Ecosystem services assessment from an ecological perspective

POSTER #116

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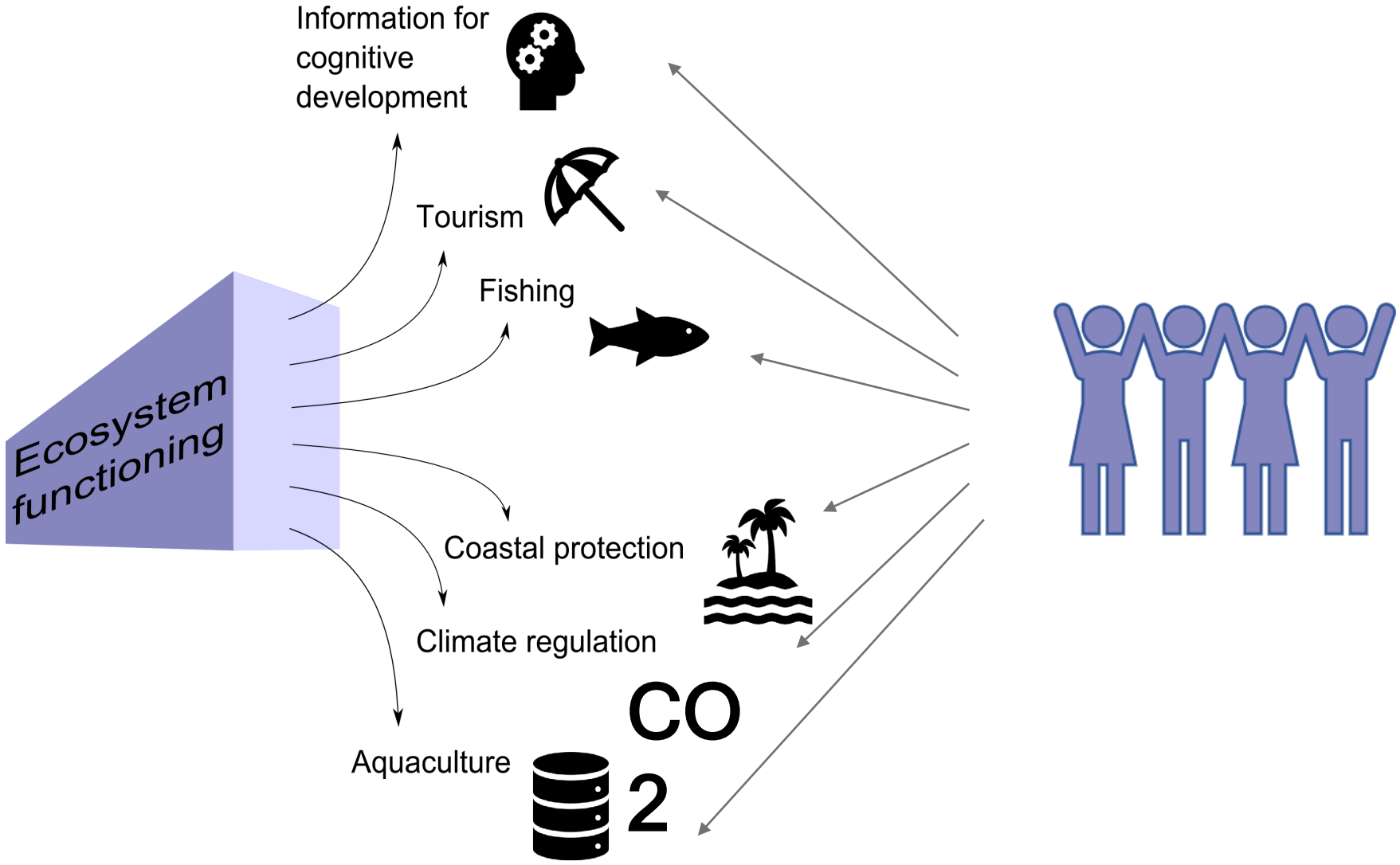
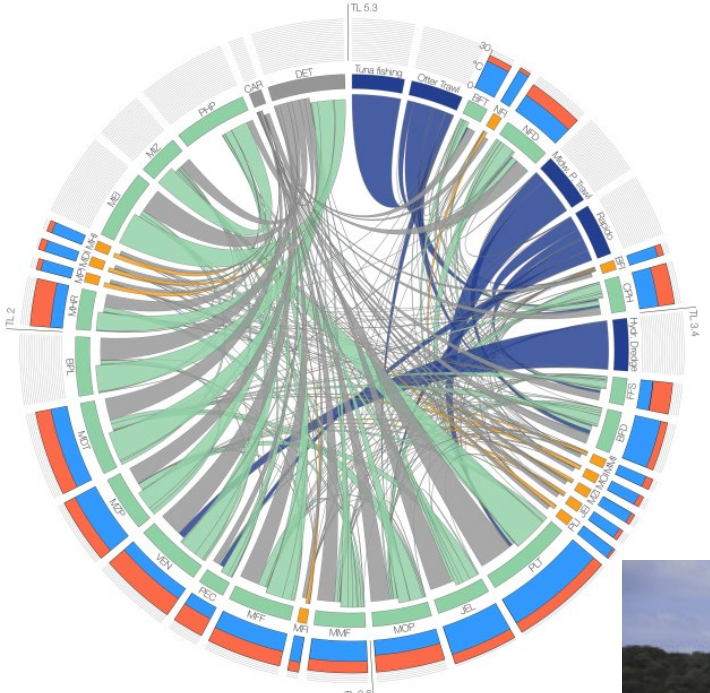
PhD in Science and Management of Climate Change

Human well-being relies on the good functioning of marine ecosystems (Costanza et al. 1997; MEA, 2005; Chapin et al. 2000; Cardinale et al. 2012). It is vital that conservationists highlight this concept thus to have sustainable human uses of the ocean, protecting biodiversity and ecosystem.





Ecopath with Ecosim 6.4

Structure and Functioning of marine and coastal ecosystems

ES Indicators

Two main advantages:

- ❑ Fueling conservation of ecosystem functioning as producer of ES
- ❑ Assess future change of ES supply

ES capacity

1) Biomass of commercial species (FoodWeb)

2) Habitat presence

3) Attractive potentiant

ES flow

1) Yield of target species

2) Habitat reduction of impacts on the coasts

3) Tourism rate (national statistics)

Multiple ES

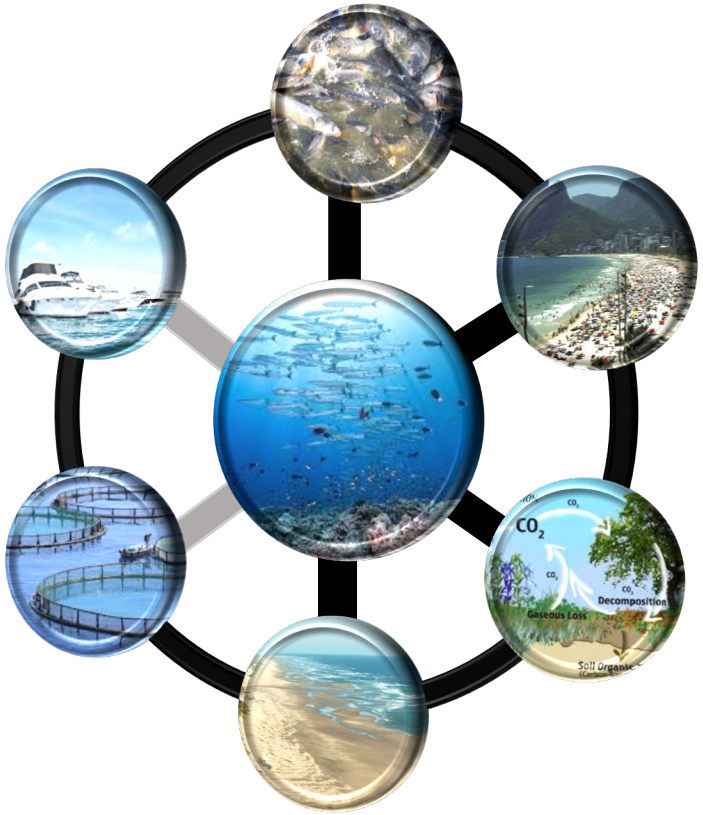
- **Present**: multiple uses at the sea (synergies and trade-offs)

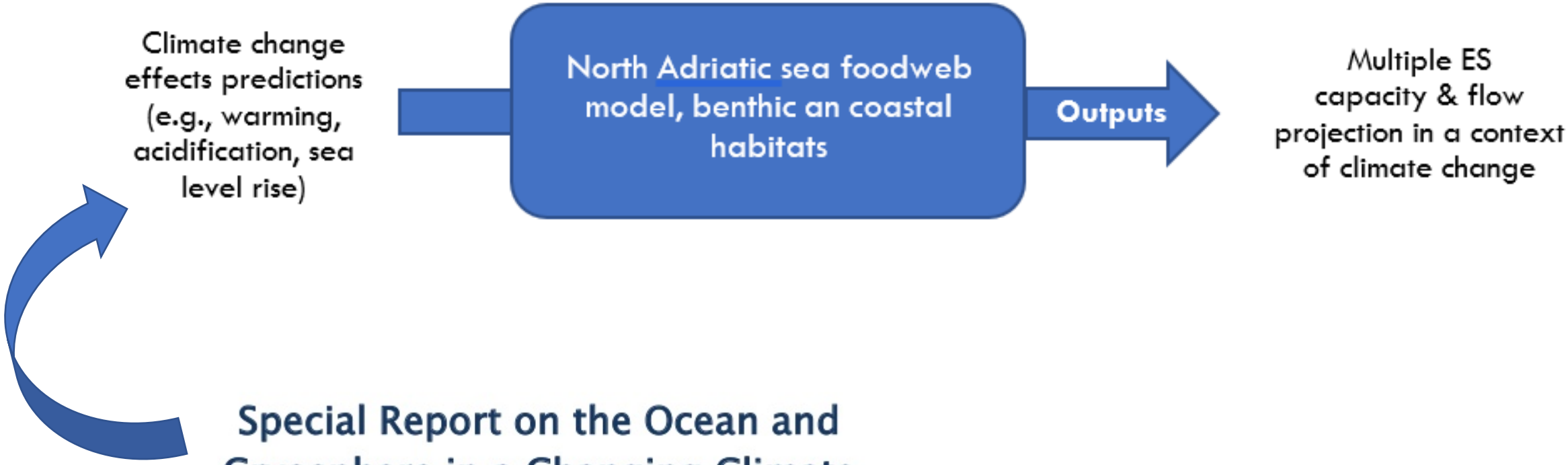
- **Future**: maximizing protection of some ecosystems can protect more ES

① Fishing

② Coastal protection

③ Tourism





Special Report on the Ocean and Cryosphere in a Changing Climate (SROCC)

An Introduction to the Report

ipcc
INTERGOVERNMENTAL PANEL ON climate change

In the last decade **EbA** (supported as best strategy from UN, 2005 and EU, 2008) found a possible realization in the assessment of ecosystem services (ES) which allow the very nature of EbA as an integrated resource management strategy. ES projection can inform national Maritime Spatial Planning (MSP) and Blue growth.

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Ecosystem services assessment from an ecological perspective

Background

Human well-being relies on the good functioning of marine ecosystems (MEA, 2005; Aburto et al. 2012) thus conservation of the marine environment have the large potential to contribute to the integrity and sustainability of our future. However, we can protect just what we know and linking the function of ecosystems to management is not an easy task. The holistic application asked from institutions (UN, 2006; EU, 2008) for natural resource management is the Ecosystem based Approach (hereafter EbA). Ecosystems by definition are considered community of living organisms within the physical environment they occupy at any given time. Hence, working at the ecosystem level implies the natural dynamic of living systems and their interconnection with the abiotic components, making EbA approach useful even in a context of abiotic sea changes (i.e. climate change). The assessment of ecosystem service (hereafter ES) has been recently used to inform policy and decision-makers in EbA, as ES is defined benefits that people derive from Nature (Costanza et al. 1997; MEA 2005). It is important to highlight that ES can be supplied to humans both by physical and biological features of ecosystems. However, use them as a strategy to protect ecosystems and their biodiversity require to consider just the latter.

Conceptual framework

In my PhD thesis, ES will be assessed as spatially explicit multiple ES delivered by North Adriatic sea and coasts, where synergies and trade-offs among ES will be identified. Indicators of capacity and flow per each ES will be proposed using different techniques (e.g., models, collection of statistical data, surveys) in order to quantify them. The main goal of my PhD projects is to value ES with an ecological perspective. ES are measured by indicators which have to be linked to the structure and the function of the marine ecosystem. Starting bridging ES to North Adriatic Food Web (NA-FW) outputs can be an option to link ES to functioning. The use of a bottom-up approach consists of understanding how the ecosystem functioning determines the ES delivery. This has been less explored than, a top-down approach (exploring of ES from users).
That is not to say, that the social approach is unimportant for ES, the mere nature of ecosystem service science is rooted in socio-ecological systems but more to emphasise the vital role that Nature has for humans and how mankind benefits from its conservation. The FoodWeb model for the North Adriatic is built in Ecopath with Ecosim 6.6.

On one hand, it is difficult to look at all the ES with and ecosystem functioning lens. Some are least linked to ecology. For instance, the cultural service of «recreational navigation» does not straightforwardly link to ecologic process and functioning but just on water and marine space.
On the other hand, even if not all many ES can be linked to the health of ecosystems (with functioning food web and biodiverse community), the above problem can be solved using multiple ES approach to connect indirectly the least linked ES to ecological processes. Moreover, trough survey is possible to understand how the coastal and marine natural capital determines the attractiveness of the place for tourist and visited sites linking ss cultural service to ecosystem.

Figure: Climate change effects on food web and marine coastal habitats an in turn on ES flow

Further advancements

Marine and coastal ES capacity and flow will be both affected by climate change. Warming temperature, acidification and sea level rise among many will have an impact on ecosystems and so on service they provide. Using the FoodWeb model and presence of habitat to quantify ES allows to explore effects of climate change on marine communities and thus how these modifications will affect the delivery of ES (Figure).
Make projections on the effects of climate change on the ES flow to humans can inform management actions. Future economic activity at the sea (i.e. Blue growth) will benefit from these knowledge, for the maintenance of ecosystem function and ES supply over time. Eventually, these knowledge can be included in national balance sheet or in stakeholders business plan which wish to fuel the economy of the sea. These projections can make decision-makers recognize that uses at the sea will be already impaired by environmental changes themselves so that protection of natural ecosystems and their functioning becomes even more crucial.

References
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See you from 5.30 pm to 7.30 pm around my poster !

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