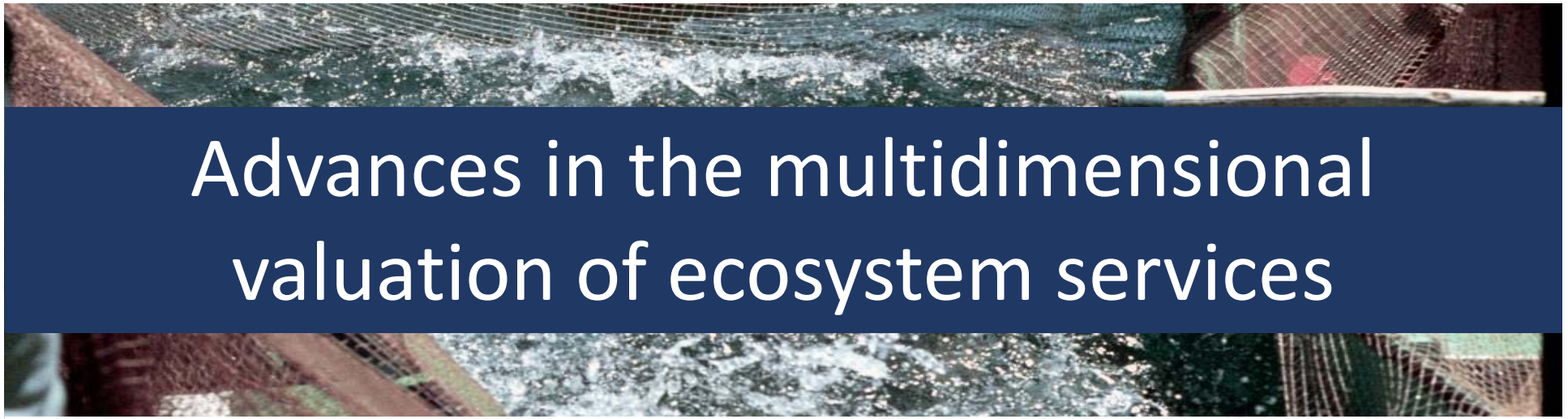


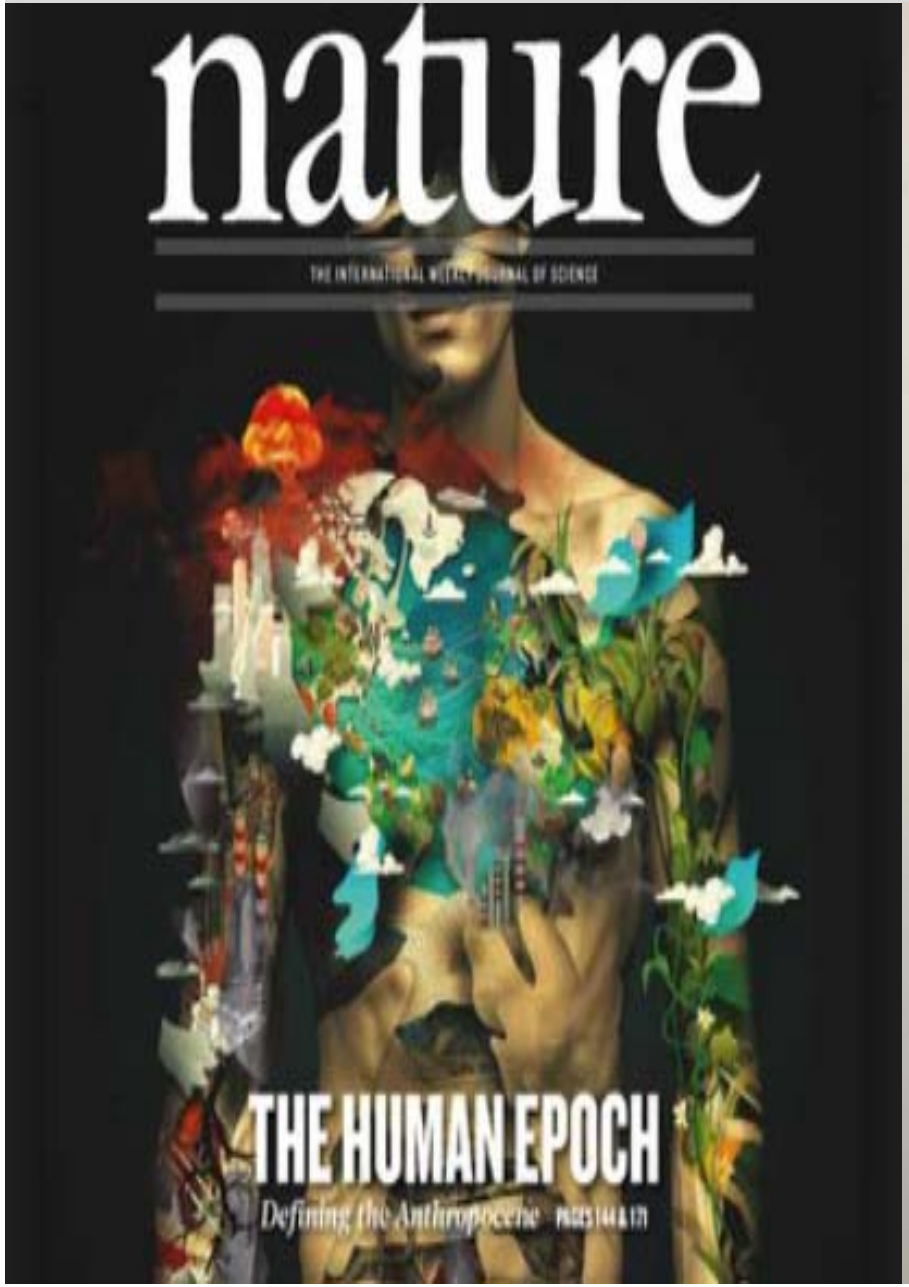
Advances in the multidimensional valuation of ecosystem services

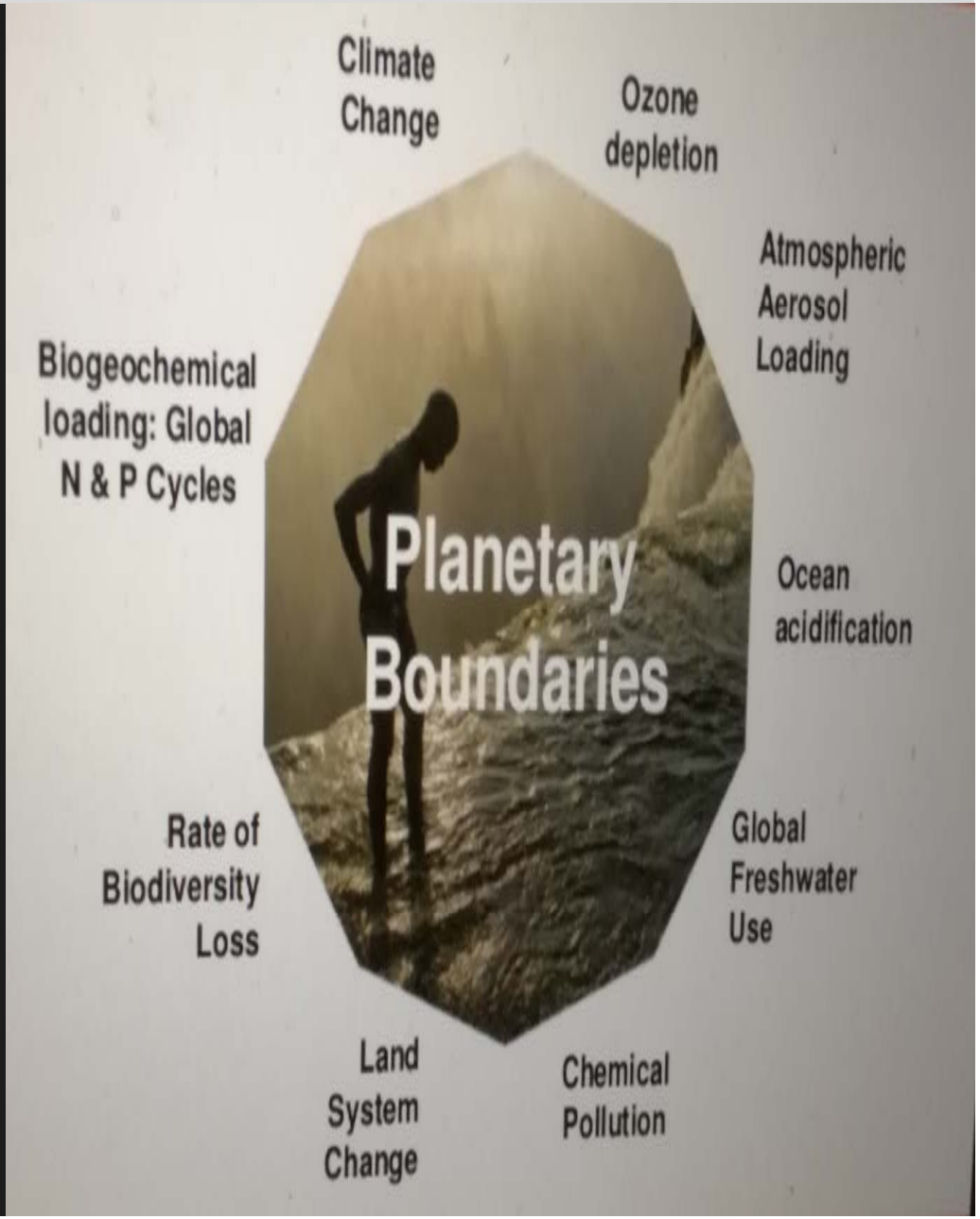
Sebastián Villasante[1,2]

[1]University of Santiago de Compostela (Spain), [2] Fellow of the Natural Capital Project (USA)

Policy Workshop i-Life Troodos Project,
December 4-5th 2018, Nicosia (Cyprus)

Welcome to the Anthropocene





The role of ecosystem services for live on Earth and Human being

Carry out 50% primary production Earth

Supply 20% average intake animal protein to 3.1 billion people

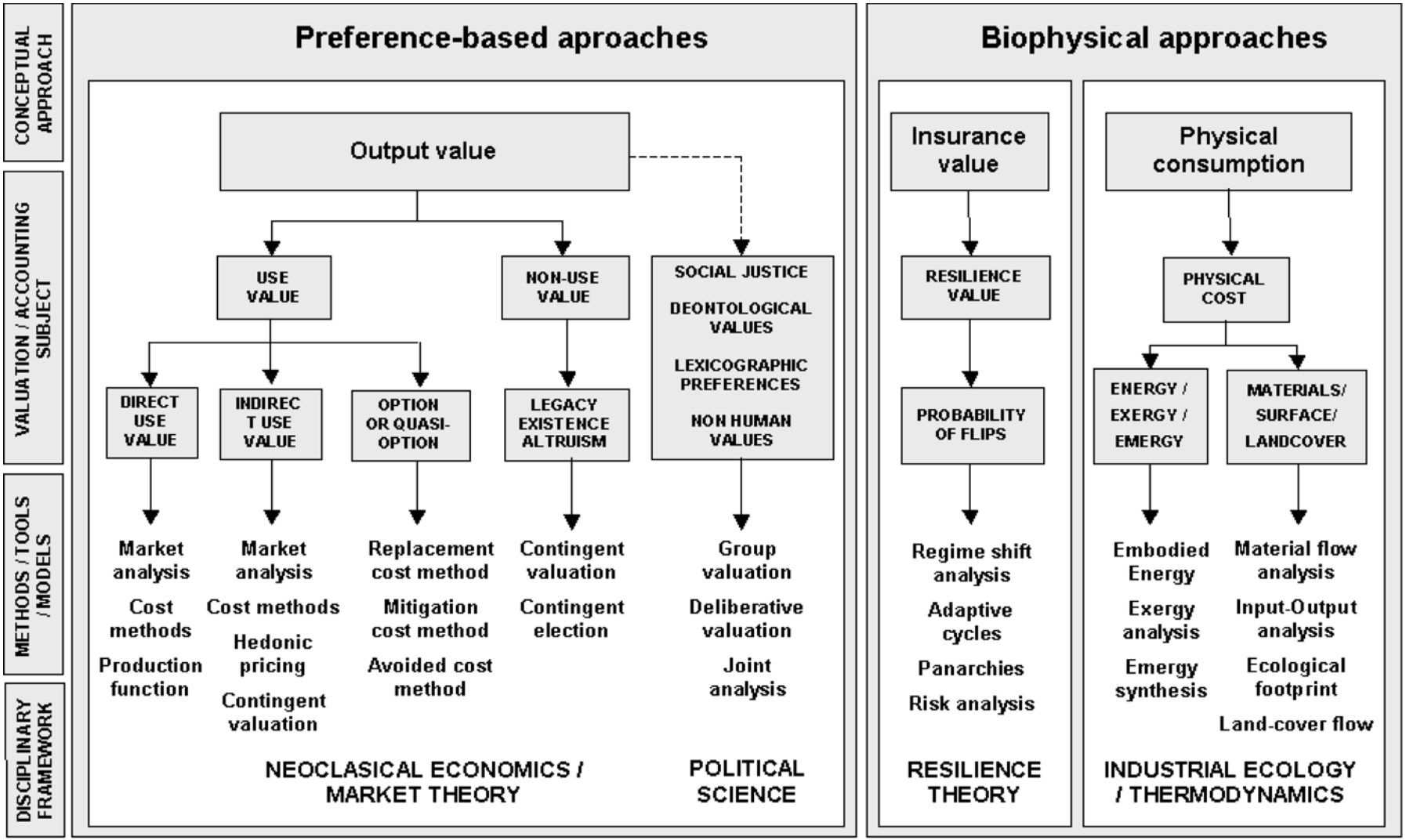
Support the greatest biodiversity on the Planet

Why *valuing* nature is key for policy makers?

Valuing ES and incorporating those values into decision-making processes will help in:

- Evaluating the impacts of development policies and policy interventions;
- Comparing the real cost-effectiveness of an investment;
- Evaluating trade-offs between different management options and choosing between competing uses;
- Assessing liability for damage to the environment;
- Creating markets for ES in order to mobilize financial resources, e.g., global carbon market and PES; and
- Awareness building and communication to the public on the overall contribution of ES to social and economic well-being

Value paradigms: preference-based and biophysical methods?

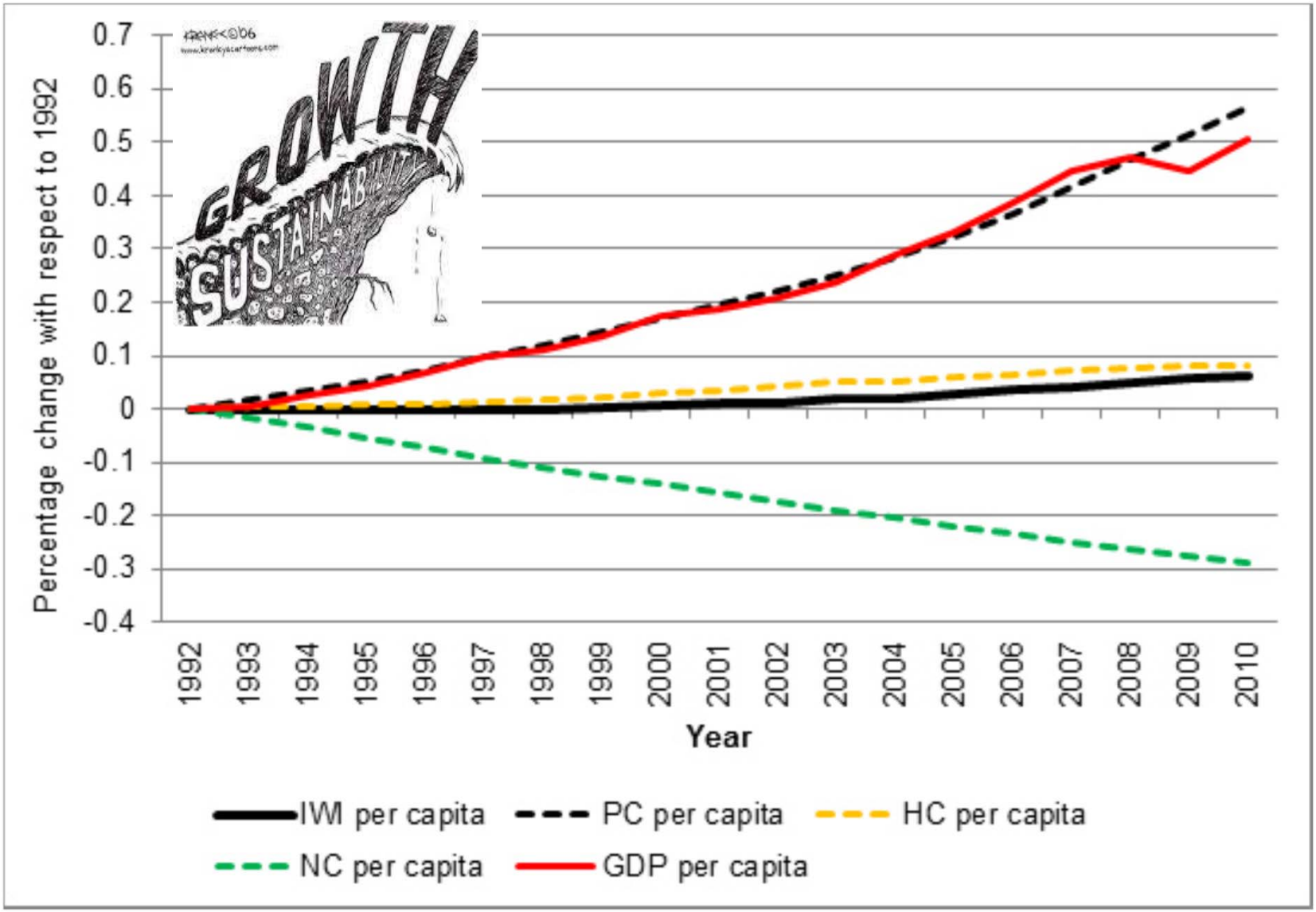


Marine systems experience an economic loss of $10.9 trillions/year

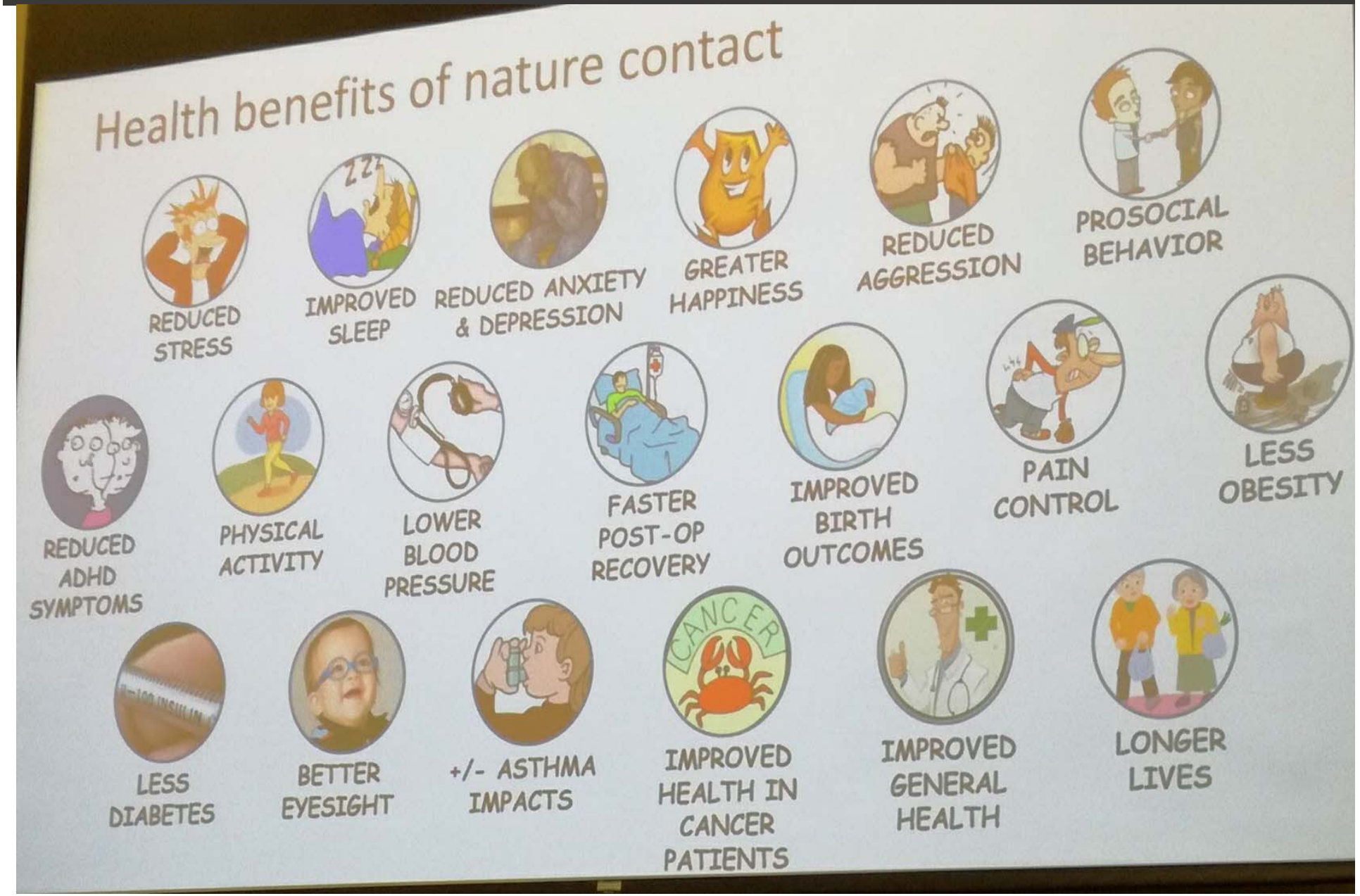
Biome	Area (e6ha)		Aggregate global flow value (trillions 2007$/yr)	
	1997	2011	1997	2011
Marine	**36,202**	**36,202**	**60.5**	**49.7**
Open ocean	33,2	33,2	21.9	21.9
Coastal	*3,102*	*3,102*	*38.6*	*27.7*
Estuaries	*180*	*180*	*5.2*	*5.2*
Seagreass/algae beds	*200*	*234*	*5.8*	*6.8*
Coral reefs	*62*	*28*	*21.7*	*9.9*
Shelf	2,66	2,66	5.9	5.9
Terrestrial	**15,323**	**15,323**	**84.5**	**75.1**
World	**51,625**	**51,625**	**145.0**	**124.8**

Costanza, R. et al. (2014) Global Environmental Change 26: 152-158.

Why do we need to *value* nature?



Human benefits from Nature



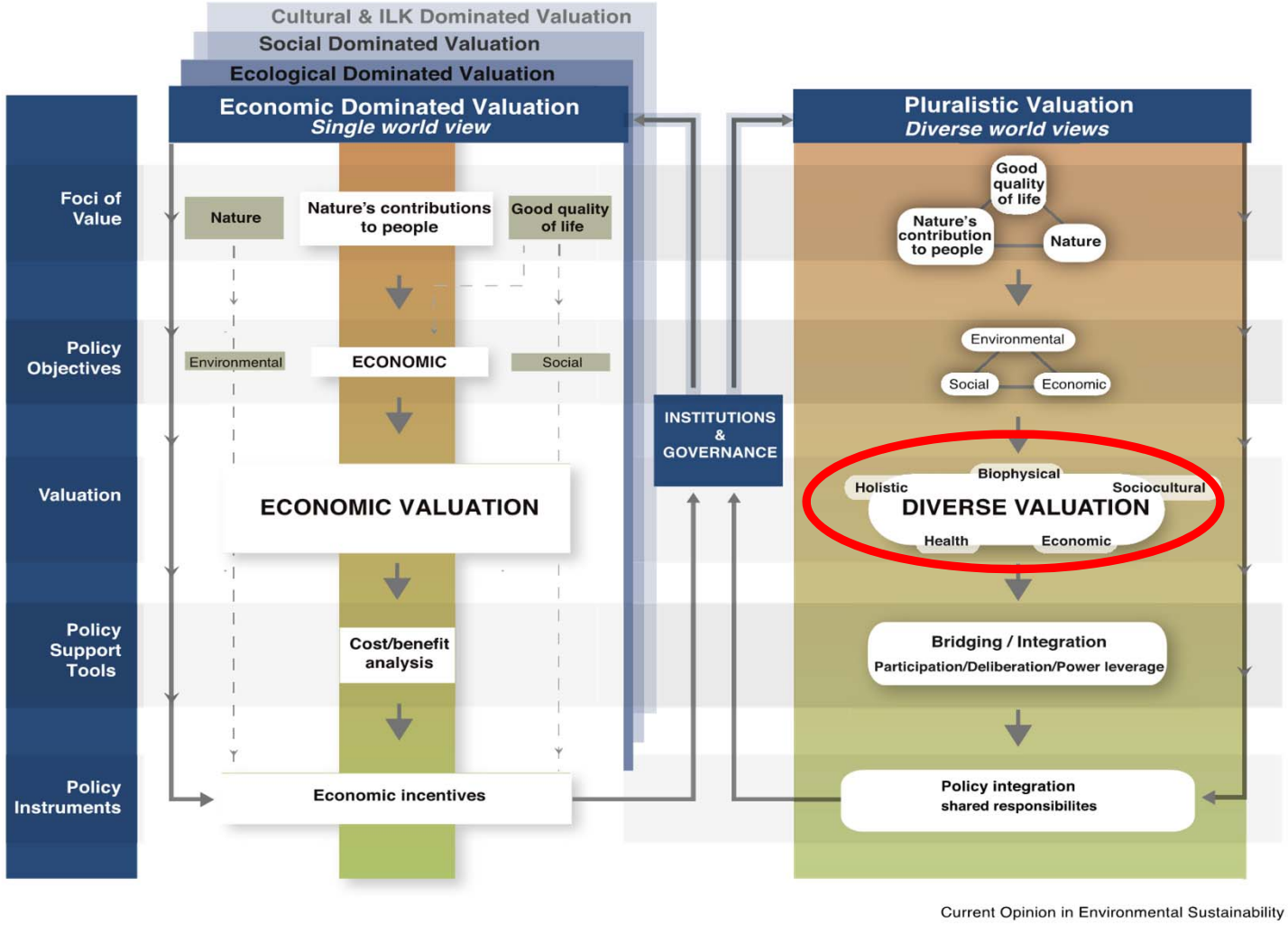
Current challenges: Multidimensional valuation of ES

BIODIVERSITY AND ECOSYSTEMS

Assessing nature's contributions to people

Recognizing culture, and diverse sources of knowledge, can improve assessments

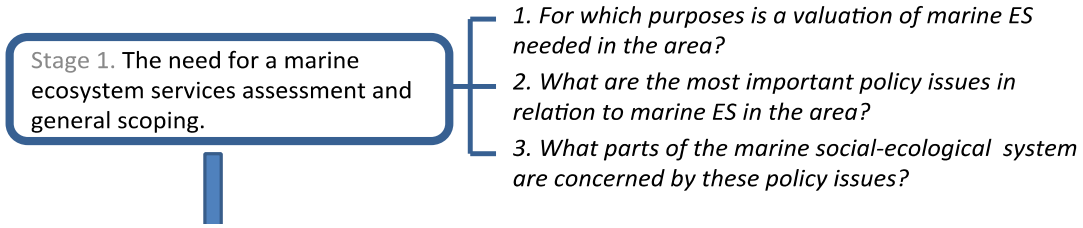
IPBES: Not just commodities!



Current Opinion in Environmental Sustainability

Pascual et al. 2017

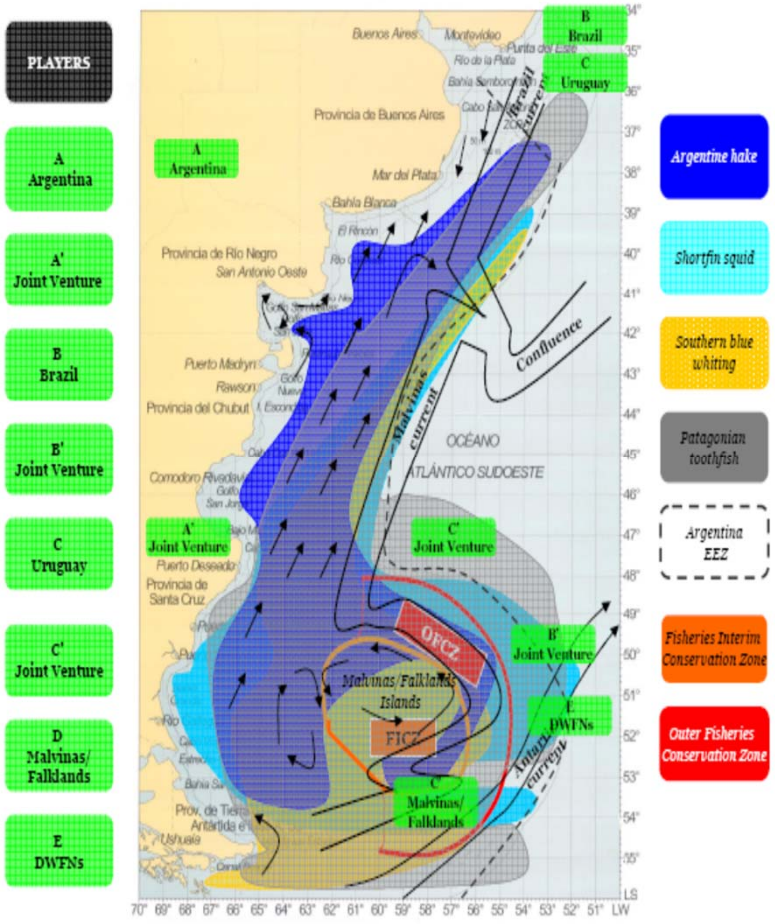
The Triage Approach



Pendleton L., R. Mongruel, N.Beaumont, T. Hooper, M. Charles. A Triage Approach to Improve the Relevance of Marine Ecosystem Services Assessments. Marine Ecology Progress Series (MEPS) 530:183-193. 2015

1) Assessment of provisioning and recreational ES

- Economic valuation and restoration of ecosystem services
- Game theory, public policies and management tools (industrial fisheries, tourism)

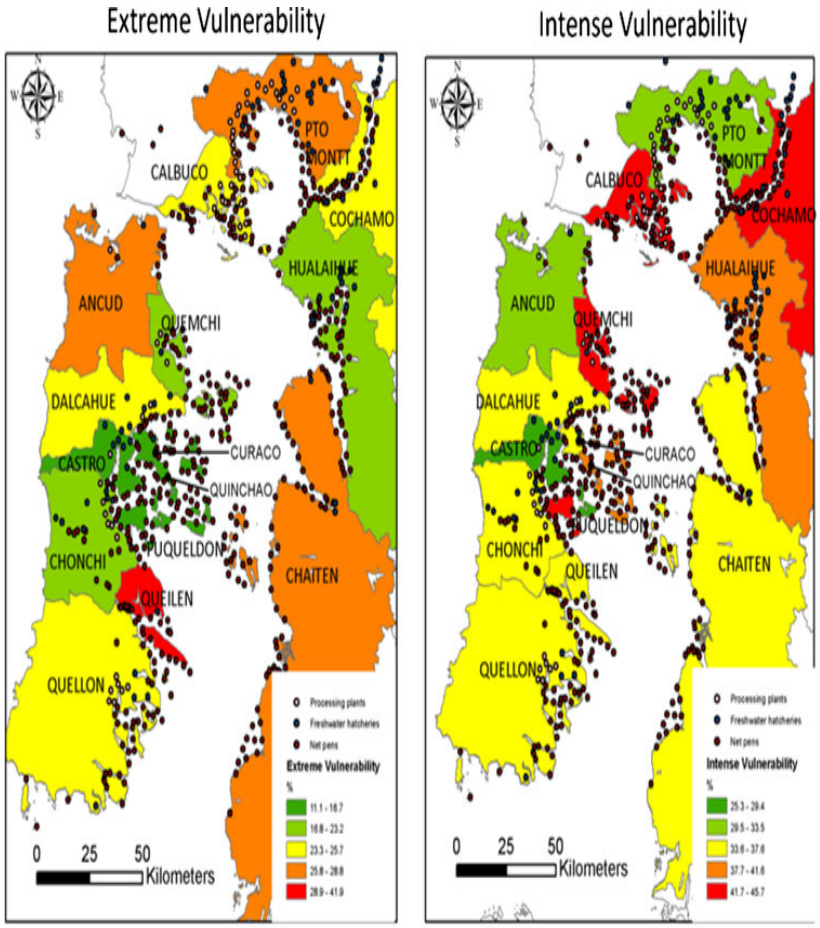


Villasante et al. 2014. In Maskin, Barret, Mäler. Oxford University Press.

Stefanski-Villasante. 2015. Ecosystem services.

2) Mapping spatial patterns of synergies and trade-offs

- Synergies and trade-offs between ES (fisheries, aquaculture, ecotourism)
- Scenario development for public policies (SSF, aboriginal communities, industrial fisheries)



Outeiro-Villasante. 2013. AMBIO.

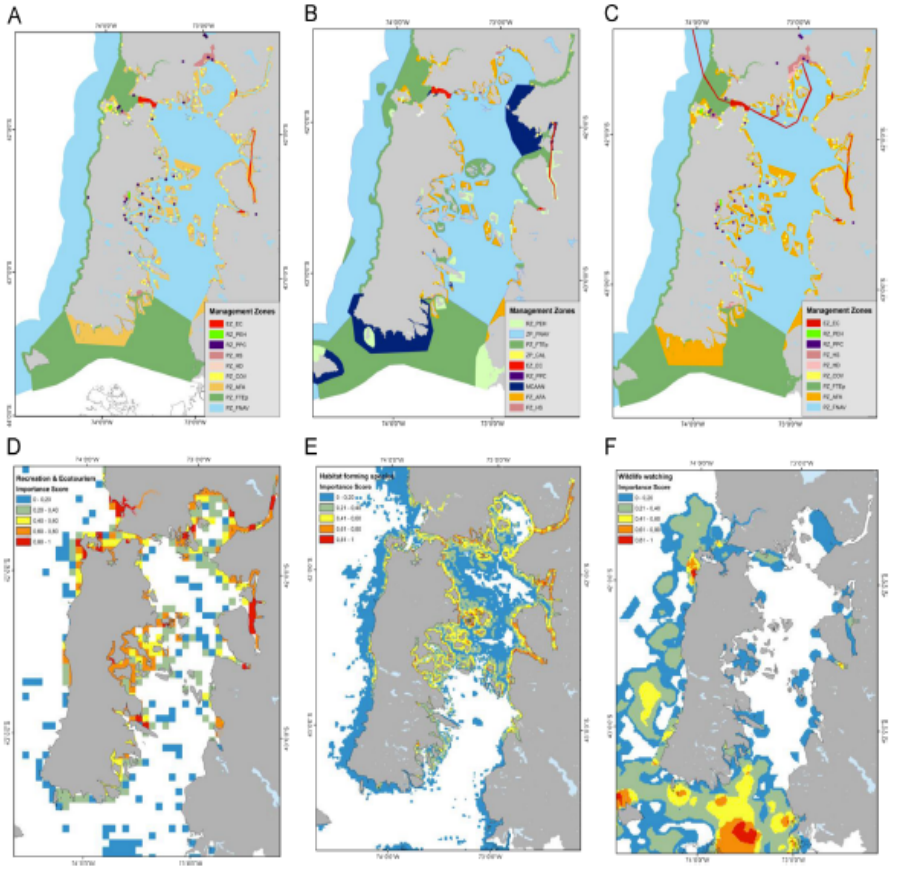


Fig. 5. Management areas for the scenario under analysis and the spatial distribution of the ecosystem services: (a) management zoning for the current scenario, (b) management zoning for the environmental conservation–indigenous development scenario, (c) management zoning for the industrial development scenario, (d) spatial distribution of the recreation and ecotourism, (e) spatial distribution of the habitat forming species, and (f) spatial distribution of the wildlife watching. *Source*: own elaboration from InVEST overlap marine model.

Outeiro-Villasante. 2015. Ecosystem Services.

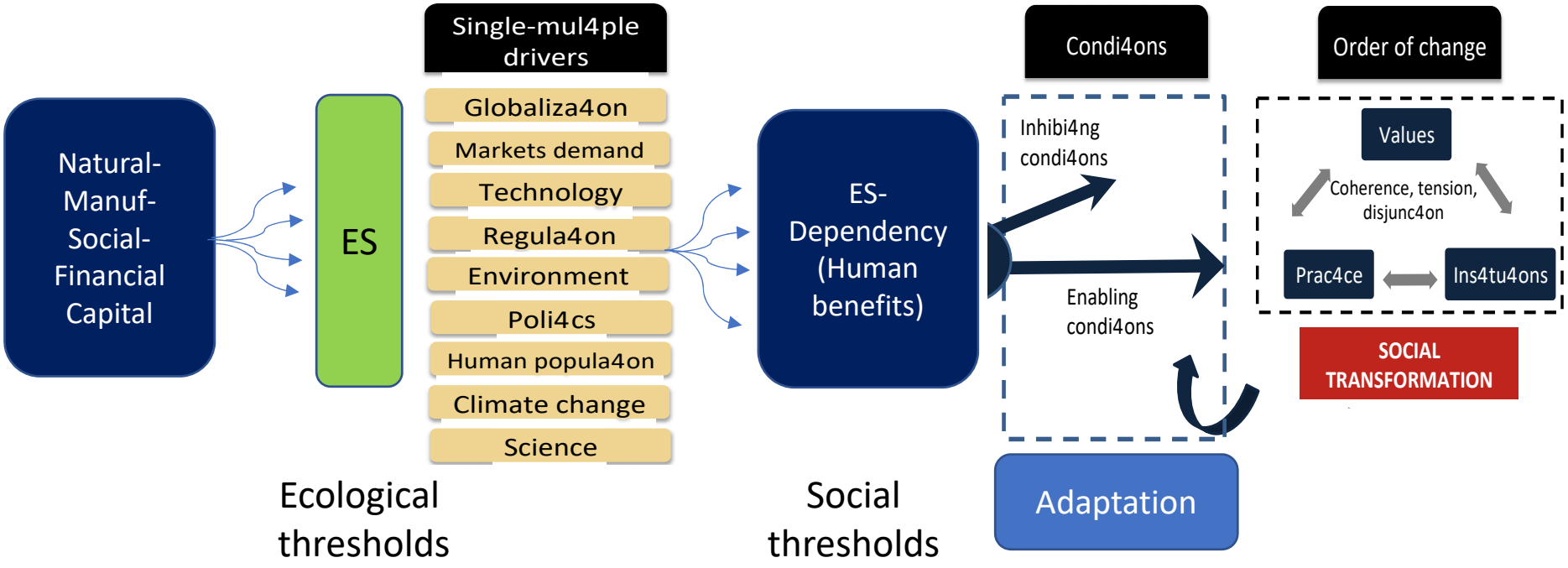
3) Co-design of plausible future scenarios

- *"Escape from the past – avoid non-desirable future"*
- Tipology of scenarios
  - Global – support from *policy-makers*, slow implementation
  - Participative – tension actors, data monitoring
  - Radical – Anthropocene, Biosphere
- Participatory scenarios
  - ES spatial quantification/mapping
  - Participatory assessment
  - Co-designing with stakeholders

- Hanapach, J. et al. (2015) Ecology and Society
- Nieto-Romero, M. et al. (2016) Land Use Policy


1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
THE GLOBAL GOALS
For Sustainable Development
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE AND JUSTICE STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS

Multidimensional valuation and social transformations of ES



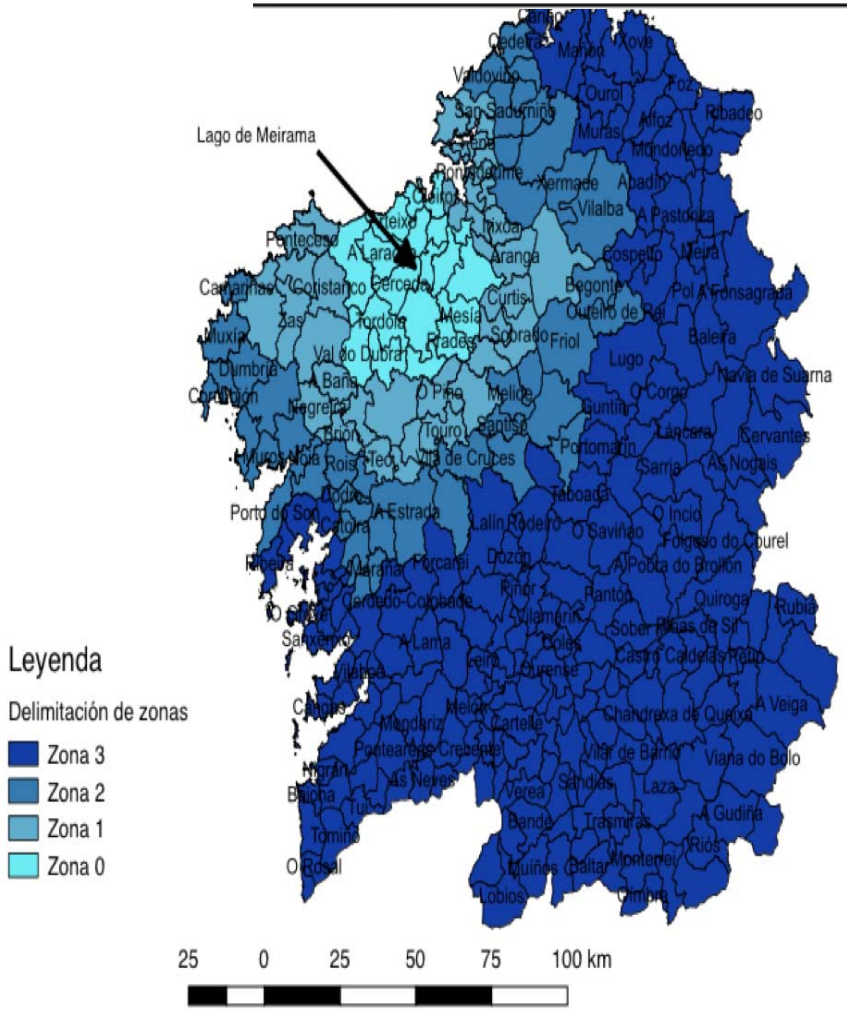
Villasante, S. et al. (2018).

What we mean by a social transformation?

- **Differentiating concepts from social sciences:**
  1. **Adaptation**: reflects the capacity of a system to adjust its responses to change in external drivers and internal processes (change on "*prac2ces*"),
  2. **Transformation:** a fundamental shift in the institutional dimension and patterns of practices through time (change on "*prac2ces*" and "*ins2tu2ons/governance*"),
  3. **Social innovation**: can be transformative or not, but implies a social change.

Villasante, S. et al. (2018).

Case 1) Meirama's Lake - Galicia (NW Spain)



Villasante, S. et al. (2018).

Case 1) Travel cost method willingness to visit Meirama's Lake - Galicia (NW Spain)

Concept	Value (€)
Value of recreational uses of the Meiramas' Lake (Travel Cost Method)	176,827,253
Willingness to pay for preferred activities	59,766,945
Willingness to pay for other ecosystem services (conservation of biodiversity, climate regulation, etc.)	17,828,969
Value of recreational uses	**254,423,167**
Value of water as stock flow	**123.413.707**
Scenario 1: 14.5 hm^3/year	20,950,735
Scenario 2: 24.5 hm^3/year	29,407,119
Total value of recreational - water uses and ecosystem services	
Scenario 1: 14.5 hm^3/year	**398,787,611**
Scenario 2: 24.5 hm^3/year	**407,243,996**

Villasante, S. et al. (2018)

Case 2) Cíes Natural Park – Natura 2000 Network - MAES in Galicia (NW Spain)

- Integrated assessment of marine SE
  - Target: double natural capital 2050
  - Cartography of habitats 92/43/CE
  - Identification of marine ES
  - Selection of economic activities
- Repository of available information
- Co-design with stakeholders:
  - I Workshop (2 pilot case studies)
    - Presentation of the project
    - Map of pressures
    - Map of synergies ad trade-offs
    - Synthesis of current scientific evidence
    - Questionnaires to collect complementary (lacking) information

Villasante, S. et al. In prep.

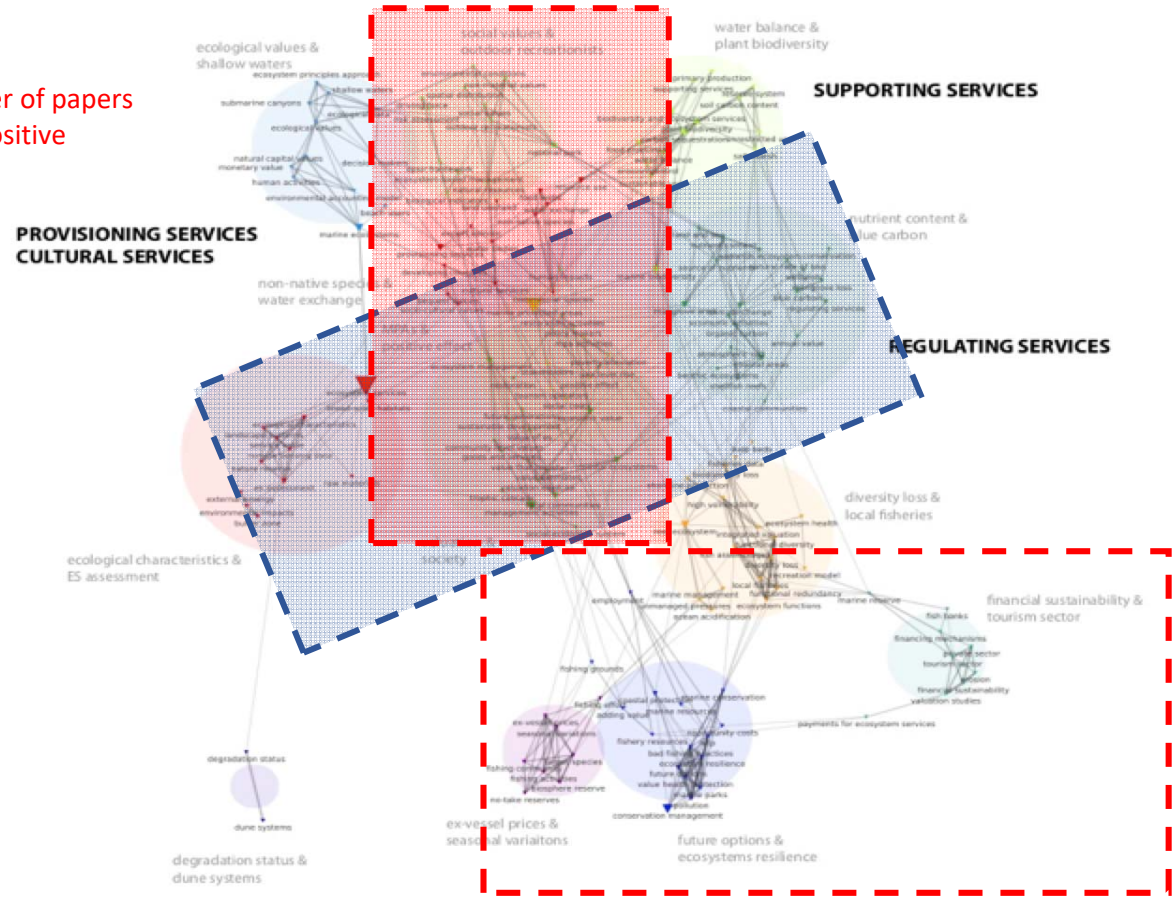
Literature review and repository of existing evidence

“Global literature review of marine ES in protected areas”

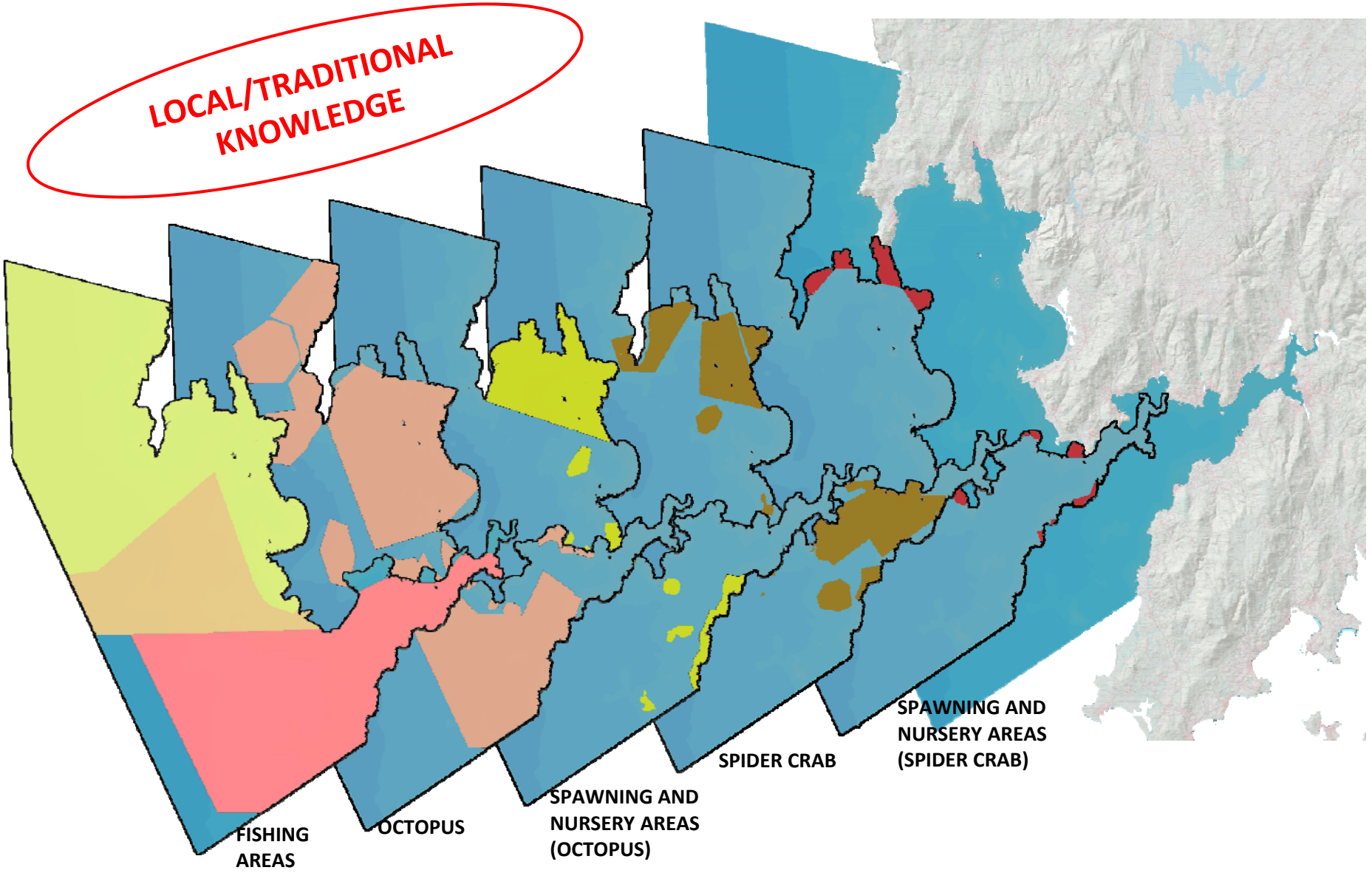
Network Core
Central position
Topics common to a large number of papers
Valuation & society + MPAs & positive effects + services

Topics more frequent in the network
Valuation & society + MPAs & positive effects

Satellite clusters
Knowledge gaps ?
Recent topics?



Local traditional knowledge



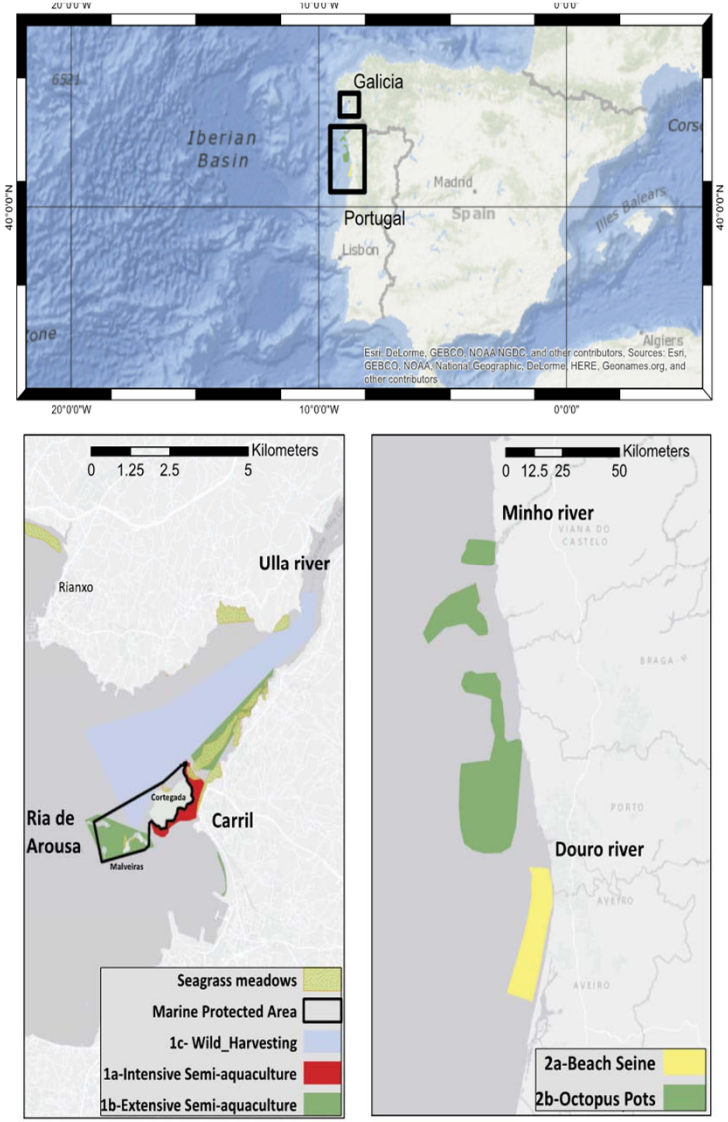
Co-production of marine ecosystem services matrix

- Study area (Ría de Arousa
- Sequential step-wise analysis including three steps:

  1) Inventory: case studies in Europe for studying co-production in small-scale fisheries based on discussions during the ICES WG meeting RMES

  2) Matrix: collect information on co-production and ES delivery from regional databases, published papers and long-term research experience

  3) Comparative analysis: scale of co-production, and co-production level and ES trade-offs with special attention to the property regime

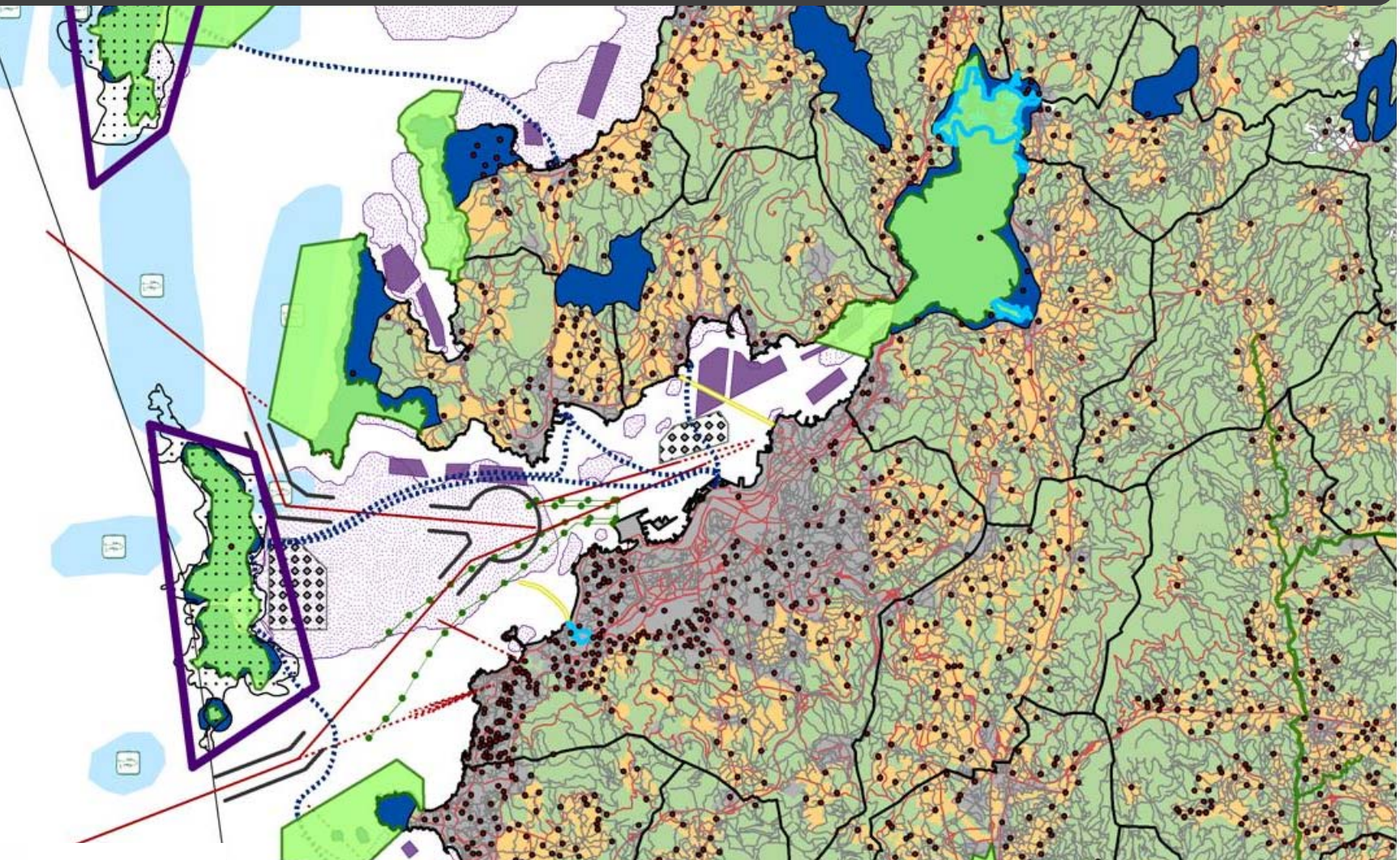


Outeiro et al. (2017) International Journal of Biodiversity Science, Ecosystem Services & Management 13:3:35-50

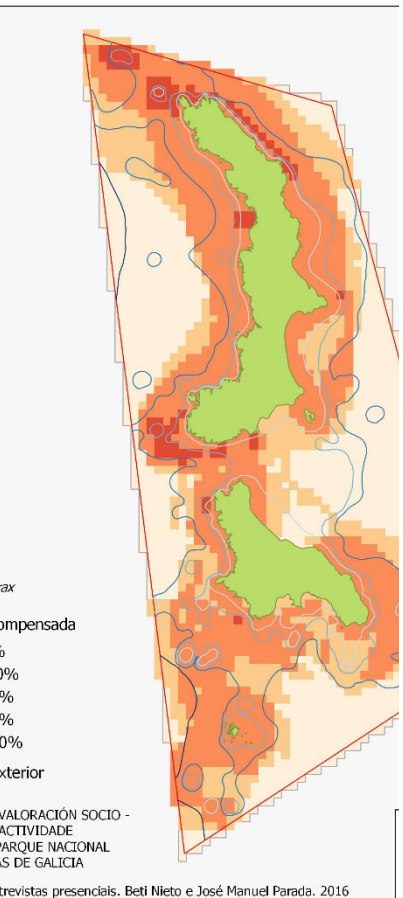
aggregated non-natural capital use and co-production of marine ecosystem (dis)services in Galicia (NW Spain)

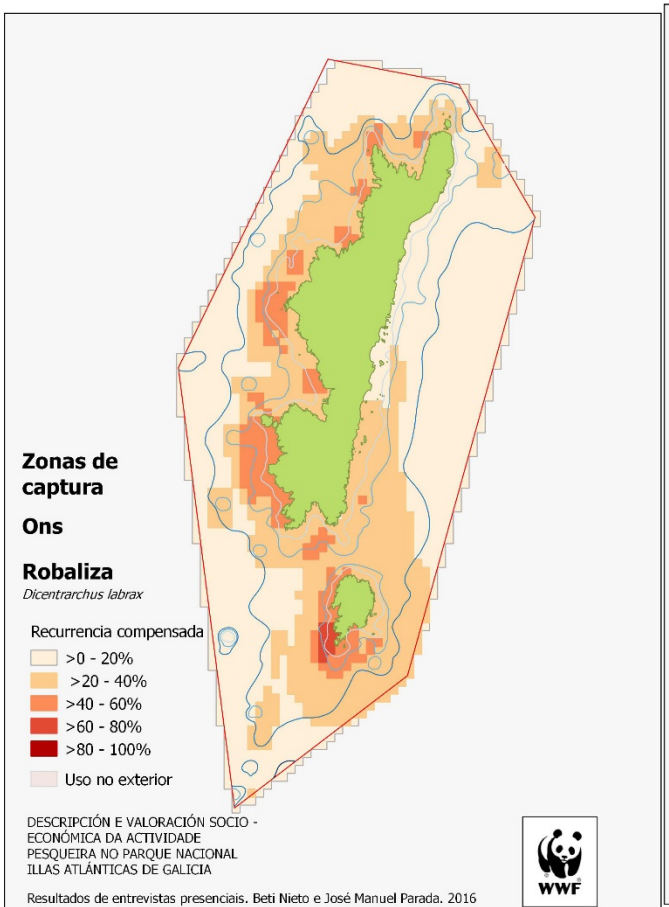
	Galicia	Galicia
Case studies	**Intensive semi-aquaculture ("Parque cultivo")**	**Wild harvesting ("Libre marisqueo")**
erty regime	Concession individuals	Common pool resource
t species	Bivalves (clams, cockles)	Bivalves (clams, cockles)
fits	Food, employment, tourism, identity	Food, employment, tourism, identity
an capital	LEK and skills, high intensity rearing, plowing, predators and algae removal, manual and mechanical harvest	LEK and skills
l capital	Collective surveillance	Gear restriction, quota based, collective surveillance
ufactured capital	Boats and rakes	Boats and rakes
cial capital	Lease of plots, seed hatcheries	May apply buy boats
of co-production	High-intensive	Low
stem disservice	Regulating, risk of pests	Unknown

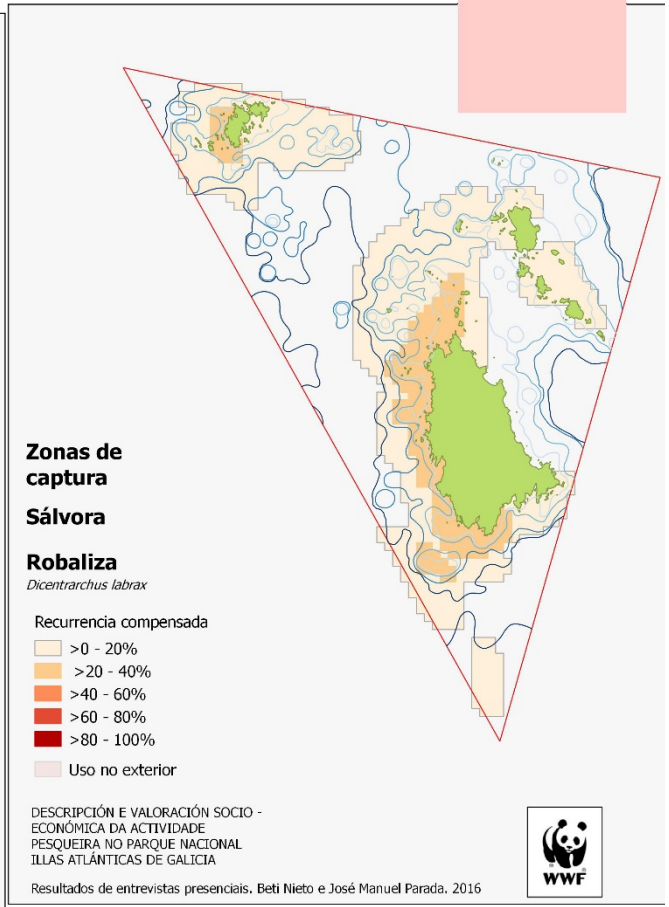
Cíes Islands Natural Park – Natura 2000 Network



ES dependency (*catches*) of small-scale and shellfishing activities





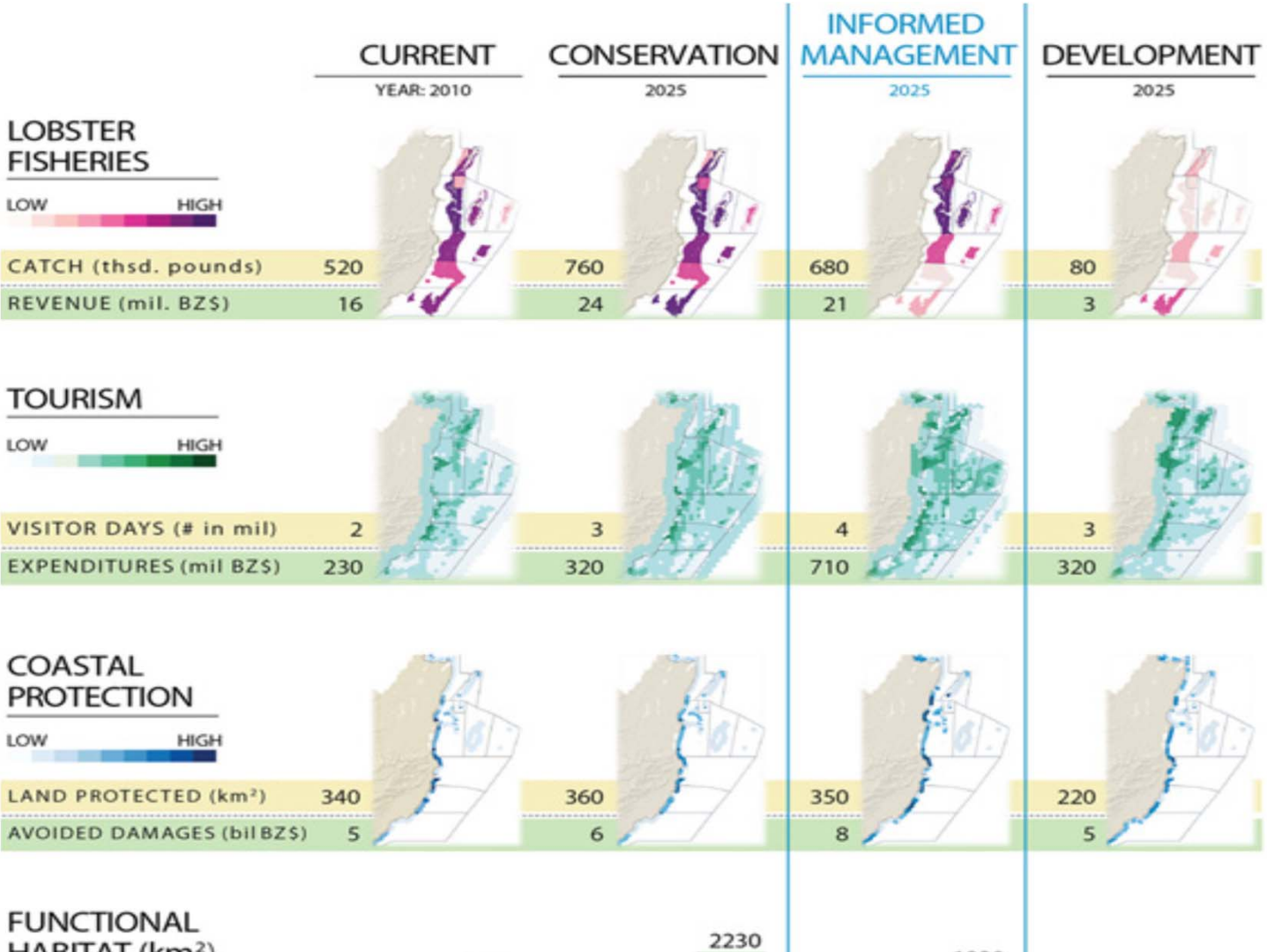


atrix to integrate and evaluate the importance of marine habitats to specific services

	Habitat and supporting services				Regulating services					Provisioning services		
abitats	Primary production	Nutrient regeneration	Habitats for species	Sediment formation & composition	Carbon sequestration & storage	Erosion prevention	Local climate and air quality	Waste-water treatment	Moderation of extreme events	Food	Raw materials	Medicinal resources
ack coral garden	2-1	1	3	1	1	1	1		1	1	2-1	2-2
yozoan bed	1	1	3	3	3	1	1		1	1	1	2-2
ull kelp (*Durvillaea*) forest	3	1	3	3	1	2-2	1	2-2	1	2-2	3	2-2
ockle bed	3	3	3	1	1	1	1	2-1	1	2-1	1	
eep/cold coral garden	2-2	1	3	3	2-1	1	1	1	1	1	2-1	2-2
cklonia forest	2-1	1	2-2		2-2	1	2-2	3	1	2-1	1	3
eart urchin plain	3	3		1	2-2	1	3	2-2	1	1	1	1
orse mussel bed	3	3	3	1	1	3	1		1	1		1
acrocystis forest	2-2	1	2-2		2-2	1	2-2	3	1	3	2-2	3
angrove forest	3	2-2	3	3	3	3	3	2-2	2-1	1	1	
ud crab bed	1	3	1		2-2	3		3	1	1		
ussel bed	1	1	2-1	1	1	1	1	1	1	3	3	3
yster reef	1	2-2	2-2	3	2-2	2-2	1	2-2	1	2-1	2-2	2-2
altmarsh	2-2	2-2	2-2	2-2	2-2	2-2	2-2	2-2	2-2	1	1	
callop bed	1	1	1	1	2-2	1	1		1	3	1	
eagrass meadow	3	2-2	2-2		3	2-2	3	1	1	1		
ponge garden	2-2	3	3	3	3	1	1	3	1	1	3	3
urf clam bed	1	1	1	1	1	1	1		1	2-1		
ubeworm reef	1	1	3	3	3	1	1	1	1	1	1	2-2
rchin plain	1	2-2	1	3	3	1	1	1	1	3	1	1
edge shell bed	1	3		1	1	1	1		1	1	1	1

Contribution to Ecosystem Services		Confidence in score	
	Significant contribution	3	New Zealand focused, peer-reviewed literature
	Moderate contribution	2-1	New Zealand focused, gray literature
	Low contribution	2-2	Overseas literature
	No or negligible contribution	1	Expert opinion

3) Co-design plausible future scenarios



Challenges and barriers

Perception of value is a cultural artefact, and if public support is required in making an ecological improvement, this may need investment in education and awareness

Linking natural capital to other public policies (employment, health and wellbeing, income inequality and cultural heritage)

Scale and boundaries matter: mismatch between where ES are supplied and location for demand

Evidence gaps: i) how to define assets and account for their interdependencies; ii) how to track changes in values over time; and iii) how to aggregate cumulative

Acknowledgments

anks for financial support from European Commission, United
tions, FAO, World Bank, European Parliament, Xunta de Galicia,
diversity Foundation