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Listen to the ocean

Human implications and management strategies in the coupled North Atlantic-Arctic system

Melanie Austen*, Plymouth Marine Laboratory
Angel Borja, AZTI-Tecnalia
Jon Hare, NOAA Northeast Fisheries Science Center

Planning Workshop for an International Research Program on the Coupled North Atlantic-Arctic System; April 14-16, 2014; Arlington, VA

VECTORS of Change in European Marine Ecosystems and their Socio-Economic Impacts

Mel Austen, Project Coordinator
Plymouth Marine Laboratory

- Feb 1 2011 - Jan 31 2015
- Total cost €16.6 million
- €12.5 million funding from EC

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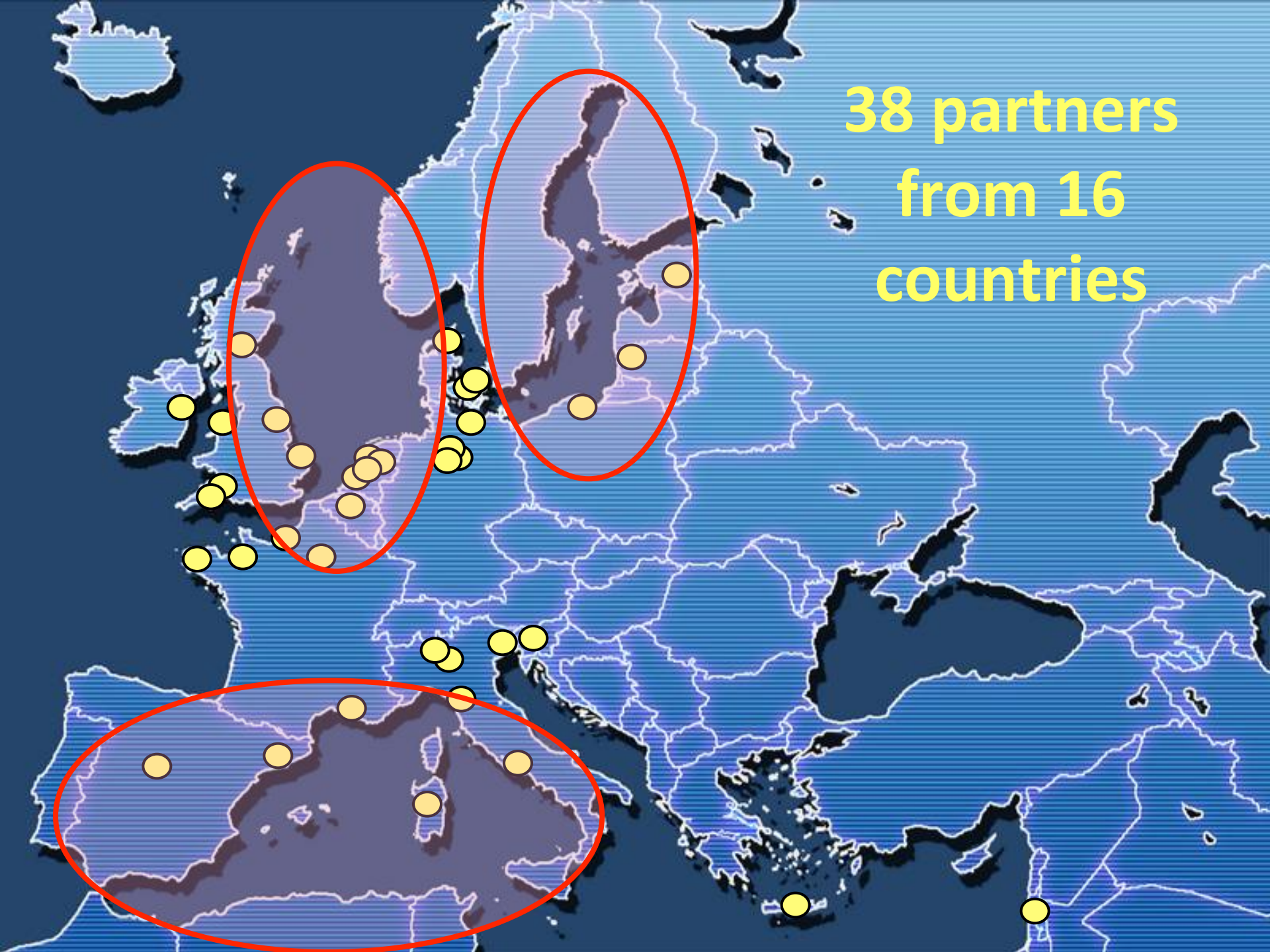
38 partners
from 16
countries

EU OCEANS OF TOMORROW

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Changes in marine life:

- **Invasive species**
- **Outbreak species**
- **Changes in fish distribution and productivity**

Ecosystem Approach:
Environmental, Economic and Social perspectives

Drivers and pressures
Mechanisms
Impacts
Future projections
Risk assessments
Policy and management implications

Baltic Sea

North Sea

West Mediterranean

VECTORS People!

- Physiologists
- Fisheries biologists/ecologists
- Modellers – fisheries, ecology, ecosystem, economy
- Ecosystem services ecology
- Ecosystem Services valuation- social
- Ecosystem services valuation – economic
- Statisticians
- Systematic reviewers
- Experimental ecologists
- Data managers
- Fisheries economists
- Theoretical economists
- Macroeconomic modellers
- Law researchers
- Policy and governance
- Cultural anthropologists
- Ballast water management
- Project management
- Communications and outreach
- Financial management
- Administrators

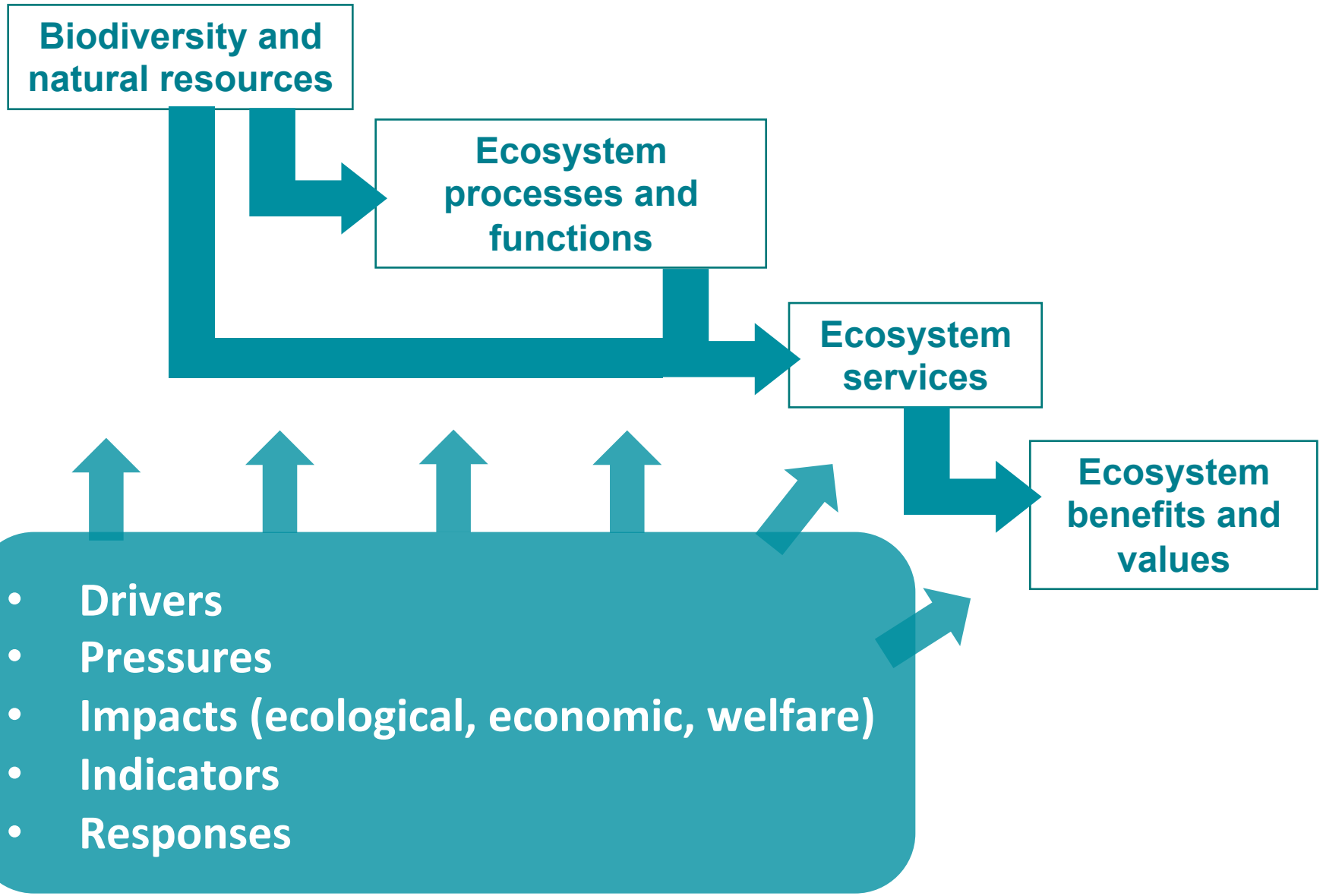
The status of Atlantic ecosystem from a human perspective

- Where are we now?
- Whe
- Whe

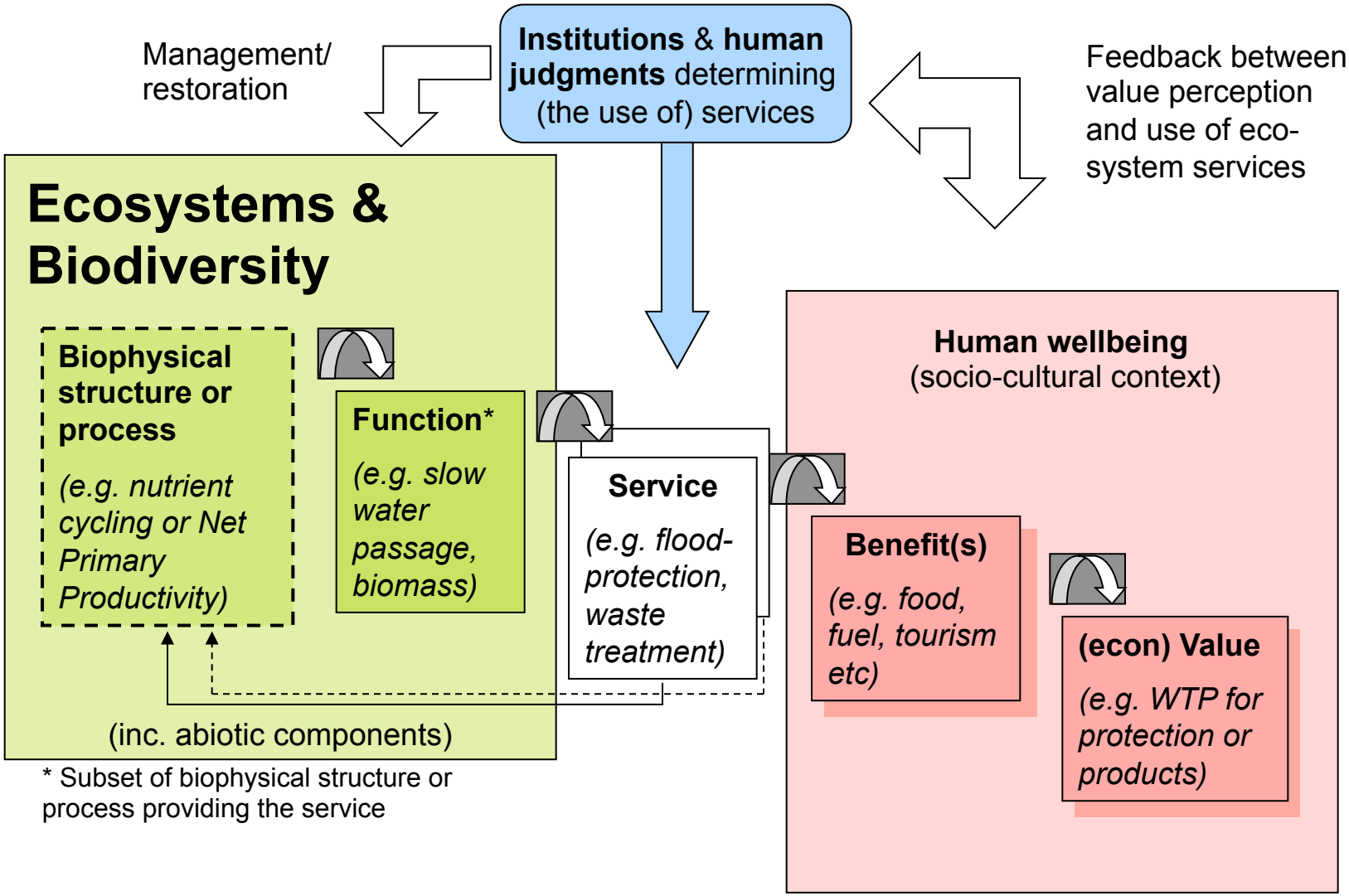
Image Source: Curiosities by Dickens http://www.c definitely-half-empty/

© Dibrova | Dreamstime.com

What do ecosystems do for people?



Ecosystem service frameworks



Modified from TEEB:

The Economics of Ecosystems and Biodiversity (2010)

PROVISIONING	REGULATING	HABITAT	CULTURAL
1a: Food provision - Wild capture sea food	3: Air purification	10: Migratory and nursery habitat	12: Leisure, recreation and tourism
1b: Food provision - Farmed sea food	4: Climate regulation	11: Gene pool protection	13: Aesthetic experience
2a: Biotic raw material - Genetic resources	5: Disturbance prevention and moderation		14: Inspiration for culture, art and design
2b: Biotic raw material - Medicinal resources	6: Regulation of water flows		15: Cultural heritage
2c: Biotic raw material - Ornamental resources	7: Waste treatment and assimilation		16: Cultural diversity
	8: Coastal erosion prevention		17: Spiritual experience
	9: Biological Control (checks & balances)		18: Information for cognitive development

VECTORS ecosystem services typology

Hattam et al. Marine ecosystem services: linking indicators to their classification. Submitted to Ecol. Indicators

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Ecosystem services in the coupled North Atlantic-Arctic system

Fisheries
Aquaculture
Biotech products

Climate regulation - carbon/climate gases
Waste regulation (including plastics)
Hazard prevention (important especially at coast)

Leisure, recreation tourism, sense of place, spiritual, aesthetic

Indicators for Ecosystem Service Assessments

(WP 3.2) C. Hattam, J.P. Atkins, N. Beaumont, T. Börger, S. Garrard, A Böhnke-Henrichs, D. Burdon, D. de Groot, E. Hoefnagel, P. Nunes, J. Piwowarczyk, S. Sastre and M.C. Austen

- Indicators provide a structured approach for assessing management effects on ES supply and related welfare changes
- Results can inform research and data collection to ensure indicators become applicable through focused monitoring and evaluation programmes

Method

- Indicator selection in 2 steps:
  (1) Expert workshop
  (2) Tailoring for case study
- Application to 3 case studies: Dogger Bank, Gulf of Gdansk, Catalan Coast

Indicator selection

- Reflect quantity and quality of ES
- How to measure indicator?
- What are potential data sources?

Apply

Results

- **Sets of indicators sets can be tailored to case study conditions**
- **Indicators of ecosystem functions, services and benefits needed**
- **For many indicators suitable data are lacking**
- **Climate change will affect indicator ability to detect other sources of change**
- **Cultural ES indicator selection challenging**

- The EC MSFD calls for an ecosystem approach to marine management
- Indicators support monitoring in context of EU's Habitats Directive, the Biodiversity Directive and can contribute to work of Intergovernmental Platform on Biodiversity

Hattam et al submitted to Ecol. Indicators

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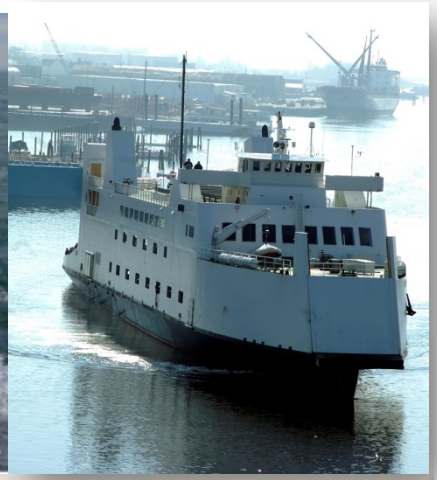
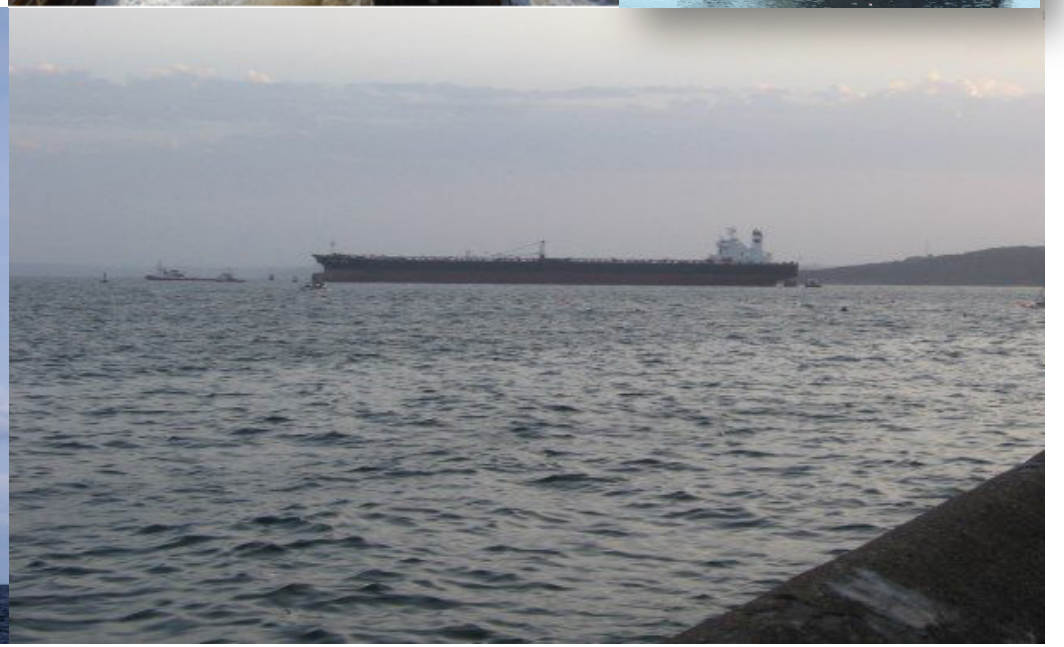
Environmental services

- Energy
- Aggregates
- Minerals
- Shipping and transport





Which services and benefits should we be aiming to enhance?

- Should we prioritise some over others?
- What will the trade-offs be if we make priorities?
- Which trade-offs are acceptable and which are not?
  - i.e. what is actually valued? (here value may not just be measured in monetary terms)

! Research scientists don't set the priorities

- Social science can help understand what the priorities are
  - Ask the stakeholders
  - Ask the public
  - Are there shared values on either side of the Atlantic?
- **Better outcomes when social and natural scientists work together to integrate and and value to each other's research**

Dogger Bank ecosystem services under differing VECTORS scenarios

(WP 3.2) SL. Garrard, C. Hattam, A. Böhnke-Henrichs, D. Burdon, J. Atkins, M. Austen

- The EC MSFD calls for an ecosystem approach to marine management
- The Dogger Bank contributes to wellbeing by providing ecosystem services (ES)
- ES assessment informs ecosystem-based management

Implications of Vectors scenarios for Dogger Bank

- Abandonment of CFP: more destructive fishing practices
- 15% cover of windfarms
- Increased oil and gas exploration
- 0.8°C SST increase

- Precautionary approach to MSY
- 50% cover of windfarms = no take zone
- Reduced oil and gas exploration
- 0.3°C SST increase

Assessment based on indicators

- Literature review
- Modelling approach
- Expert judgement

Trends in ES

Food provision (example)		A2	B1
Fish/ shellfish populations:	Biomass	↓	↑
	Abundance	↓	↑
Quality of the fishery:	Species composition	↓	↔
	Age profile	↓	↑
	Length profile	↓	↑
	Fishing mortality	↑	↓
	% affected by disease	↔	↔

Lessons learnt:

- Data limitation restrict ES valuation; more indicator specific data needed
- Results help prioritize research and monitoring
- Interdisciplinary teams are essential for ES assessment

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Valuation of Ecosystem Benefits from the Dogger Bank

(WP 3.2) T. Börger, C. Hattam, D. Burdon, J. Atkins, M. Austen

- The Dogger Bank is facing various pressures from fisheries, wind farm development and aggregate extraction.
- To comply with the EC Habitats Directive and Marine Strategy Framework Directive, the Dogger Bank SAC requires management to achieve the protection objectives.

Method and Results

- UK-wide choice experiment survey (N=1,022 households)
- Unit: Willingness to pay (WTP) to secure ecosystem service change
- Outcomes can inform management planning and decision making

Dogger Bank management targets

- Change in species diversity
- Protection area for porpoises, seals and seabirds
- Reduction of risk of invasive species

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Dogger Bank

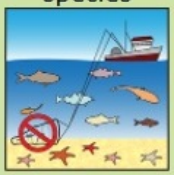
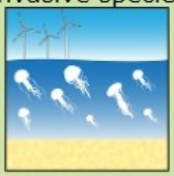
Method:

- Survey all beneficiaries of a set of ecosystem services
- Respondents make choices and reveal their preferences

Results:

- Value of particular services (Willingness to pay)
- Tradeoff between particular services
- Profile of groups that profit more or less from ecosystem service change

Please choose the one you prefer by selecting the button in the appropriate box.

Description	Dogger Bank Management Plan A "no change"	Dogger Bank Management Plan B	Dogger Bank Management Plan C
Diversity of species 	**No change** in species diversity	**25% increase** in species diversity	**10% increase** in species diversity
Protection of porpoises, seals and seabirds 	Porpoises, seals and seabirds **Not Protected**	Porpoises, seals and seabirds **Protected on 50% of area**	Porpoises, seals and seabirds **Not Protected**
Invasive species 	**Restricted spread** of invasive species	**Wide spread** of invasive species	**Wide spread** of invasive species
Additional tax 	Additional tax **£0** per household per year	Additional tax **£20** per household per year	Additional tax **£5** per household per year
Please select your answer here:	○	○	○

Valuation of Ecosystem Benefits from the Dogger Bank

(WP 3.2) T. Börger, C. Hattam, D. Burdon, J. Atkins, M. Austen

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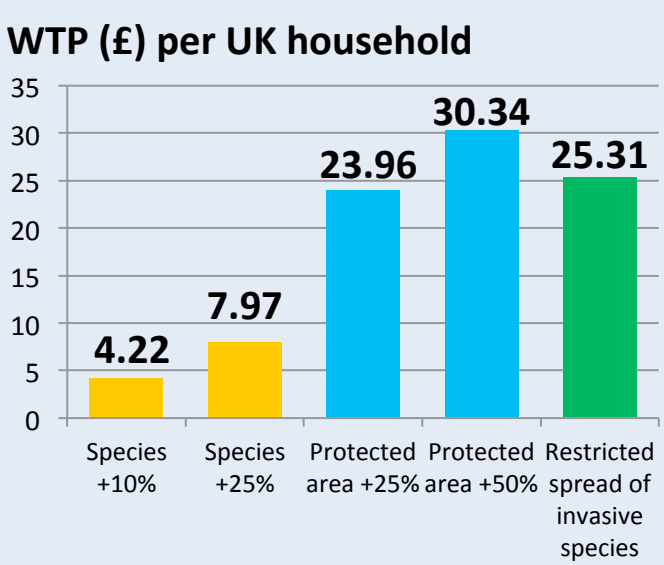
Economic valuation of impacts



- Economic valuation can quantify the welfare impacts of policy-induced ecosystem change to inform management planning and decision-making.

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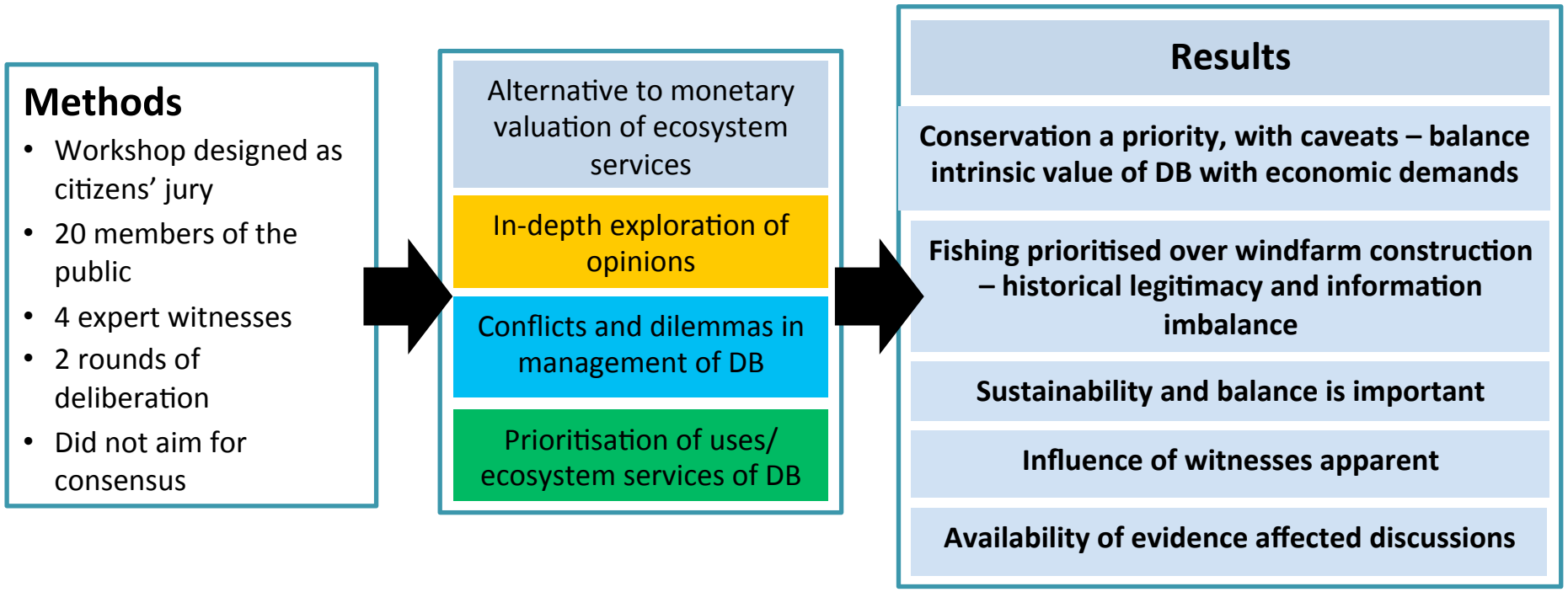
Deliberative Valuation and the Dogger Bank

(WP 3.2) A. Delaney, D. Degnbol, M. Hadjimichael, C. Hattam, T. Börger, J. Atkins, D. Burdon, M. Austen

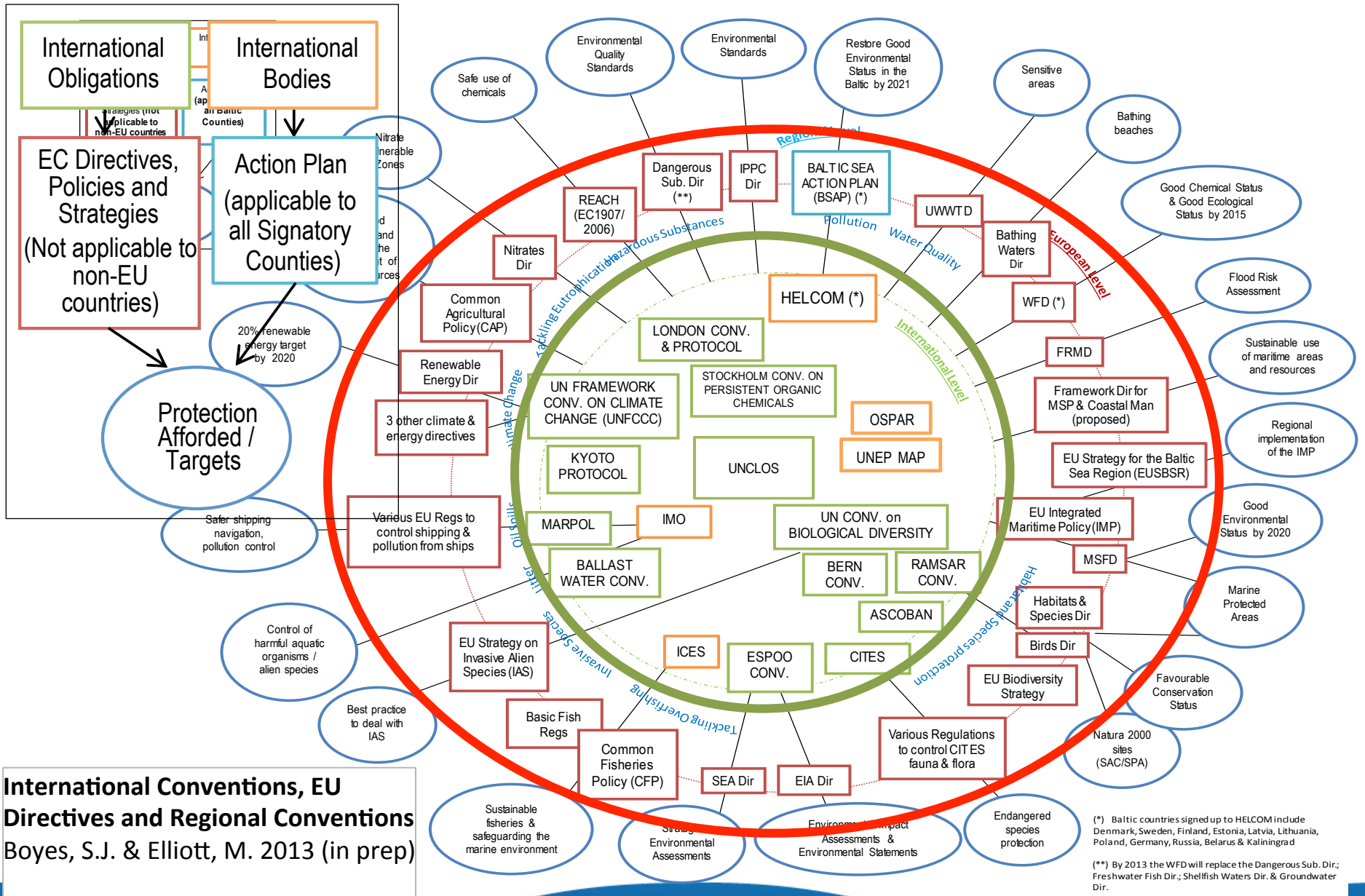


- Supports development of management plan for the Dogger Bank cSAC
- Complements ecosystem service valuation in support of ecosystem approach to marine management, as required by MSFD

What are the drivers for making trade-offs? What are the risks if we do so?

- Governance
  - Legislatively-Mandated Conservation and Sustainability

International Conventions, EU Directives and Regional Conventions



International Conventions, EU Directives and Regional Conventions
Boyes, S.J. & Elliott, M. 2013 (in prep)

(*) Baltic countries signed up to HELCOM include Denmark, Sweden, Finland, Estonia, Latvia, Lithuania, Poland, Germany, Russia, Belarus & Kaliningrad

(**) By 2013 the WFD will replace the Dangerous Sub. Dir.; Freshwater Fish Dir.; Shellfish Waters Dir. & Groundwater Dir.

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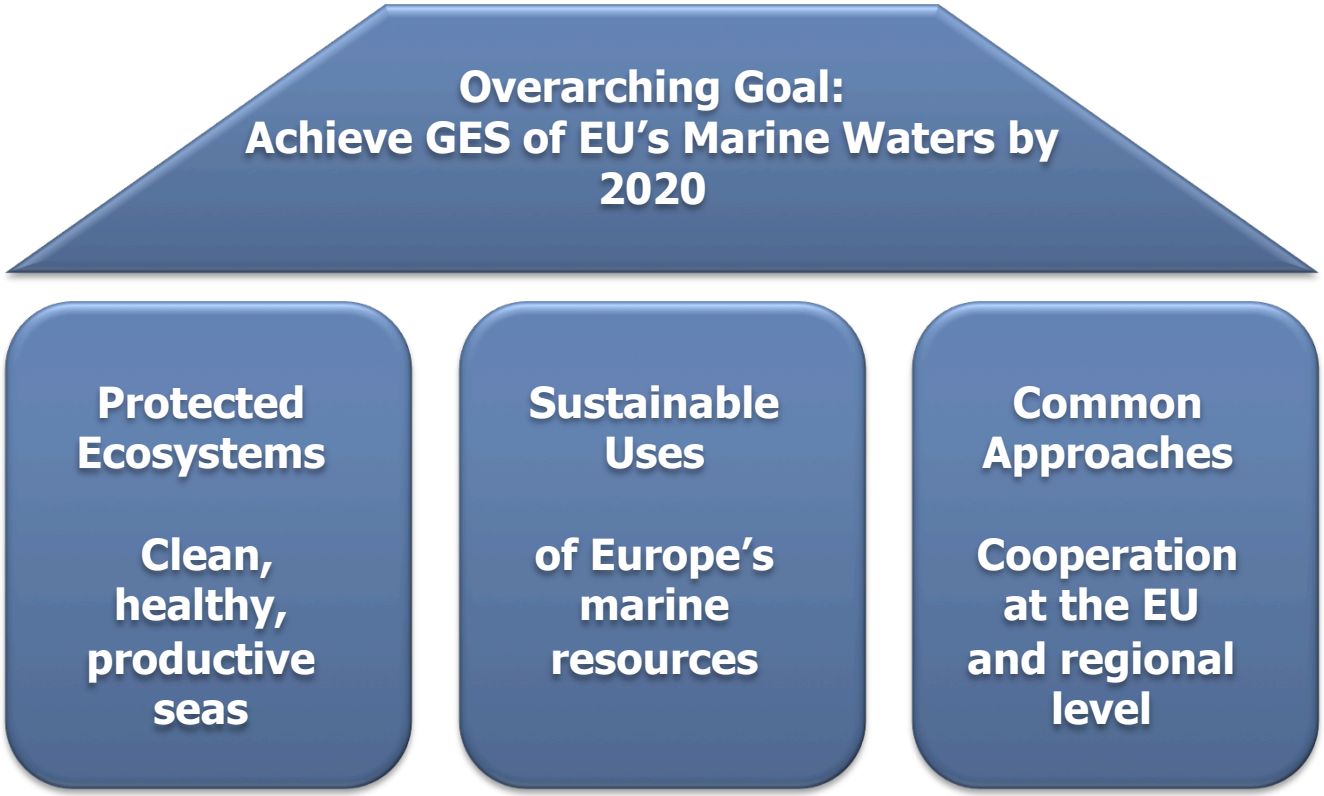
The Marine Strategy Framework Directive

EU's legal instrument for the protection of our seas

- Overall objective: achieve or maintain Good Environmental Status (GES) of the EU's marine waters by 2020
- Regional approach to implementation
- Adoption of an ecosystem-based and integrated approach to the management of all human activities which have an impact on the marine environment



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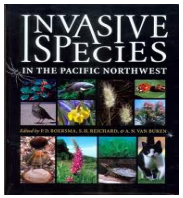
Good Environmental Status (GES)

"The environmental status of marine waters where these provide ecologically diverse and dynamic oceans and seas which are clean, healthy and productive" (art. 3(5)).

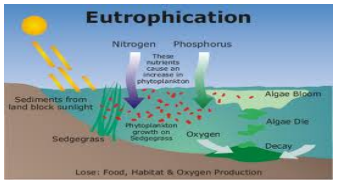
11 Qualitative descriptors for achieving GES within the Marine Strategy Framework Directive:

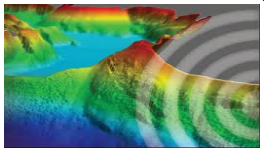
Biodiversity



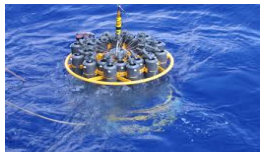
Fishing

Foodwebs





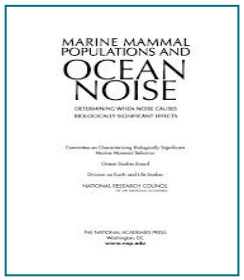
Seafloor integrity



Hydrography

Pollution

Litter



The ecosystem-based approach

'A comprehensive integrated management of human activities based on the best available scientific knowledge about the ecosystem and its dynamics, in order to identify and take action on influences which are critical to the health of the marine ecosystems, thereby achieving sustainable use of ecosystem goods and services and maintenance of ecosystem integrity.'

Stakeholder Interviews contributing to assessment of the main barriers to and drivers for successful EU marine resource management

- **69 semi-structured stakeholder and policy maker interviews in four case study areas** - views on a wide range of marine governance issues in the North Sea, Baltic Sea and W. Mediterranean.
  - in depth analysis of stakeholder requirements
  - better understanding of the implementation of sub-national, national, EU and regional marine governance in practice.
- A number of common themes emerged:
  - There are **conflicts between different stakeholders about the use of certain parts of the marine environment, and possible conflict resolution strategies**. Conflicts were particularly intense between (would be) users and those stakeholders who would like to ensure as high a level of protection as possible for the marine environment.
  - **Differing levels of knowledge** amongst respondents on **the functioning of marine ecosystems with regard to human activities**, and also **regarding the duties and responsibilities** of different stakeholders.
  - **Those with a statutory responsibility have a good knowledge of the legislation and agreements relating to their sphere of influence** but less so for the other areas.
  - Uncertainties about the future **efficacy and implementation** of the MSFD and the CFP have **contributed t**o the many concerns and potential **difficulties in achieving an integrated management of the marine space.**

J. Atkins, L. Berner, A. Delaney, K. Frangoudes, I. Krueger,
P. Magni, L. Piñol, J. Piwowarczyk, L. Rodriguez & R. Wurzel

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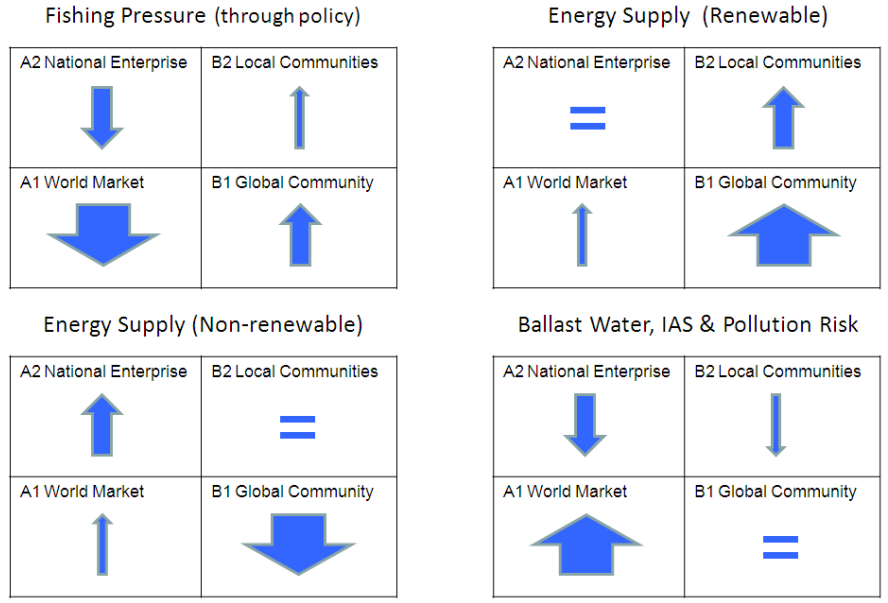
VECTORS Themes & Policy Implications for Future Scenarios

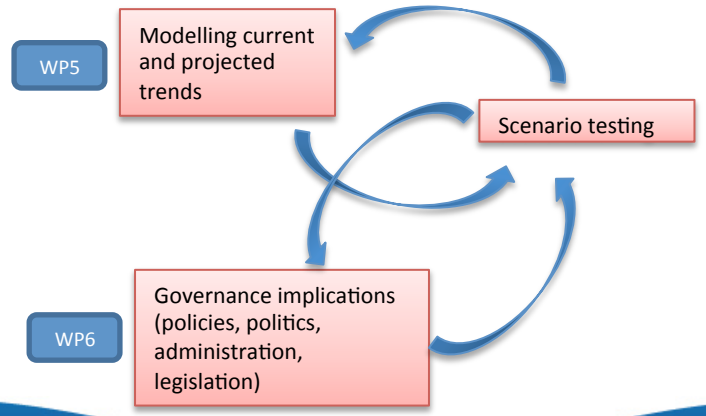
- Have looked at the implications on policy, legislation and governance of four contrasting future scenarios for the marine environment (scenarios were originally developed by the Special Report on Emission Scenarios (SRES) (IPCC, 2000)).

- The possible changes and repercussions on governance, policy, politics, administration and legislation have been assessed for the VECTORS themes (Fisheries, Energy, Ballast water, IAS and Pollution) under the future scenarios.

- Feedback has been provided for scenario testing and recommendations given for accommodating trajectories in VECTORS case-study areas.



increase (↑), decrease (↓) or remain at about the same level (=) over the next 20-30 years. Relative magnitude of anticipated change (large, moderate and small arrows).



Lead Authors: S. Boyes, R. Barnes & M. Elliott (UHULL)

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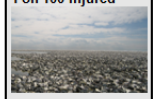
What are the drivers for making trade-offs? What are the risks if we do so?

- Governance
  - Legislatively-Mandated Conservation and Sustainability
- Economic

Tourists valuing the current situation and future changes in the Dutch Wadden Sea (WP 3.3)

Femke Schasvoort, Maaike van Aalst, Laia Piñol, Lola Rodriguez, Joanna Piwowarczyk, Sergio Sastre, Paulo Nunes

	Situation 1	Situation 2	Situation: Without measures
Pacific Oyster	1 on 1000 injured 	1 on 100 injured 	1 on 100 injured 
Trend: Number of seals	Decrease 	Increase 	Decrease 
Trend: Number of birds and bird species	Small decrease 	Stable 	Strong decrease 
Wind turbines	None 	Far away 	Close by 
Extra Tourist tax	€ 8 per adult a day	€ 6 per adult a day	€ 0 per adult a day

- **The estimated current value of the Wadden Sea for tourists is:**
  - ~ € 650 per household per year
  - ~ € 450 million per year

- **Tourists are willing to pay….**
  - most to avoid a large decrease in number of birds (~ € 7)
  - are indifferent of locating wind turbines far away or not at all
  - German and Dutch tourists have similar willingness to pay, except for the WTP to avoid wind turbines (Dutch ~ € 3,50 & Germans ~ € 0,50).

- Avoiding changes in attributes can cause substantial non-market benefits for tourists.
- Climate change is one of the drivers of these changes.
- Capturing the changes in values across different states of ecological disturbance will especially be important for taking decisions to conserve ecosystems or allow changing situations.

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Deltares

Obtain insight on the impact of Jellyfish Outbreaks on the tourism industry

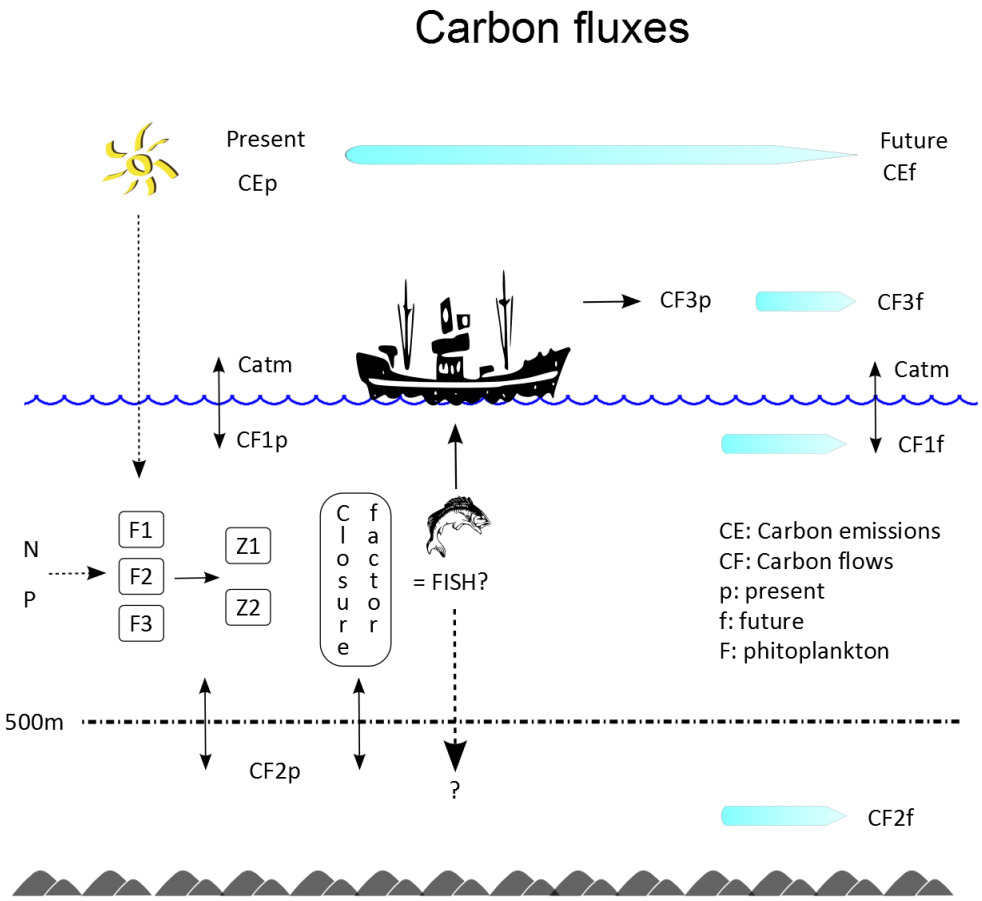
By surveying beach users following a stated-choice exercise, insight was got on the beach recreationists preferences. Tourism is a key economic sector in the Mediterranean. Climate change might induce changes in species distribution and abundance such as jellyfish

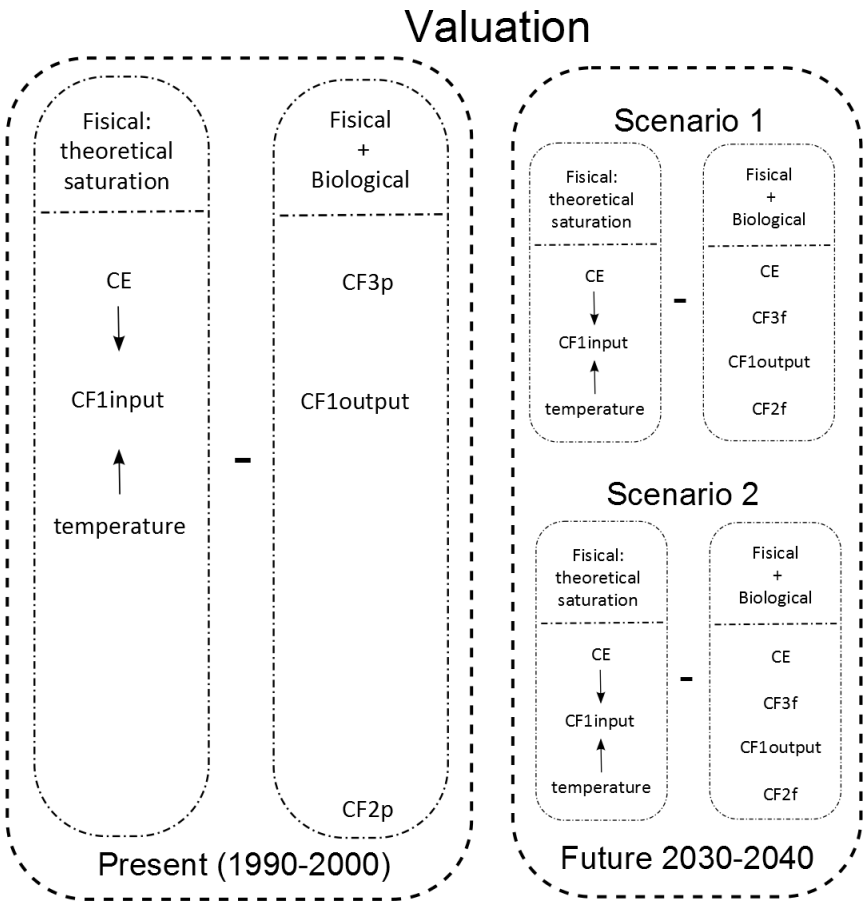
- **Water quality ranks as the most important variable** when making the choice of which beach to visit

- **Beach users are willing to expend additional travel time if the risk of finding jellyfish is reduced** (Nunes et al, 2014). These results suggest that **there is room for investment in adaptation strategies**

Giving **real time information** about the presence or absence of jellyfish can be beneficial. The **smartphone application Med Jelly** (http://www.medjelly.com/) **might be considered as one example of these strategies**.

EURO-BASIN: Carbon sequestration valuation in the North Atlantic





- Bio-geochemical modelling (Momme Butenschon)
- Fisheries and integration modelling (Jose A. Fernandes)
- Valuation (Nicola Beaumont)
- Scientific advice (Manuel Barange)

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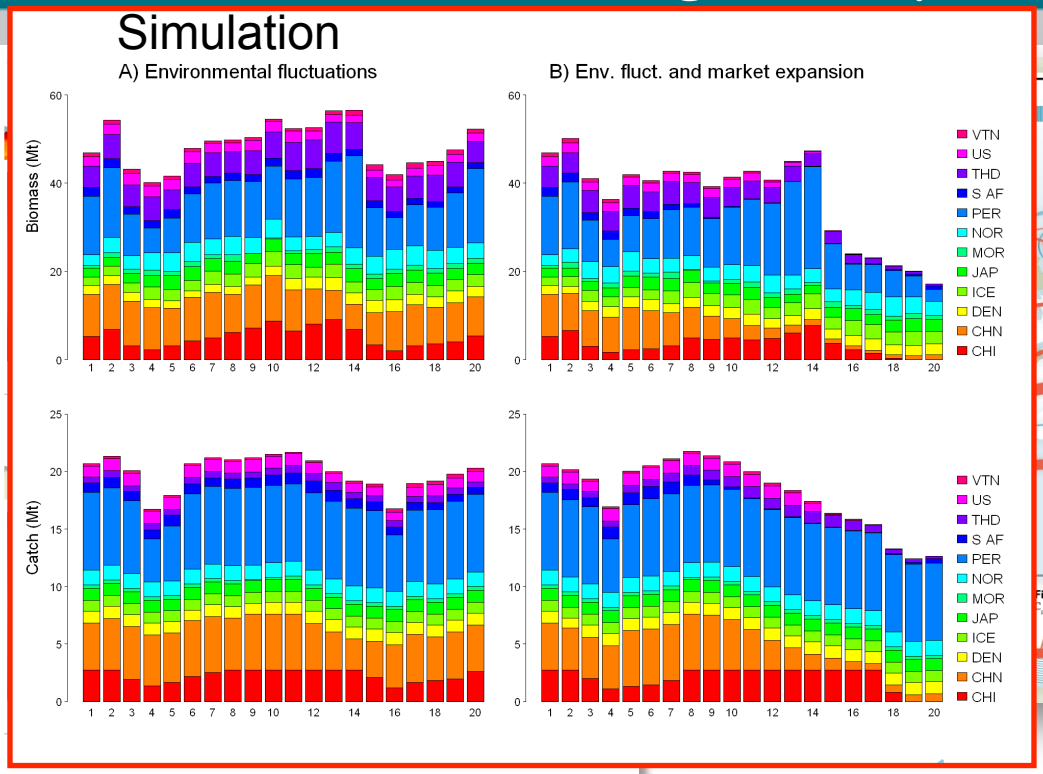
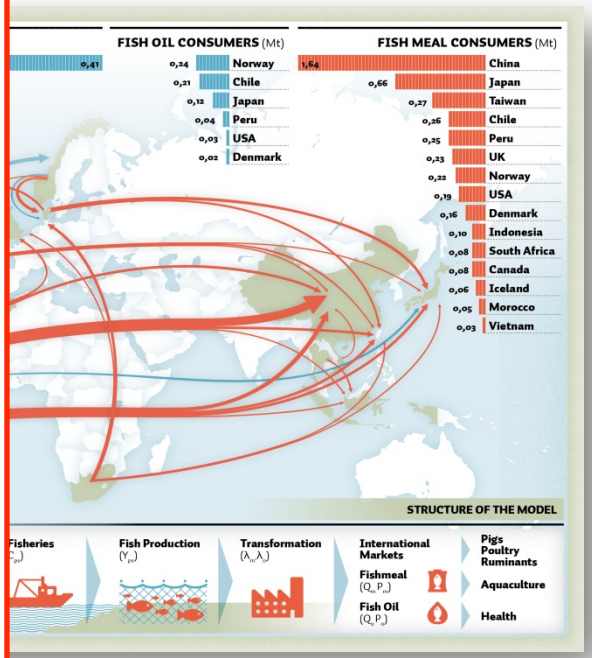
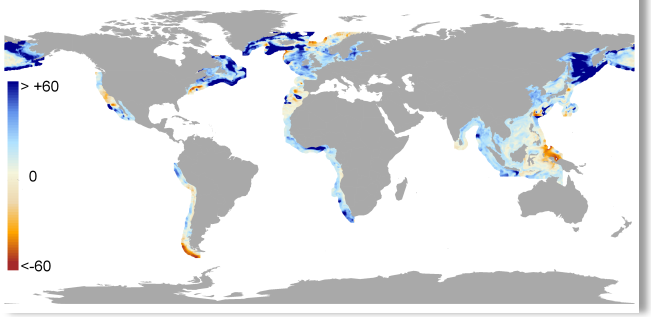
Estimating CC impacts on global fish production





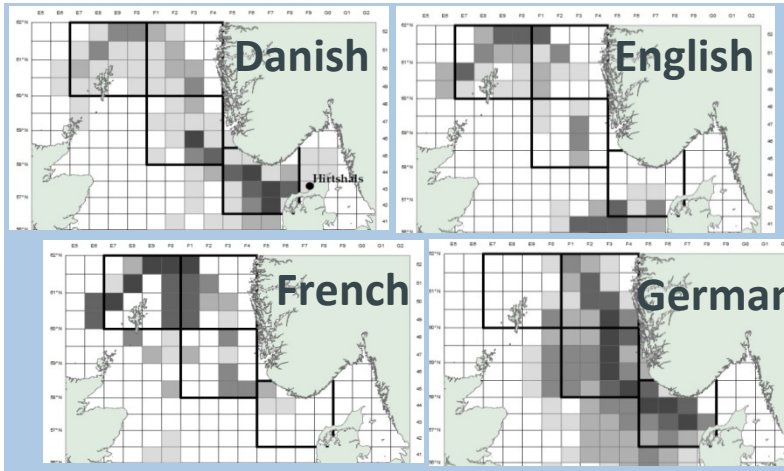
QUEST-Fish

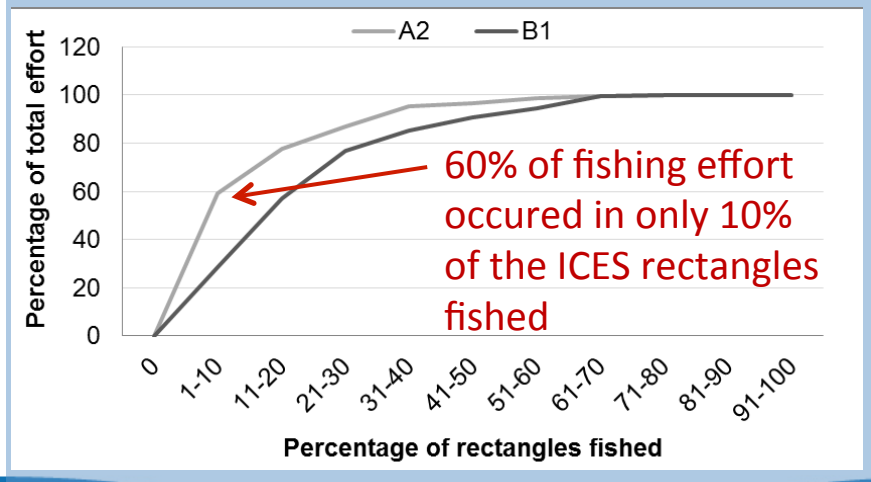


- **Determining pathways of sustainability for a growing populations in a changing climate**
- **Exploring the double exposure of globalisation and climate change**

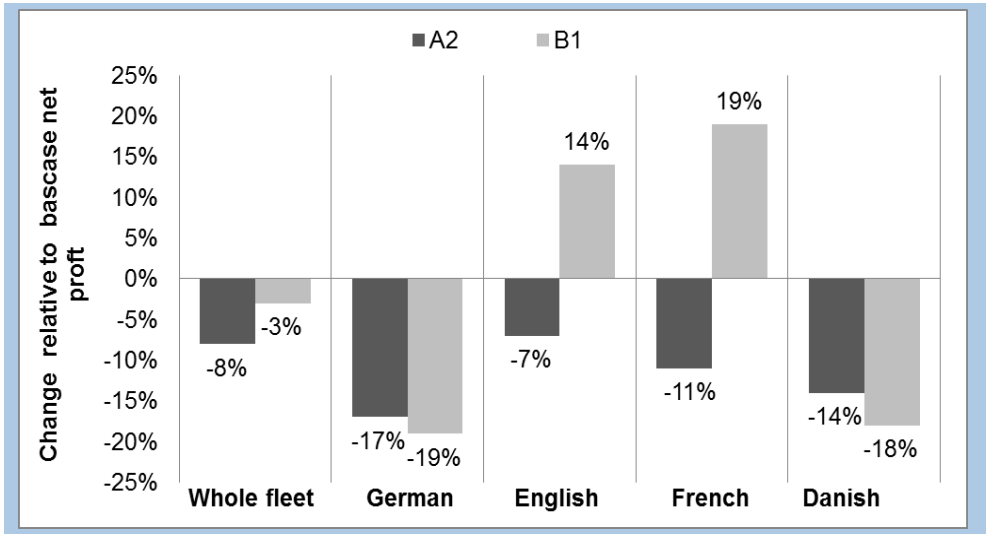
- Barange, M., I. Allen, et al. 2011. In: Ommer, R. et al., Coping with climate change in marine socio-ecological systems. Blackwell FAR
- Merino, G., M. Barange and C. Mullon 2010. Global Environmental Change 20: 586-596.

Integrating age-structured population dynamics into FishRent to model the impact of regulatory, market and ecological changes (A2 & B1) on economic results of the North Sea saithe fishery . . .





. . . fishing effort will be displaced closer to home ports with a high concentration in areas where fish abundance is high and/or fishing costs low . . .

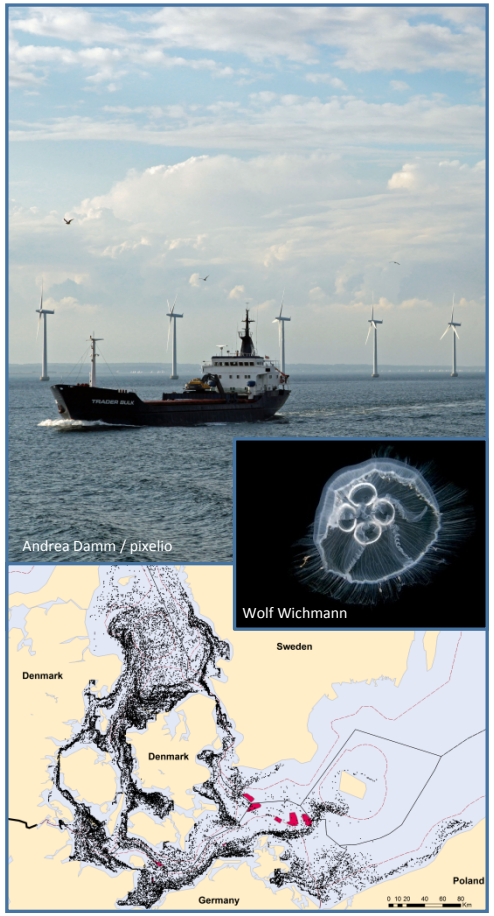


. . . there will be heterogeneous impacts on the profitability of individual fleet segments !

Katell Hamon,
Heleen Bartelings, Sarah Simons
Contact: sarah.simons@ti.bund.de

The Baltic Sea:
Cross-border impacts of offshore wind farms

- Wind farms will cause changes in the distribution and abundance of biomass in the south-western Baltic. The occurrence of moon jellyfish, *Aurelia aurita,* will increase over large distances.
- Multi-year data sampling and modelling with Lagrangian particle technique.
- Impacts on nature protection goals and economic sectors, e.g. coastal tourism and fisheries.
- Lessons learned for cross-border and cross-sectorial management, e.g. Marine Spatial Planning, MSFD and Natura 2000 management.



VECTORS

SEVENTH FRAMEWORK PROGRAMME

LEIBNIZ INSTITUTE FOR BALTIC SEA RESEARCH WARNEMÜNDE

IOW

DTU

What are the drivers for making trade-offs? What are the risks if we do so?

- Governance
  - Legislatively-Mandated Conservation and Sustainability
- Economic
- Social
  - Demographic changes
  - Economic growth
  - Socio-political changes
  - Cultural behavioural changes
  - Advances in science and technology

Social impacts - changes occurring in one of the following:

- **People's way of life** – how people live, work, play and interact with one another on a day-to-day basis
- **Their culture** – their shared beliefs, customs, values and language or dialect
- **Their community** – its cohesion, stability, character, services and facilities
- **Their political systems** – the extent to which people are able to participate in decisions that affect their lives, the level of democratisation that is taking place, and the resources provided for this purpose
- **Their environment** – the quality of the air and water people use; the availability and quality of the food they eat; the level of hazard or risk, dust and noise they are exposed to; the adequacy of sanitation, their physical safety, and their access to and control over resources
- **Their personal and property rights** – particularly whether people are economically affected, or experience personal disadvantage which may include a violation of their civil liberties
- **Their fears and aspirations** – their perceptions about their safety, their fears about the future of their community, and their aspirations for their future and the future of their children.
- **Their health and wellbeing** – health is a state of complete physical, mental, social and spiritual wellbeing and not merely the absence of disease or infirmity

Papathanasopoulou, E., et al 2013. Social impacts of fisheries, aquaculture, recreation, tourism and marine protected areas (MPAs) in marine plan areas in England. www.marinemanagement.org.uk/evidence/1035.htm

Key overarching social impacts investigated by research in the UK

Social impact	Fishing	Marine Protected Areas
Way of life		
Lifestyles	✓	
Work	✓	✓
Interaction between social groups	✓	✓
Play		✓
Political system		✓
Participation		✓
Person and property rights		✓
Economic impacts		✓
Personal disadvantage		✓
Culture		
Customs	✓	
Culture	✓	
Community		
Cohesion	✓	
Character	✓	
Political systems		
Participation	✓	

Social Vulnerability

- Adaptive capacity
  - The ability of individuals and communities to adapt to drivers of change.
  - A system's adaptive capacity can be characterised as
    a. the amount of disturbance it can absorb and, either, return to its original functioning form, structure and identity or change to another state;
    b. capability of self-organisation;
    c. degree to which the system learns adding to its capacity to adapt
- Exposure
- Sensitivity

Input-output tables

In economic analysis reliance of different sectors on each other is captured in national and regional input-output (IO) tables. These:

- Describe the flow of money (and by derivation the flow of goods) between sectors highlighting industries' interconnections and economic benefits.
- Can also be used to some extent to describe positive and negative social impacts in terms of employment and income
- Approach adapted to systematically capture more extensive positive and negative social impacts of marine activities
- Inputs (columns) and outputs (rows) from one sector to another

PML | Plymouth Marine Laboratory

Example of an Input-output table

		1	2	3	4	5
	Product	Agriculture [1-3]	Mining and quarrying [4-7]	Manufac-turing [8-84]	Electricity, Gas and water supply [85-87]	Construc-tion [88]
1	Agriculture	2073	1	10047	8	230
2	Mining and quarrying	5	3579	17982	17104	2861
3	Manufacturing	6017	2443	184619	4013	27620
4	Electricity, gas and water supply	472	775	9978	16013	292
5	Construction	255	738	1368	965	52880
6	Wholesale & retail trade	697	101	1382	219	1646
7	Transport and communication	444	1320	14074	463	1322
8	Financial intermediation	2219	2962	33949	3864	22523
9	Public administration	12	22	557	62	383
10	Education, health and social work	175	31	1175	216	173
11	Other services	239	101	3017	196	164
12	Public administration (non-market)	-	-	-	-	-
13	Education, health and social work (non-market)	-	-	-	-	-
14	Other services (non-market)	-	-	-	-	-
15	Financial intermediation (NPISH)	-	-	-	-	-
16	Education, health and social work (NPISH)	-	-	-	-	-
17	Other services (NPISH)	-	-	-	-	-
	Total consumption	12608	12073	278148	43123	110094
	Taxes less subsidies on production	-3215	232	2334	1117	610
	Compensation of employees	3515	3206	105247	4857	33320
	Gross operating surplus	7230	24015	40530	10711	35938
	Total output	20138	39526	426259	59808	179962

Industries benefiting from fisheries

Input industries/commodities (1.904)

- Agriculture (0.011)
- Oil; gas (0.034; 0.089)
- Animal feed (0.051)
- Plastic products (0.021)
- Shipbuilding and repair (0.052)
- Electricity, gas (0.058, 0.023)
- Construction (0.058)
- Wholesale distribution (0.046)
- Insurance and pension funds (0.052)
- Renting of machinery (0.025)

Output industries/commodities (1.117)

- Fish and fruit processing (0.083)
- Other food processing (0.010)
- Hotels, catering (0.003)
- Water transport (0.002)

Eleni Papathanasopoulou (in preparation). Valuing ecosystem services using input-output techniques: the case of UK fisheries
See also - Kaplan & Leonard 2012. From krill to convenience stores: Forecasting the economic and ecological effects of fisheries management on the US West Coast Marine Policy 36

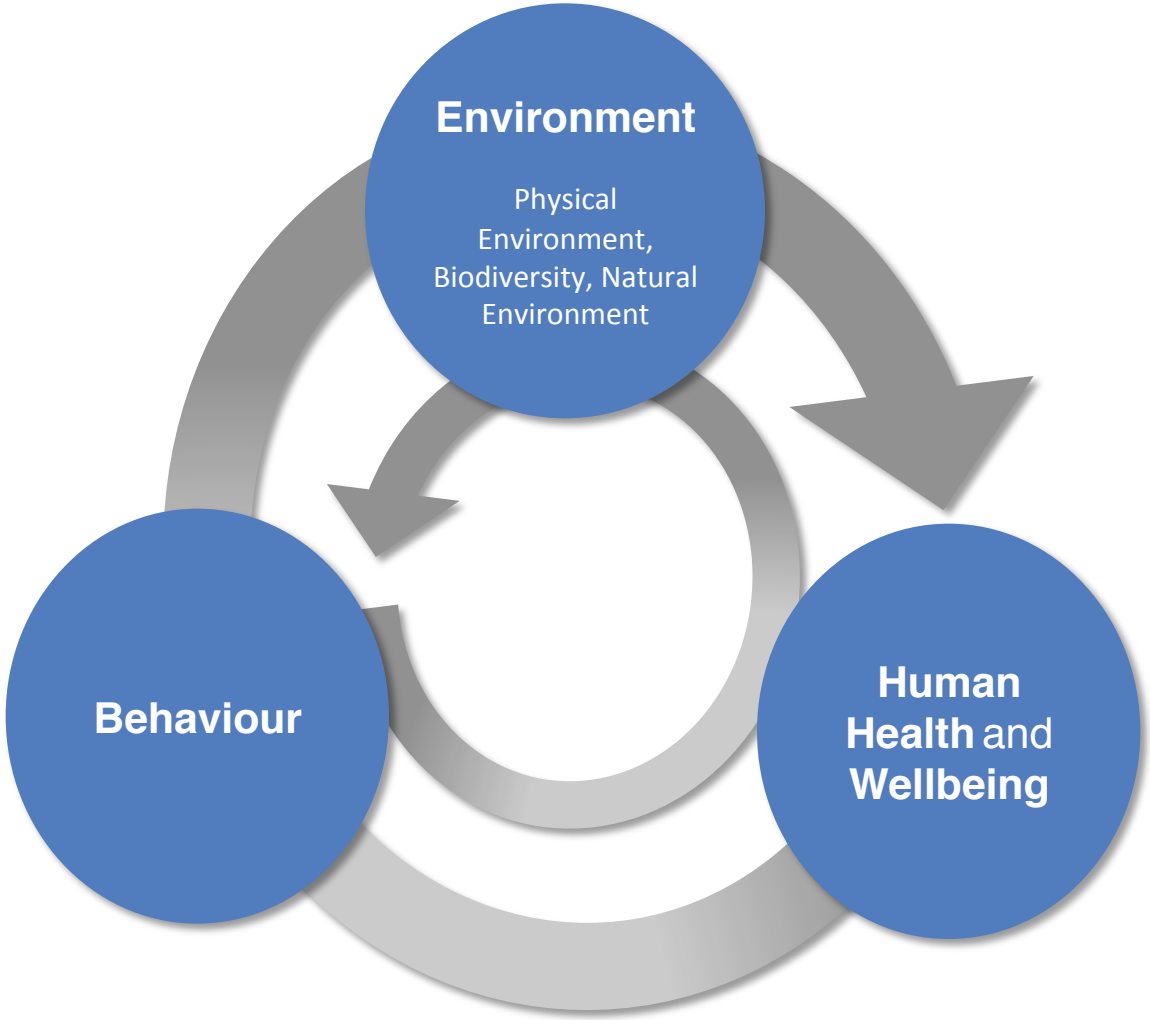
What are the drivers for making trade-offs? What are the risks if we do so?

- Governance
  - Legislatively-Mandated Conservation and Sustainability
- Economic
- Social
- Wellbeing
  - Health and welfare
    - Physical and mental health
      - blue gym
  - Water quality for recreation, food
    - HAB's, toxins and pathogens (especially in relation to climate change impacts)
    - Litter/plastics
  - eDPSEEA approach

European Centre for Environment & Human Health

PML Plymouth Marine Laboratory

Interconnections: Environment ⟷ Human Health



"Risks"

- Climate Change, extreme weather, and natural events
- Ocean Acidification
- Harmful algal blooms (HABs)
- Microbial Pollution
- Future risks of chemicals and microbial contaminants
- Anthropogenic chemicals and nanomaterials
- Plastics in the Marine/Coastal environment

"Mixed Risks & Benefits"

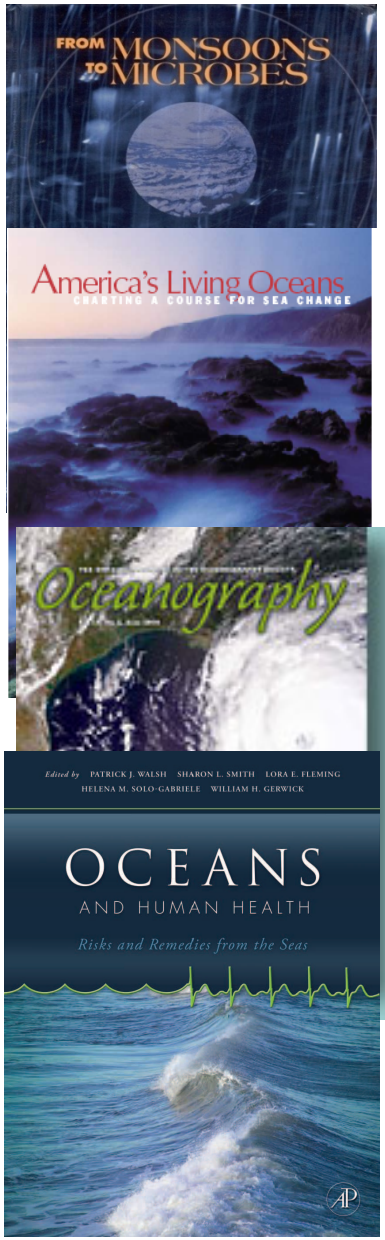
- Alien Invasive species
- Ecosystems Services
- Fisheries and aquaculture
- Economics/Valuation
- Health Cultural dimensions of the marine environment

"Benefits"

- Pharmaceuticals/Natural Product/Marine Biotech
- Marine Animals: Model Systems and Sentinel Species
- Marine Renewable Energy
- Blue Carbon
- "Blue Gym" recreation and health and wellbeing from the coasts

European Centre for Environment & Human Health

Oceans & human health: A rather negative focus

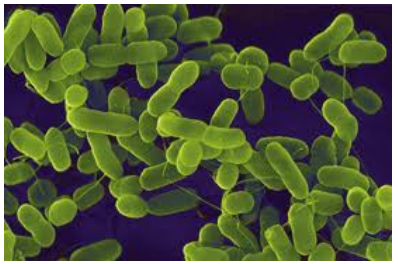


HABs & Other Toxins

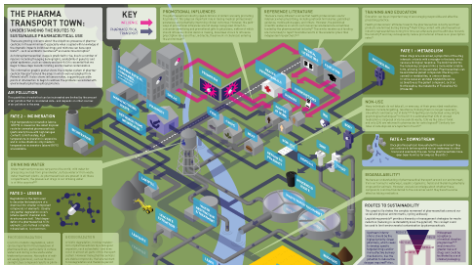
Fisheries Destruction

RISKS

Storms, Floods & Climate Change



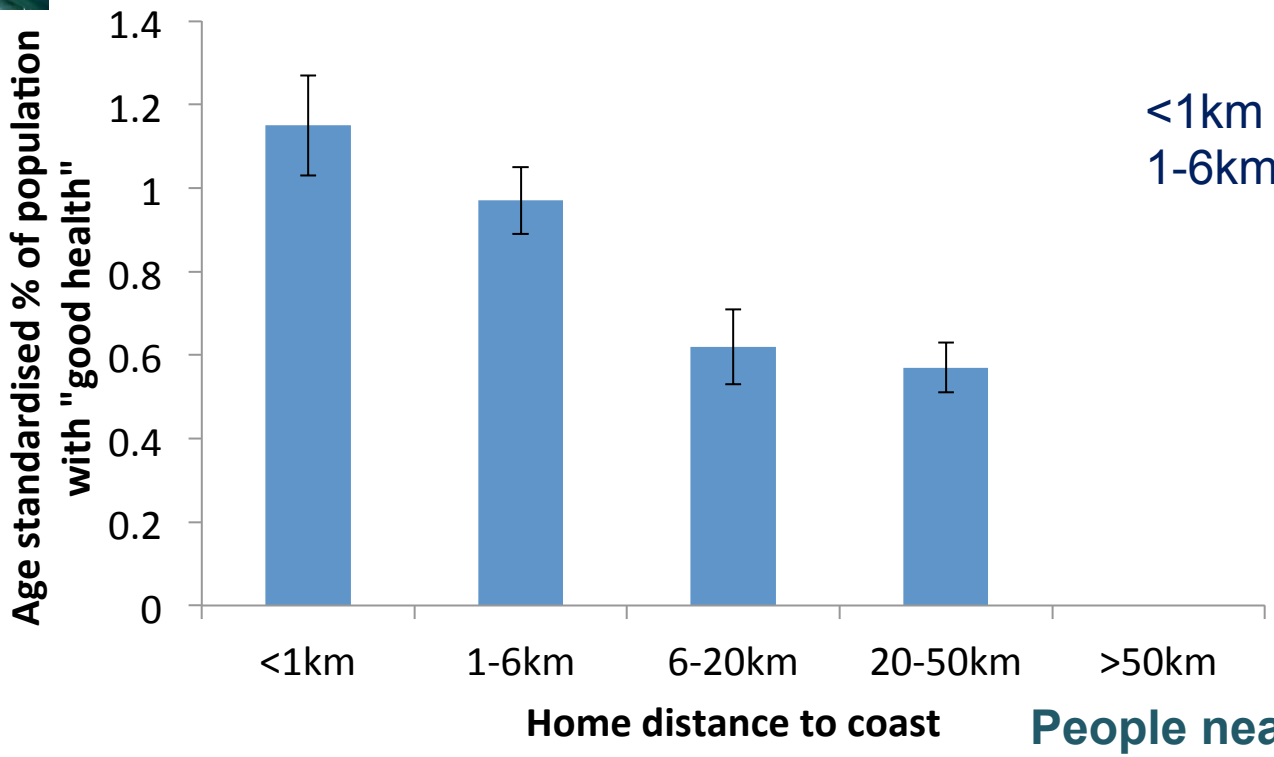
Microbial pollution



Man-made Chemicals*

*Stahl-Timmins, White, Fleming, Depledge & Redshaw (2013). *Science, 339, 514-515.*

Self-reported health
Census Data (England, n = 48 million)



<1km 3 million
1-6km 8 million

Error bars:
95% CI

- The effects are strongest in poorer communities

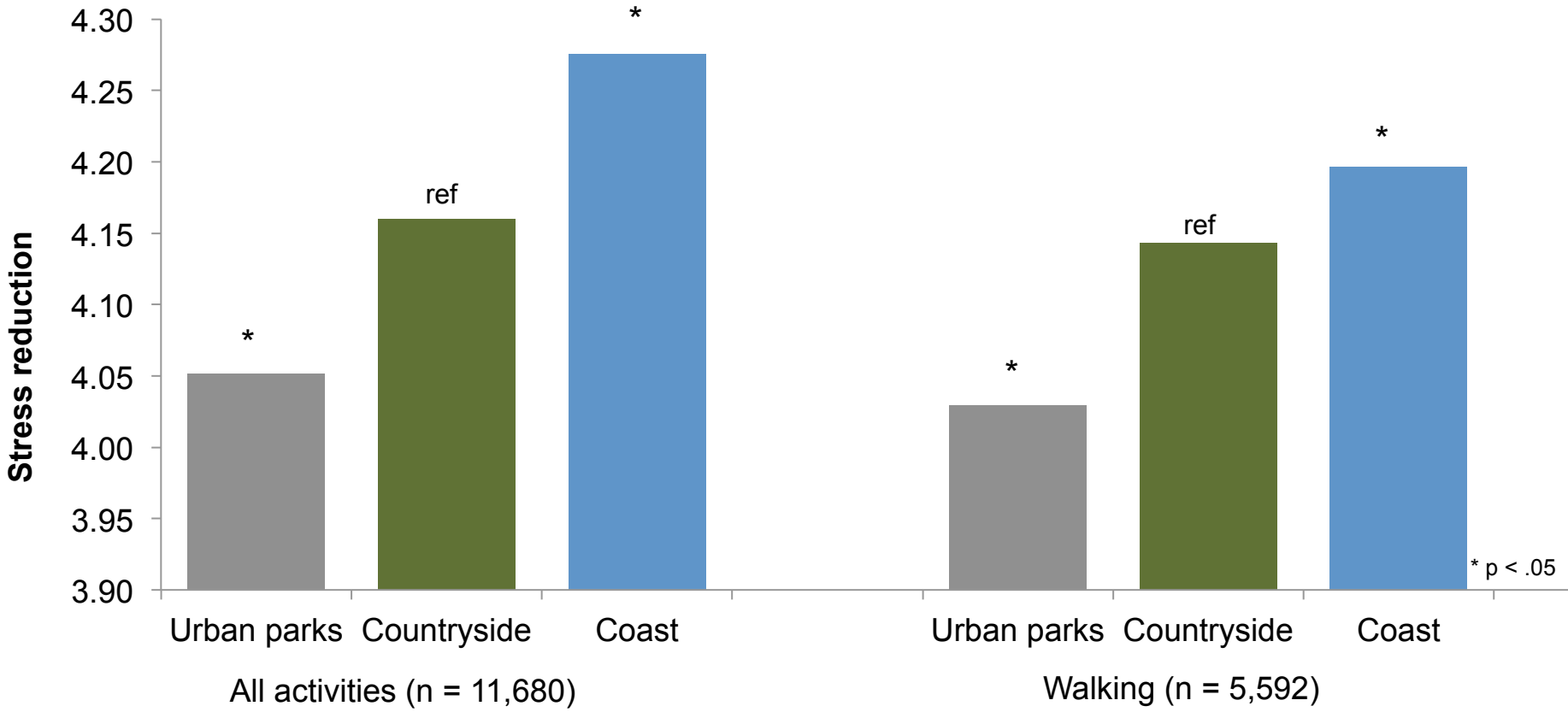
Controlling for area Level: Income, Employment, Education, Crime,

People near coast seem to exercise more - White, pers. comm.

Wheeler, White, Stahl-Timmins & Depledge (2012). Does living by the coast improve health and wellbeing? *Health & Place*, *18*, 1198-1201.

NATURAL ENGLAND

Monitor of Engagement with the Natural Environment (visits n = 11,680)



Controlling for: Age, gender, SES, activity type, visit duration, companions, distance travelled & mode of transport

White, M.P., Pahl, S. Ashbullby, K., Herbert, S.& Depledge, M.H. (2013). Restoration from recent nature visits. *Journal of Environmental Psychology*, *35*, 40-51.

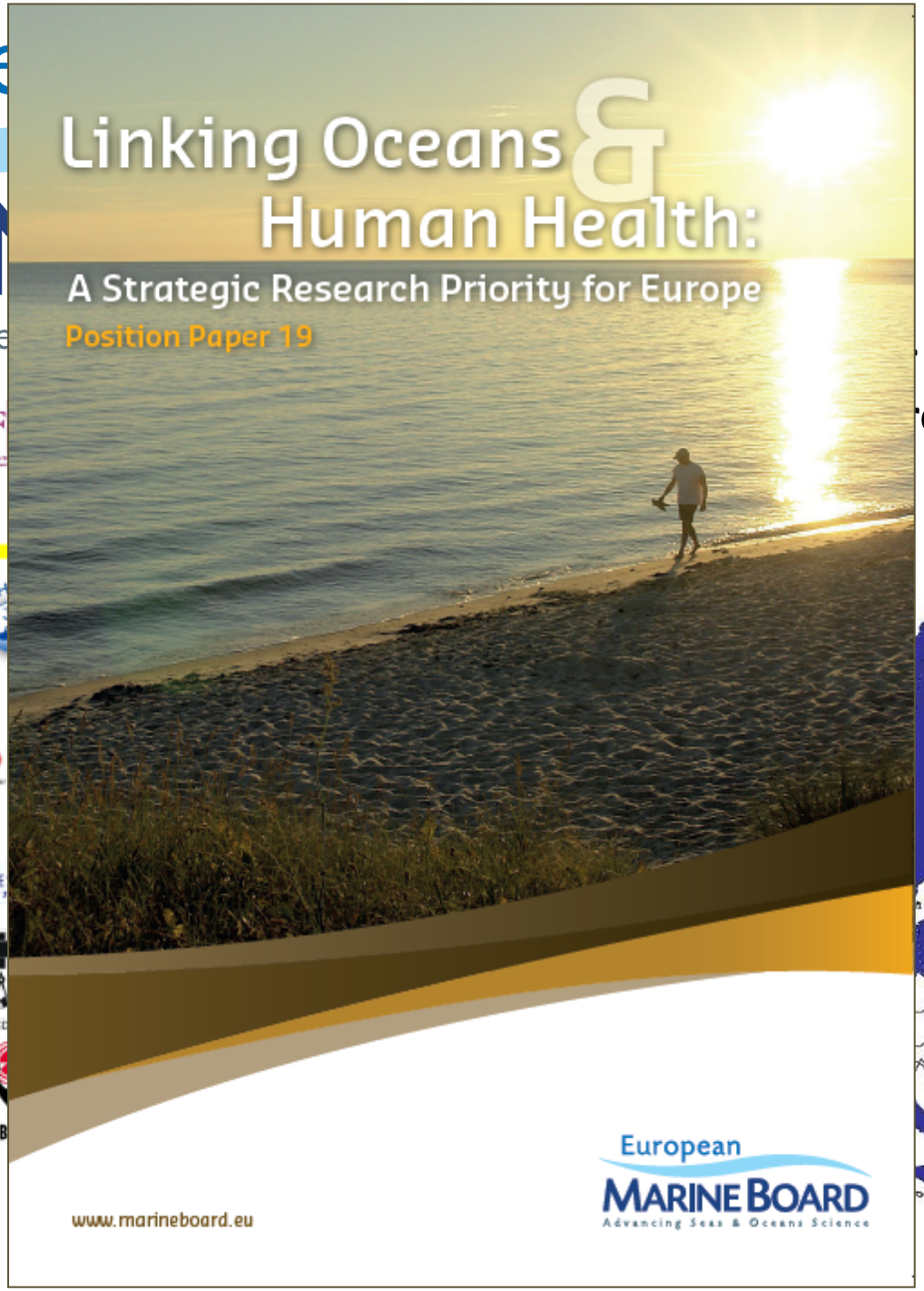
Europe

MARIN

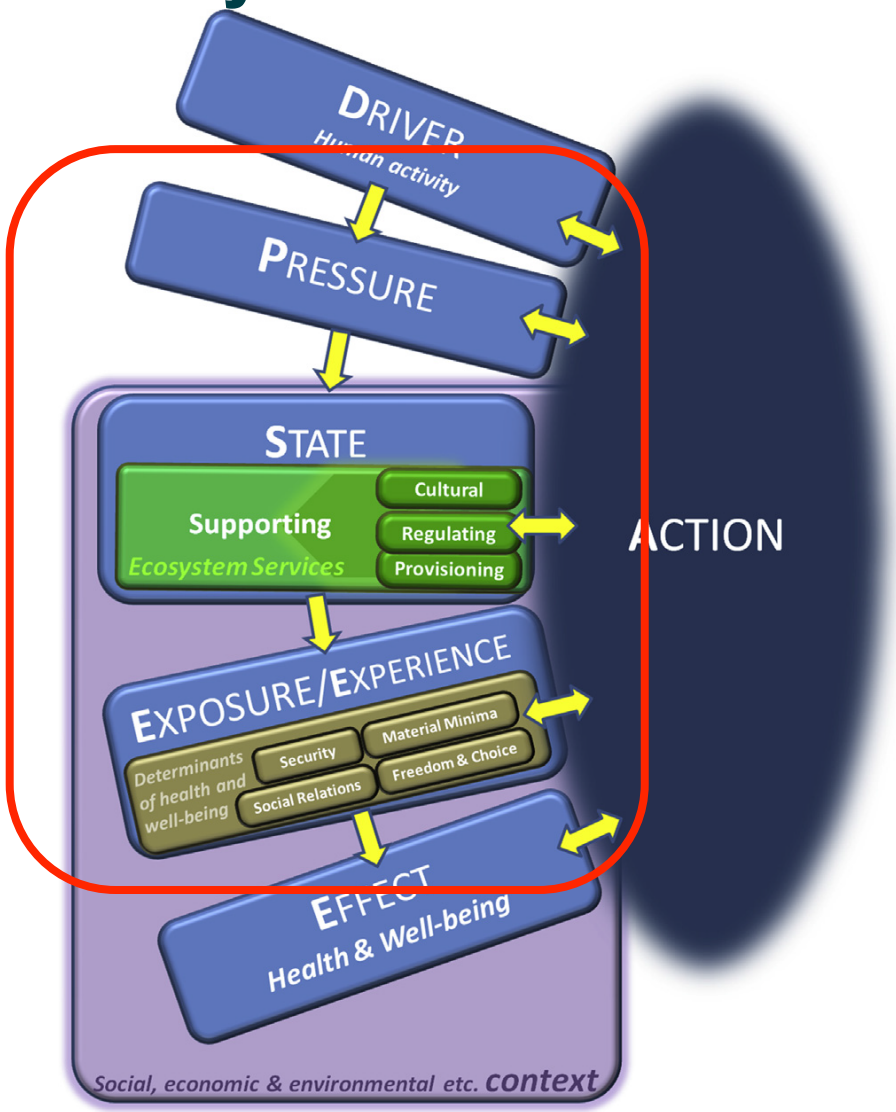
Advancing Se

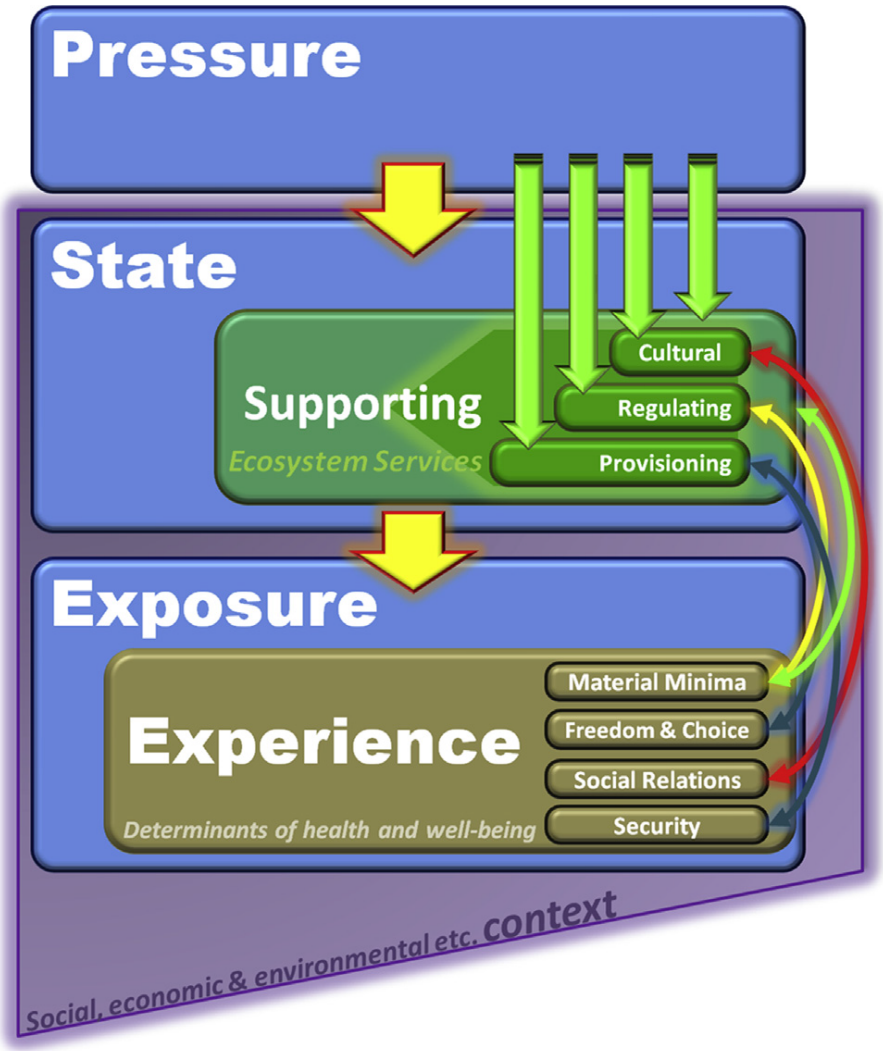
Organizations

ropean countries



Ecosystem-enriched DPSEEA (eDPSEEA)





Reis S, et al., Integrating health and environmental impact analysis, Public Health (2013), http://dx.doi.org/10.1016/j.puhe.2013.07.006

Management strategies/policy/regulation for the Atlantic

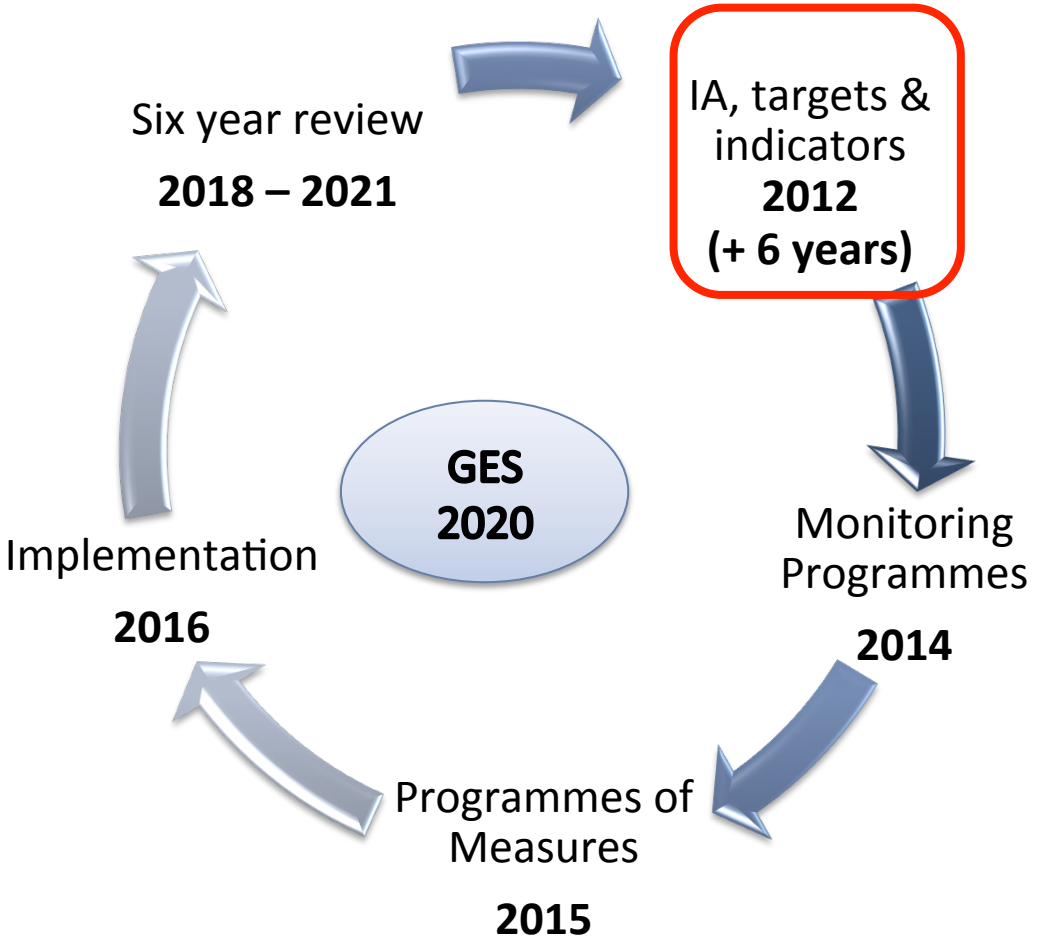
- How can research support development and implementation of management strategies/policy/regulation for the Atlantic ecosystem to reach the desired objectives?
- Can we/do we/should we always try to link our fundamental research to this objective?
  - How can we best link social and economic science to natural science?
  - How much empirical data do we need?
  - How reliable are models?
  - How do we express uncertainty?
  - How do we communicate knowledge and understanding?

Examples of where EU Research supports policy needs in the marine and maritime sectors:

- EU Marine Strategy Framework Directive
- Scientific advice on fisheries management in the EU (CFP)
- Marine and maritime cross-cutting research in Horizon 2020 (Blue Growth Focus Area) **[started in Jan 2014]**

SEVENTH FRAMEWORK PROGRAMME

Implementation Steps



Main Steps of a Marine Strategy:

- ***Initial assessment (IA)*** **of current environmental status of MS waters**
- ***Determination*** **of GES**
- **Establishment of environmental *targets* and associated *indicators***
- ***Monitoring programme*** **for ongoing assessment and regular updating of targets**
- ***Programme of measures*** **to achieve or maintain GES**
- ***Review*** **of the different steps**

Scientific advice on fisheries management in the EU(CFP)

FP7 → Research

DCF/MAP → Data collection

Research Institutes

"The CFP shall be guided by …a decision-making process based on sound scientific advice which delivers timely results"

Data Analysis Research results

ICES
International Council for Exploration of the Sea

STECF
Scientific, Technical and Economic Committee for Fisheries

Advice

Requests for advice

Stakeholder groups
RACs

European Commission

Proposals

Council

Policy decisions

European Parliament

SEVENTH FRAMEWORK PROGRAMME

VECTORS partners are developing ATLANTIS: a true 'super model' in terms of its complexity and requirements

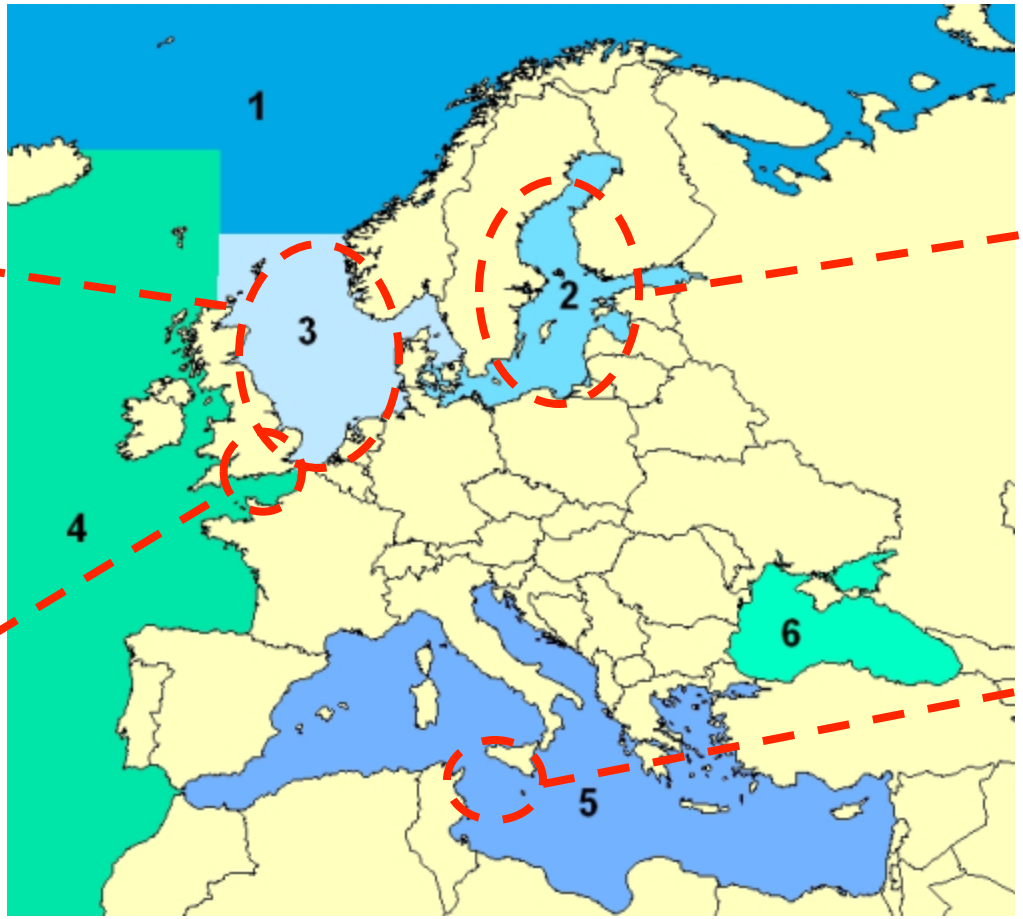
Biophysical, economic and social; investigate trade-offs between multiple pressures

The North Sea

- fisheries,
- windfarms,
- eutrophication
- climate change

English Channel

- fisheries,
- aggregates
- shipping



The Baltic Sea

- fisheries,
- eutrophication
- non-natives
- climate change

Sicilian Channel

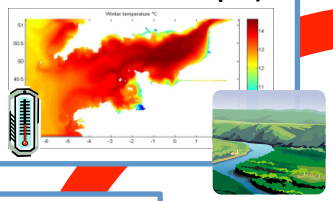
- fisheries,
- climate change
- tourism
- non-natives

Relevant to policy makers, coastal managers and planners ICZM , MSFD, and the forthcoming Marine Planning Directive

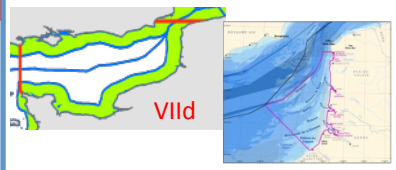
Fisheries access restrictions and ecosystem-based management in the Eastern Channel : ATLANTIS

Girardin, R.[1], Fulton, E.A.[2], Gorton, R.[2], Savina-Rolland, M.[1], Thébaud, O.[1], Travers-Trolet, M.[1], Vermard, Y.[1], Marchal, P.[1]
[1]Ifremer, [2]CSIRO

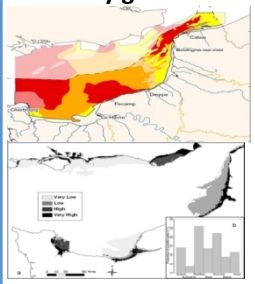
Hydro-dynamics and Physics (MARS3D + SoDa + Rivers input)



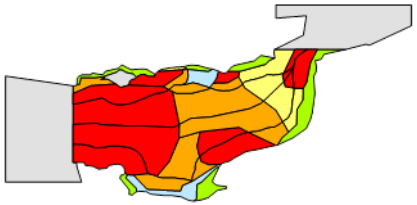
Spatial management: MPA, 12 miles…



Benthic habitats and nursery grounds



ATLANTIS: 38 Boxes & 3 layers

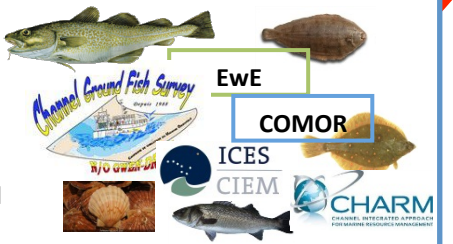


Fishery

- 61 fleets
- Constant F per species
- Data from logbooks, economic surveys and assessment

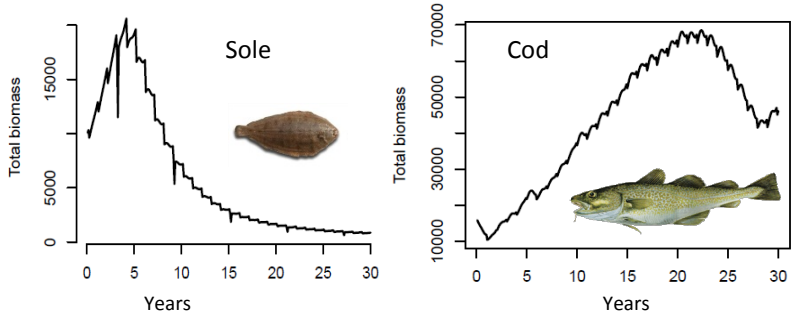
40 Functional groups:

- 20 size classed vertebrate groups
- Initial biomass from 2001
- Data from surveys, literature, MARS3D and assessment



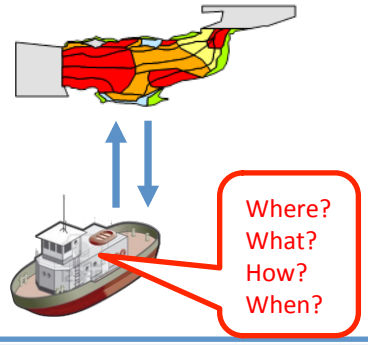
Ongoing calibration

ATLANTIS ouput: Total biomass in the Eastern English Channel (tons)

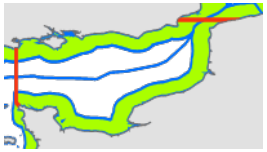


Perspectives and scenarii

Coupling:
Atlantis + fleets dynamics (RUM)



MPA: - total 12 miles
- partial12 miles



Maritime traffic increase:

Learning from different experiences around the Atlantic

e.g.

- ‘Blue Growth’ Different approaches to biotech exploitation
  - learn from each other, seek mutual benefit
- Engagement of policy and governance
- Engagement of society

Thank you