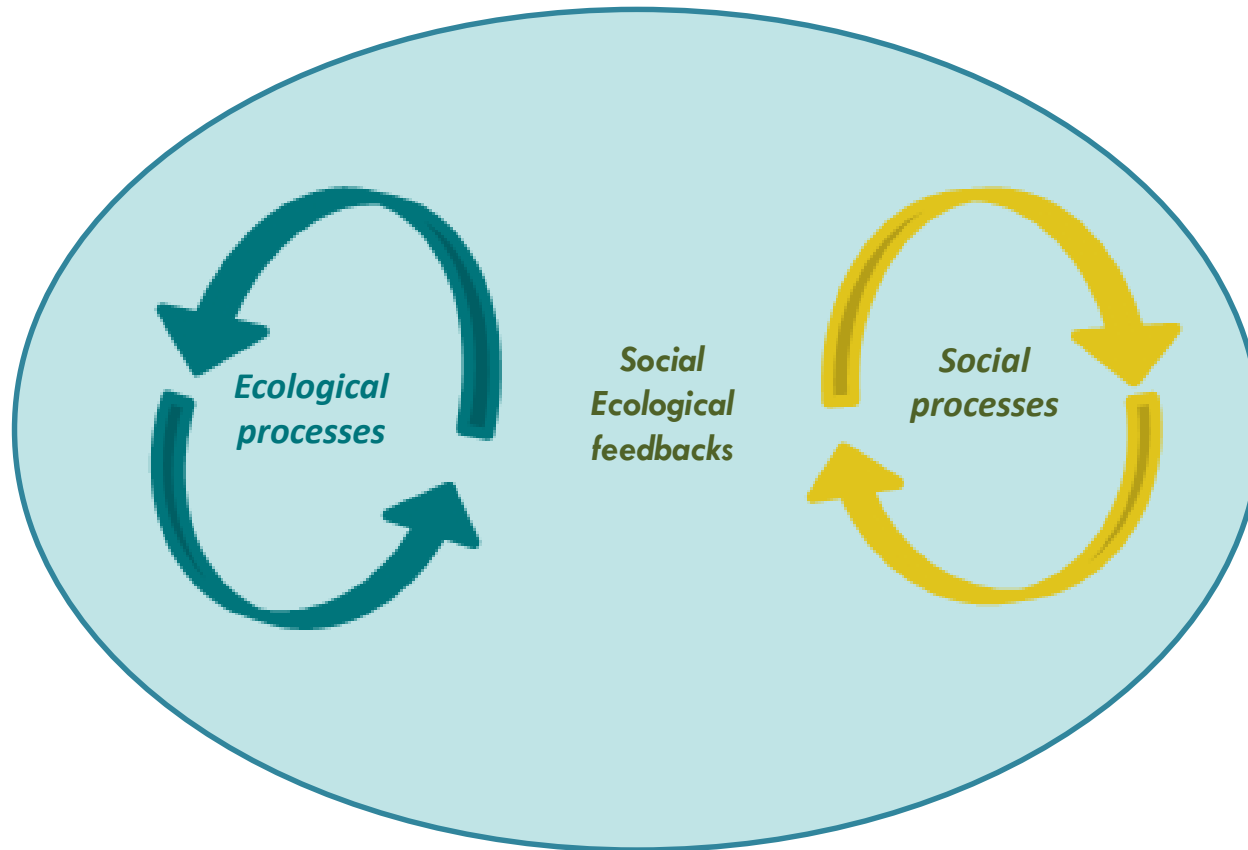
Why not going on just with traditional impact pathway analysis:

- **DPSIR** does not explicitly account for ecosystem's services (nor for the values people give to them).
- Responses are designed to affect pressures (and not necessarily the drivers).
- Emphasis is on top down analysis. Then impacts are negative and responses are reactive and remedial rather than pro-active and preventive solutions.

Why not just adding EGS as another intermediate step in the impact pathway?

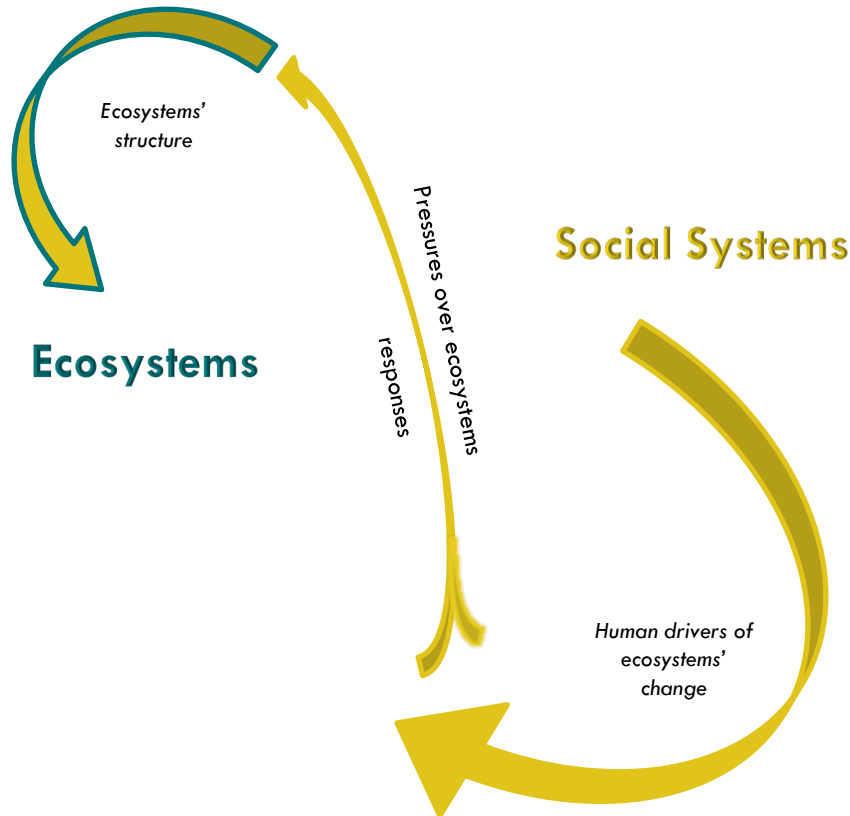
- **The goal of the conceptual model** must be to represent how the ecosystem works and produces the ecosystems services that benefit humans.
- Ecosystems services have **complex links among them** (regulation, support, provisioning, etc.).
- In order to **ensure the policy relevance** of the conceptual model the endpoints must be placed in those ecosystems attributes and services people care about.
- Ecosystems services **the natural bridge between the biophysical and the human dimensions of science.**

Ecological and Socio–Economic Systems: Two interconnected complex adaptive systems



Source: own elaboration based on Biggs et al. 2015 p. 8

AQUACROSS Architecture: Demand-Side linkages



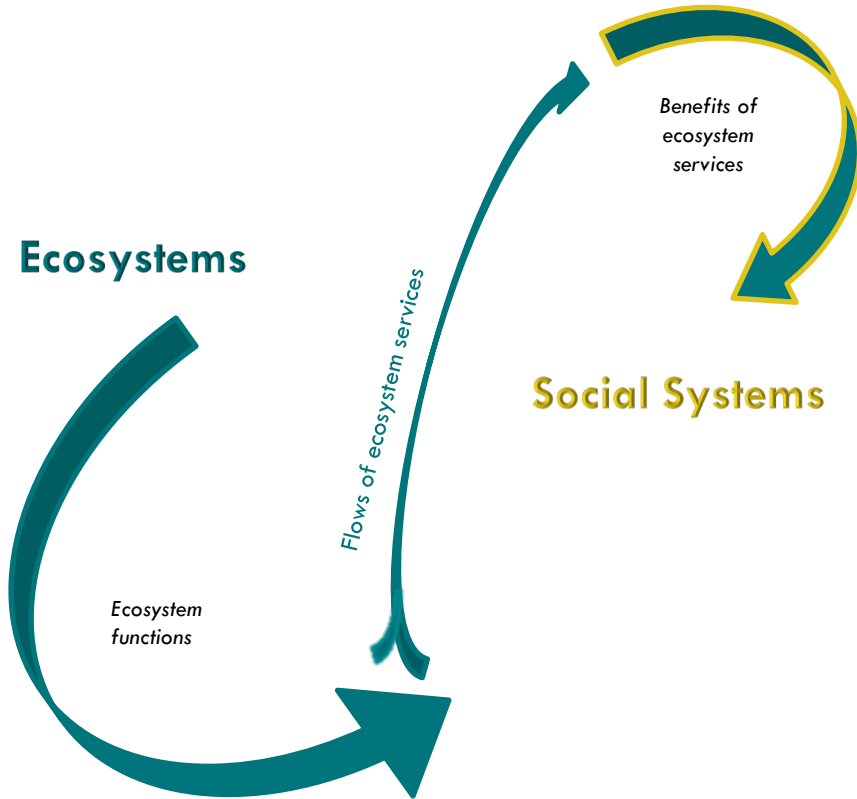
PURPOSE

The analysis of the multiple pathways in which society shapes ecosystems through the way the demand of ecosystem services are satisfied and the way ecosystems are governed

Sources of Inspiration

- ⌘ Impact pathway analysis.
- ⌘ DPSIR

AQUACROSS Architecture: Supply-Side linkages



PURPOSE

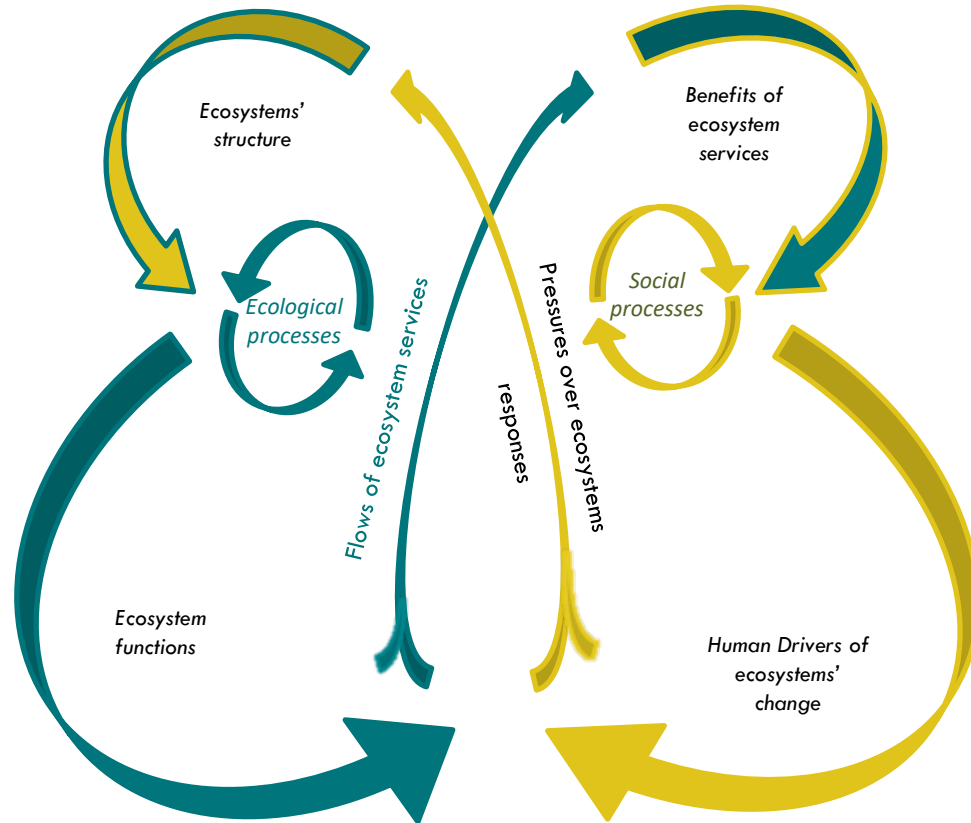
The analysis and assessment of ecosystems and their link to human welfare through the supply and use of ecosystem services

Sources of Inspiration

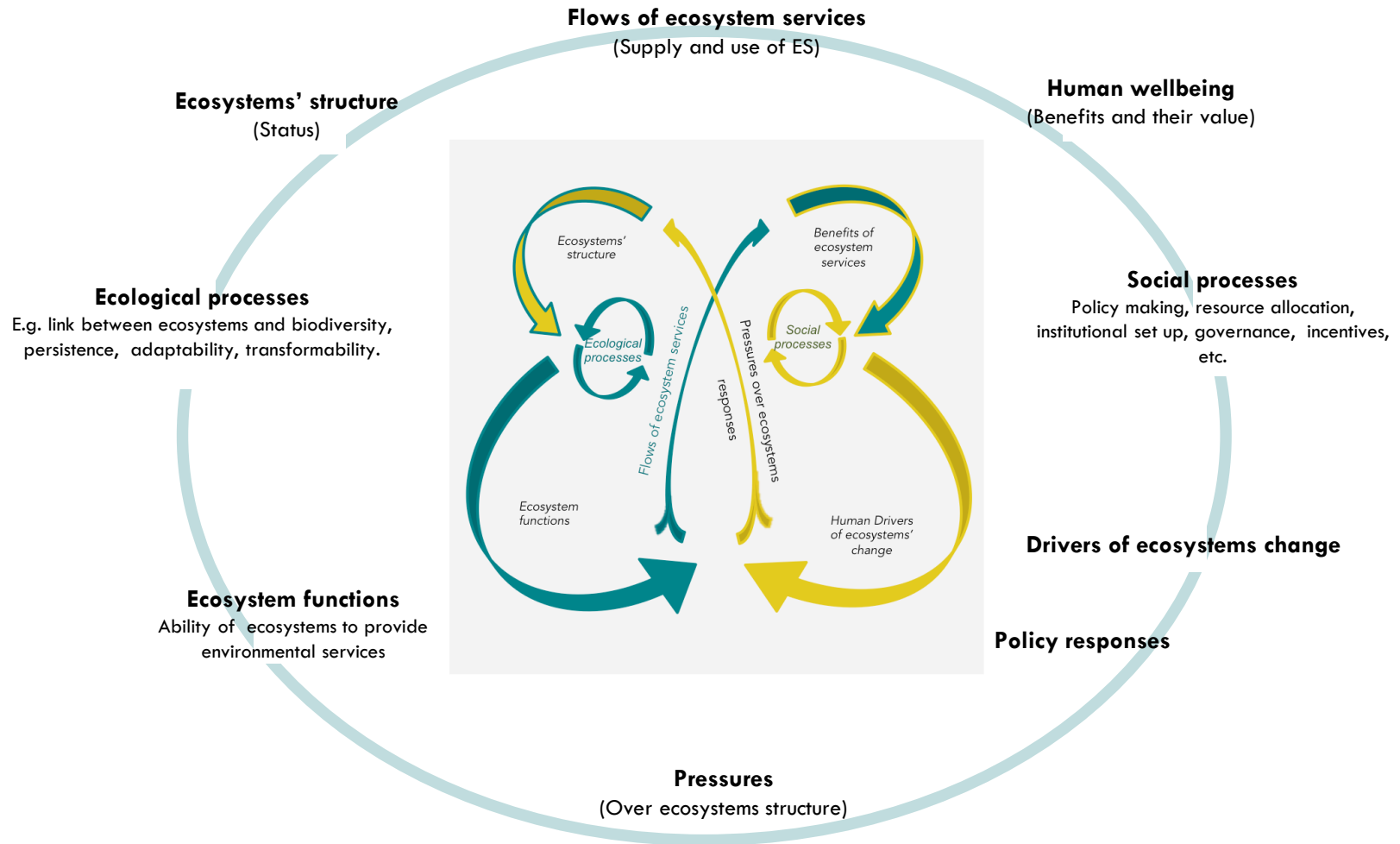
- ⌘ Millennium Ecosystem Assessment.
- ⌘ MAES
- ⌘ TEEB



The AQUACROSS Architecture



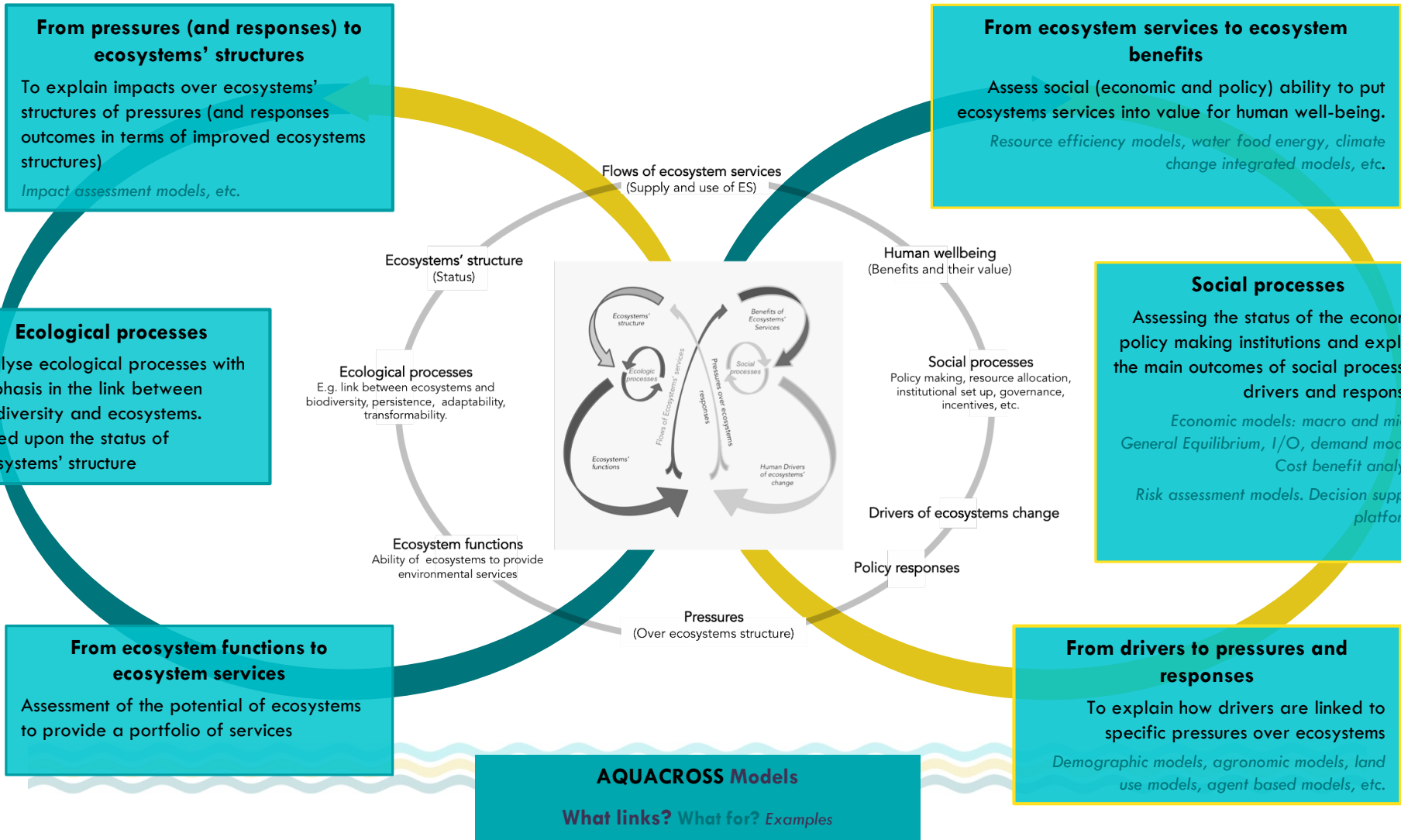
AQUACROSS Heuristic I : How one thing lead to another



***Heuristic** (from Eureka): Any approach to problem solving, learning, or discovery that employs a practical method not guaranteed to be optimal or perfect, but sufficient for the immediate goals. Where finding an optimal solution is impossible or impractical, heuristic methods can be used to speed up the process of finding a satisfactory solution*

AQUACROSS Heuristic II

Analytical models and tools



What for: Building and assessing scenarios



- ≍ Rather than constructed empirically or scientifically, scenarios are the outcome of a cooperative process of learning and co-building foresight visions of the SES.
- ≍ A Baseline is instrumental to identify sustainability challenges rooting its causes in governance and markets and to identify opportunities linked to moving away from traditional practice (such as implementing innovative EBM).
- ≍ A policy scenario is instrumental to set up commonly agreed objectives and to assess alternative courses of action of doing them. It requires assessing the full system (resilience) its environmental outcomes (effectiveness) the wellbeing consequences (efficiency and equity) and the capacities of the governance systems in place to come out with a solution)