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BASQUE RESEARCH
& TECHNOLOGY ALLIANCE

15th March 2023

Bringing marine nature back to our lives – the role of science

Organised by VELMU – the Finnish Inventory Programme for Underwater Marine Diversity*

14-15 March 2023, Helsinki, Finland
Venue: Paasitorni, Paasivuorenkatu 5A

Maritime Spatial Planning, blue economy and ecosystem-based management, reconciling them to achieve good environmental status at sea

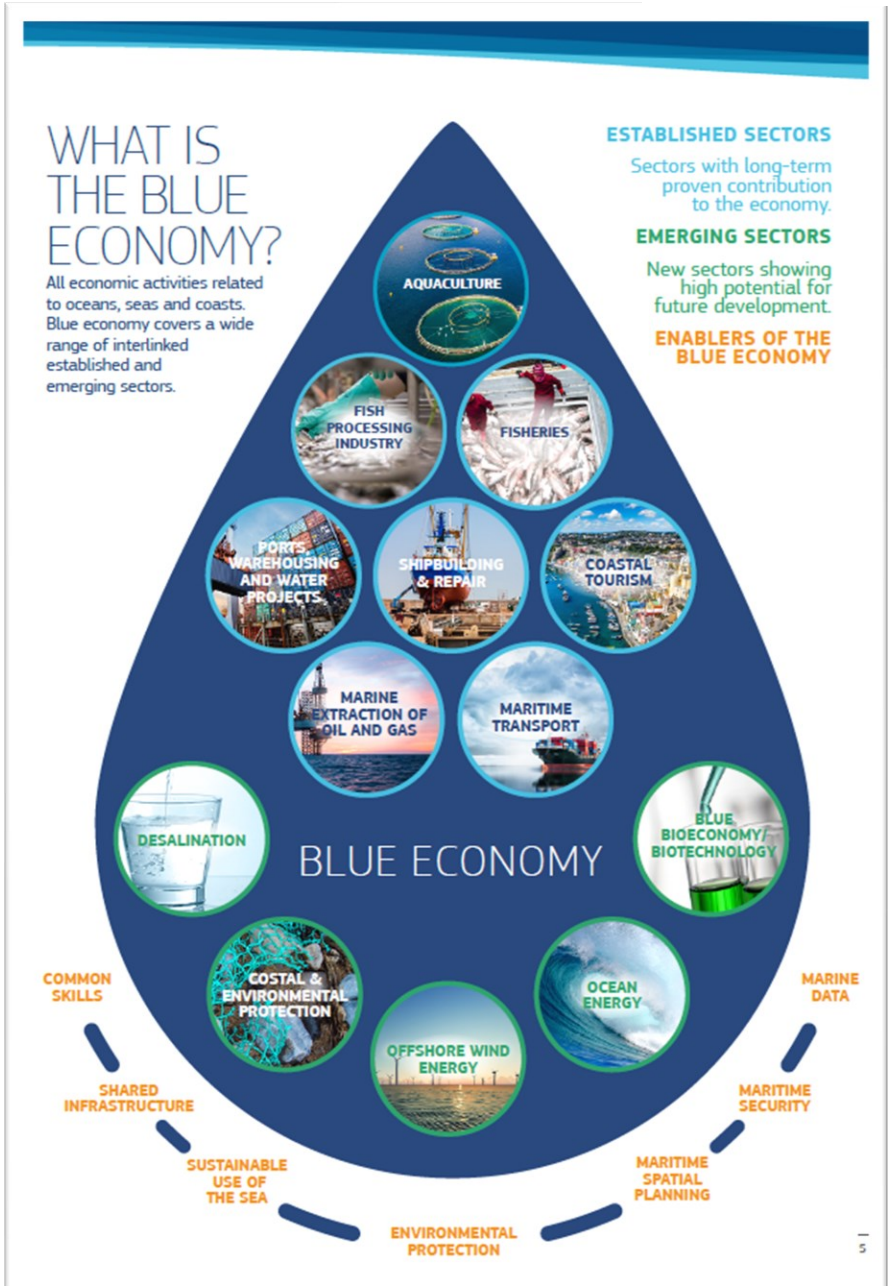
Dr. Ángel Borja
(with strong inputs from Mike Elliott, University of Hull)
aborja@azti.es
Marine Research Division
AZTI

UNIVERSITY OF HULL

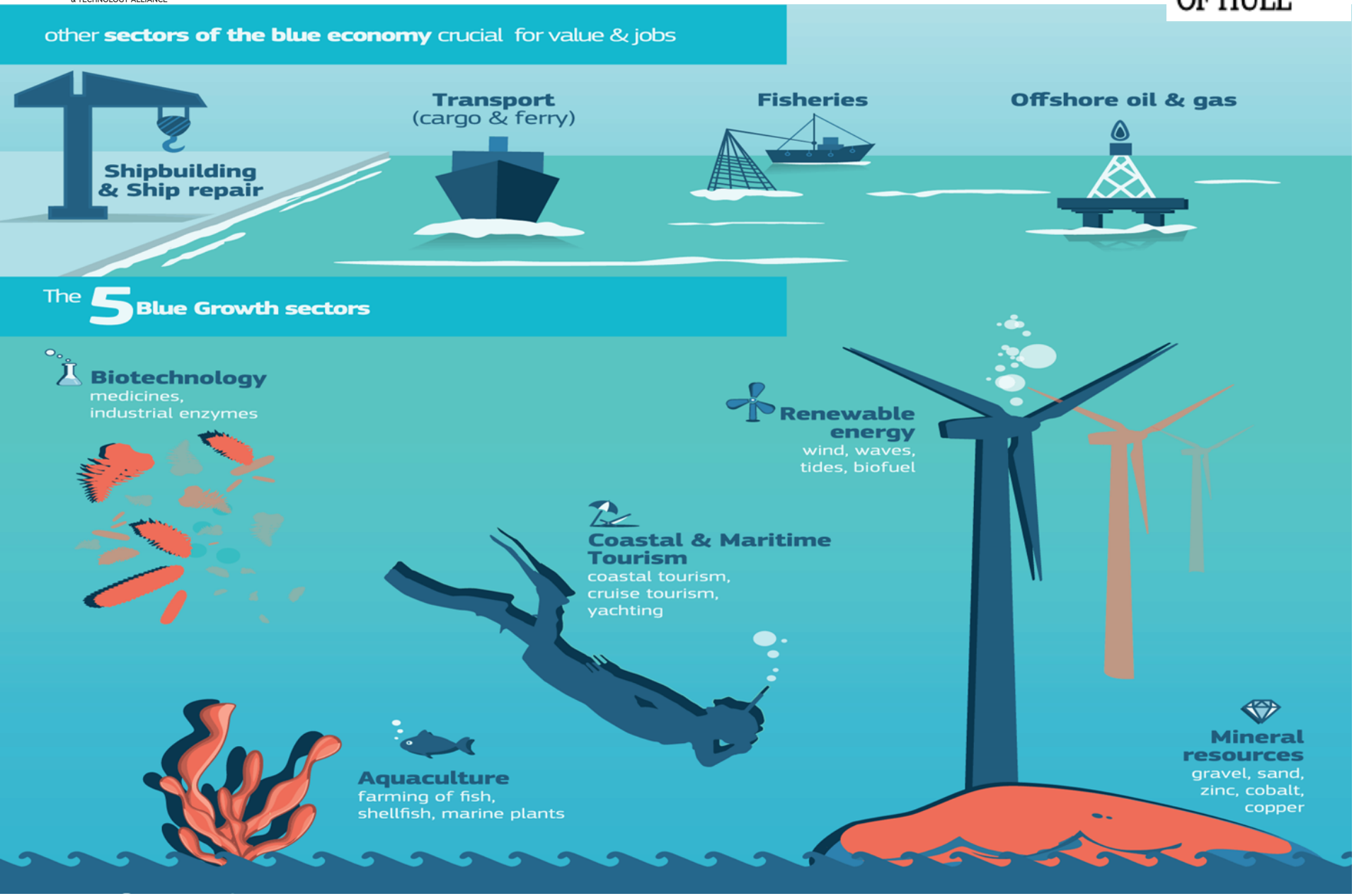
Blue Economy and Blue Growth

Blue Economy represents 1.5% of the total European Gross Domestic Product, has a turnover of around €667 billion, generates €184 billion in added value and provides jobs for 4.45 million people in Europe

https://op.europa.eu/en/publication-detail/-/publication/156eecbd-d7eb-11ec-a95f-01aa75ed71a1



Blue Economy and Blue Growth



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Blue Economy, Blue Growth & SDG

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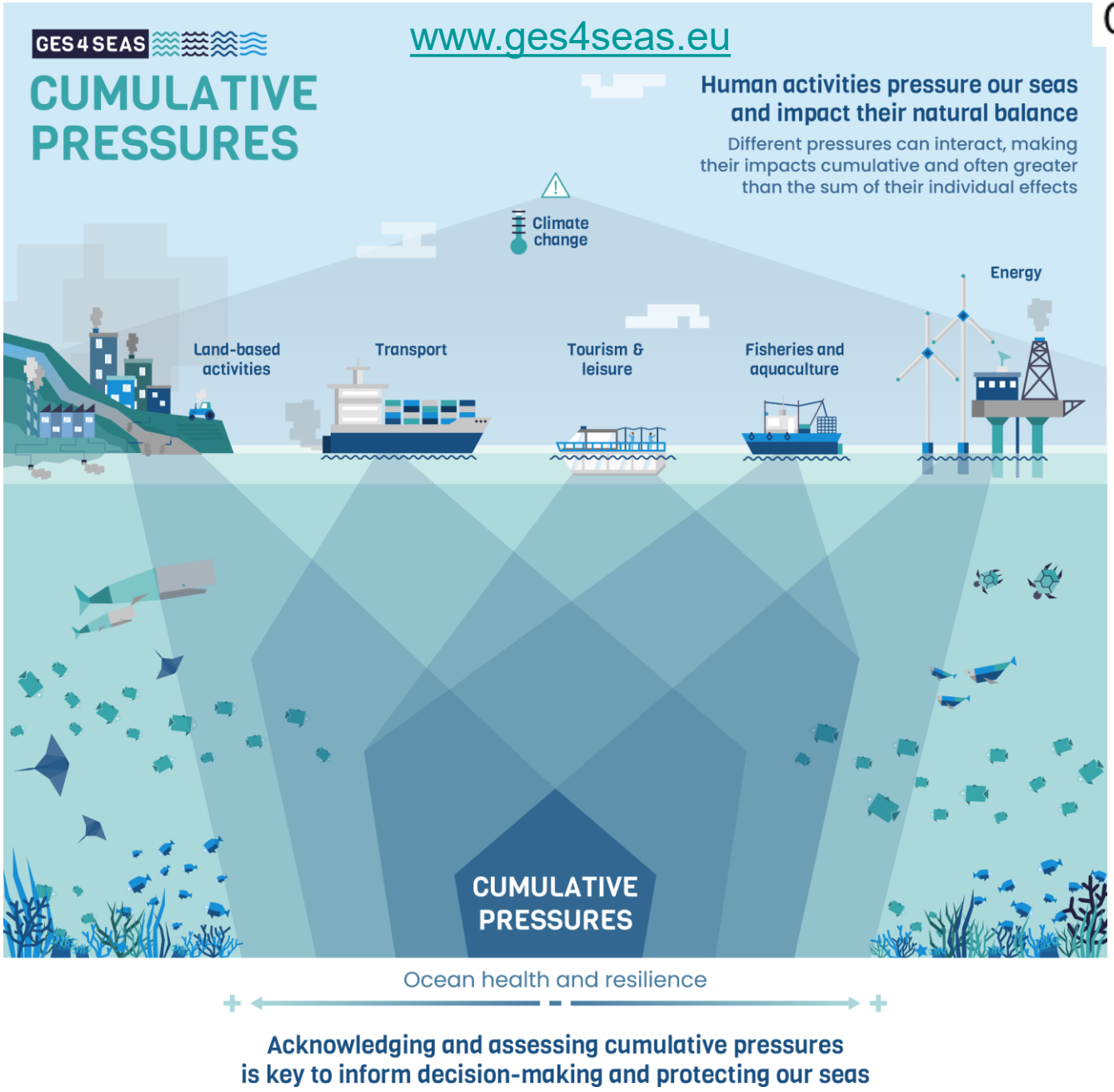
Addressing human activities and pressures



Addressing human activities and pressures

DAPSI(W)R(M) framework

Marine Pollution Bulletin 118 (2017) 27–40

Contents lists available at ScienceDirect

Marine Pollution Bulletin

journal homepage: www.elsevier.com/locate/marpolbul

Viewpoint

"And DPSIR begat DAPSI(W)R(M)!" - A unifying framework for marine environmental management

M. Elliott [a,*], D. Burdon [a], J.P. Atkins [b], A. Borja [c], R. Cormier [d], V.N. de Jonge [a], R.K. Turner [e]

Drivers (societal basic needs)

Responses (economic, legal, etc) (**M**easures)

Activities (of society)

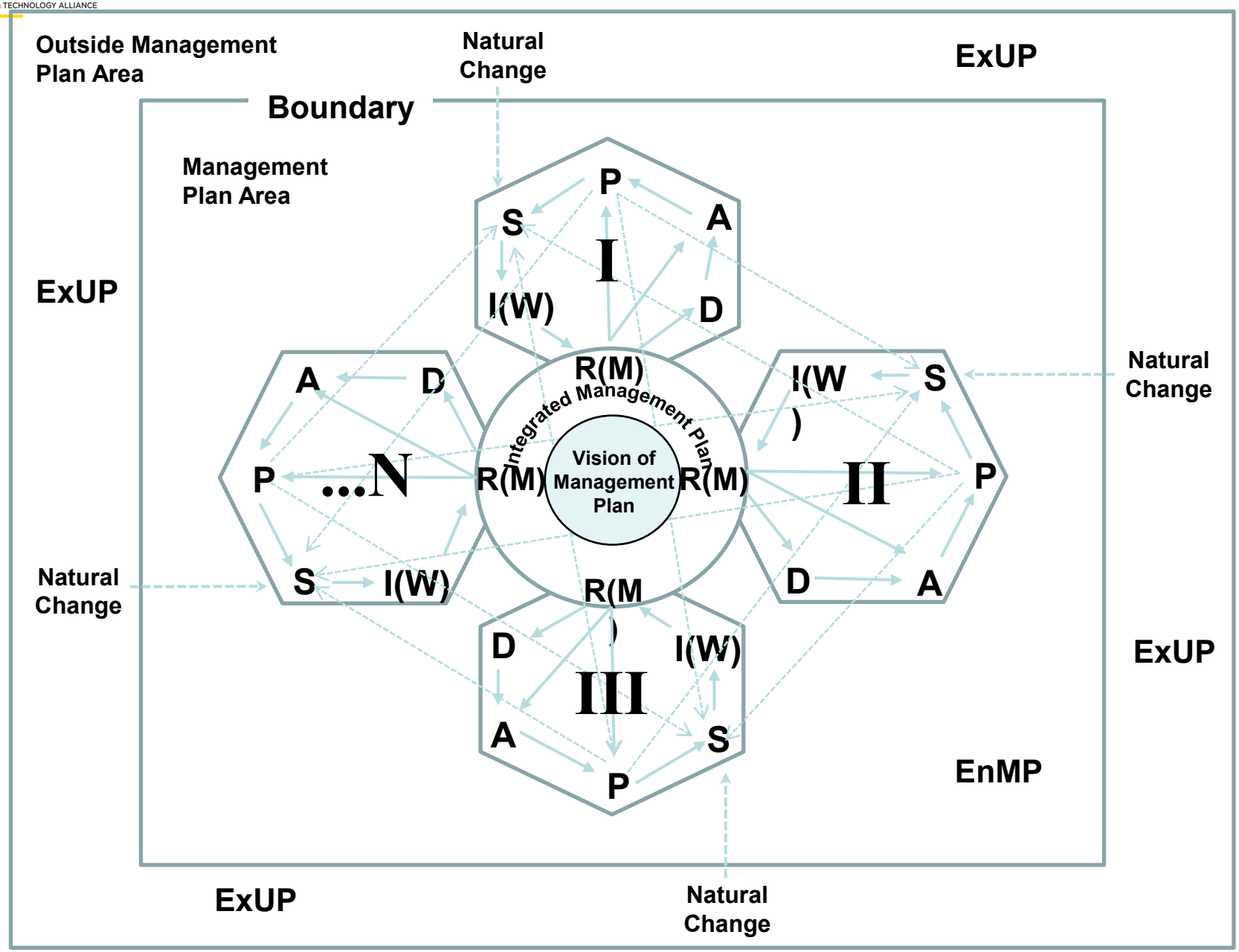
Impacts (on human **W**elfare) (changes affecting wealth creation, quality of life)

Pressures (resulting from activities)

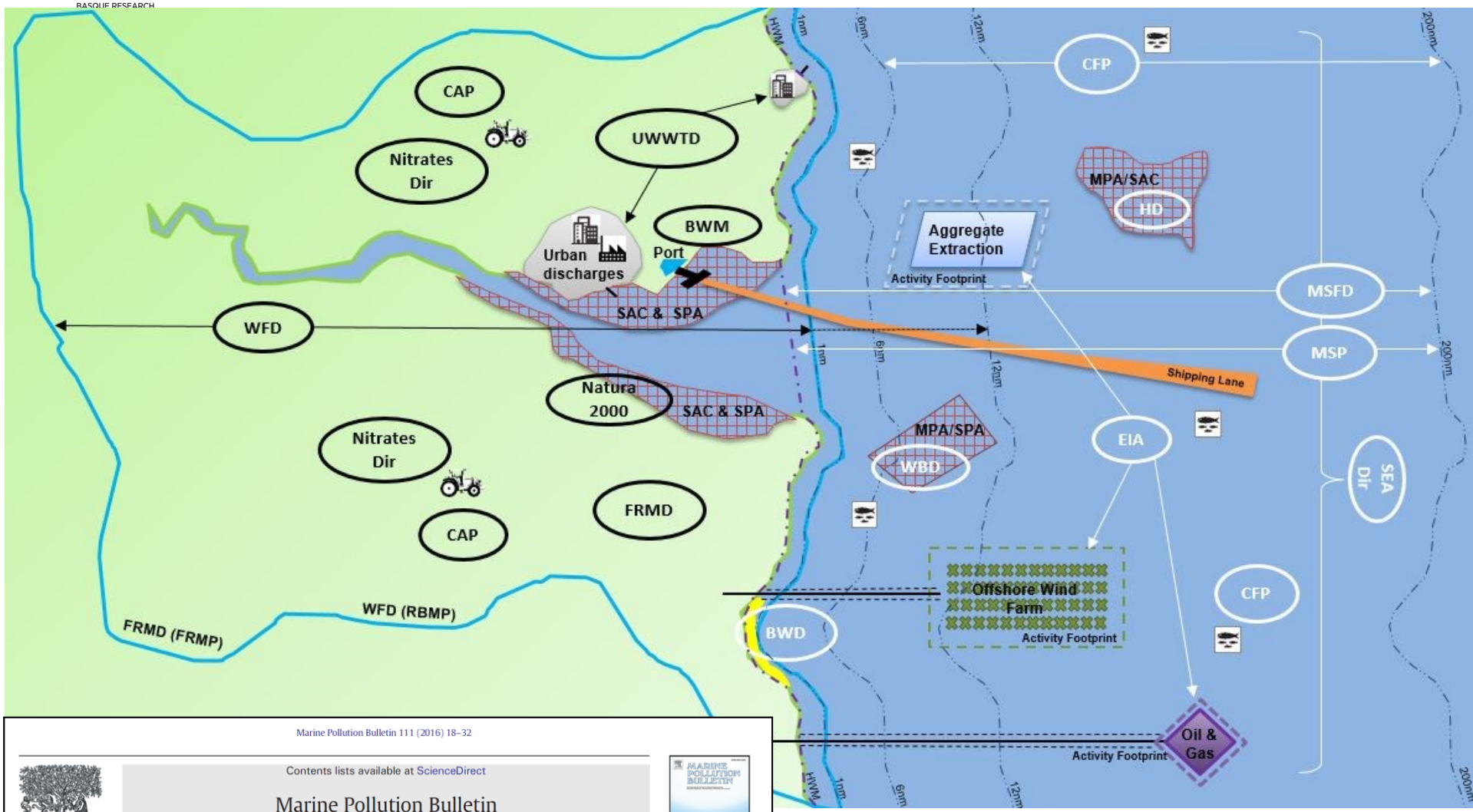
State change (on the natural system)

Nested DAPSI(W)R(M)

ExUP: exogenic unmanaged pressures
EnMP: endogenic managed pressures



Complex environmental and legal situation



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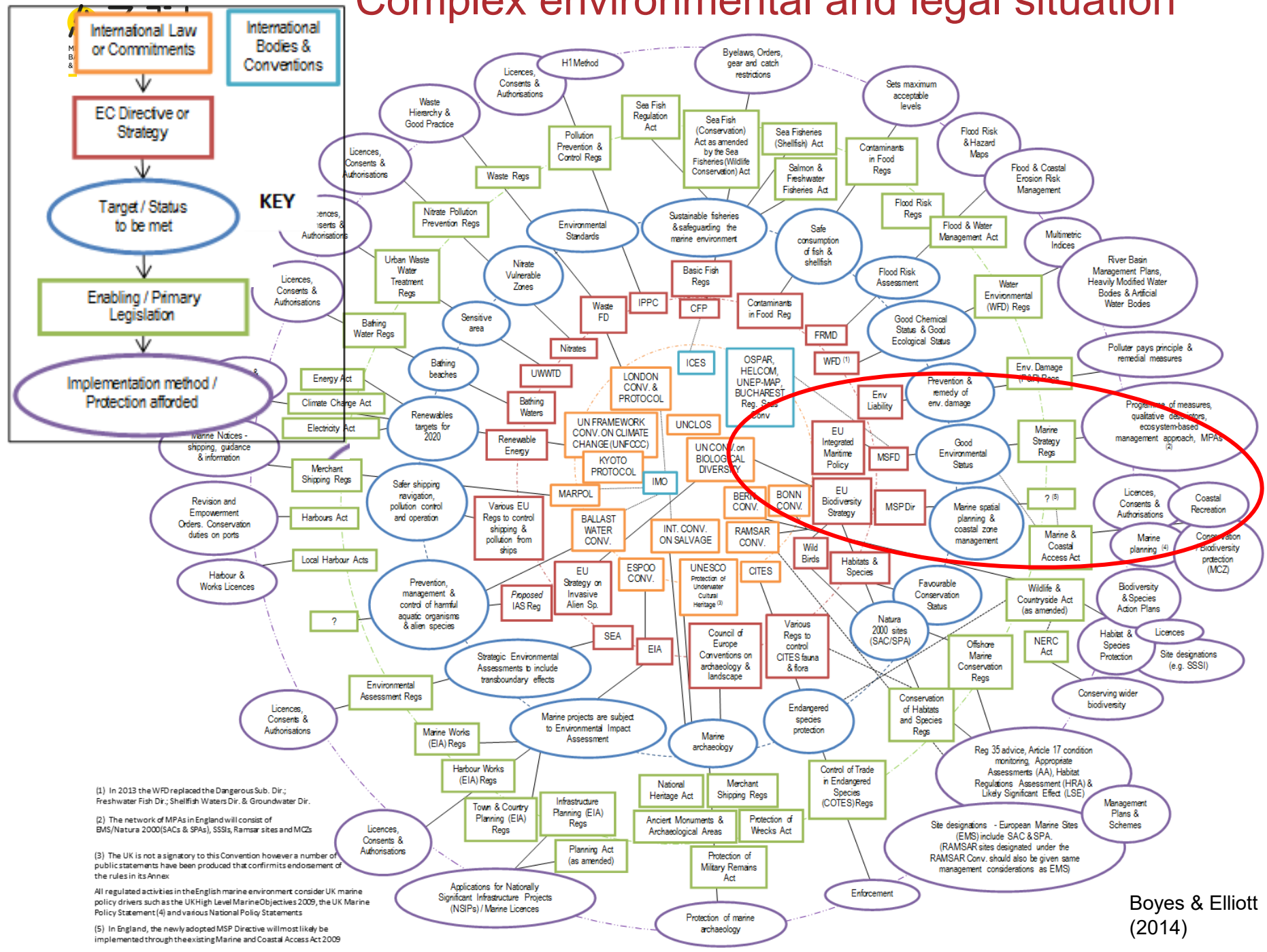
Is existing legislation fit-for-purpose to achieve Good Environmental Status in European seas?

Suzanne J. Boyes [a,*], Michael Elliott [a], Arantza Murillas-Maza [b], Nadia Papadopoulou [c], Maria C. Uyarra [b]

Geographical scope and competencies of EU legislation

Complex environmental and legal situation



(1) In 2013 the WFD replaced the Dangerous Sub. Dir.; Freshwater Fish Dir.; Shellfish Waters Dir. & Groundwater Dir.

(2) The network of MPAs in England will consist of EMS/Natura 2000(SACs & SPAs), SSSIs, Ramsar sites and MCZs

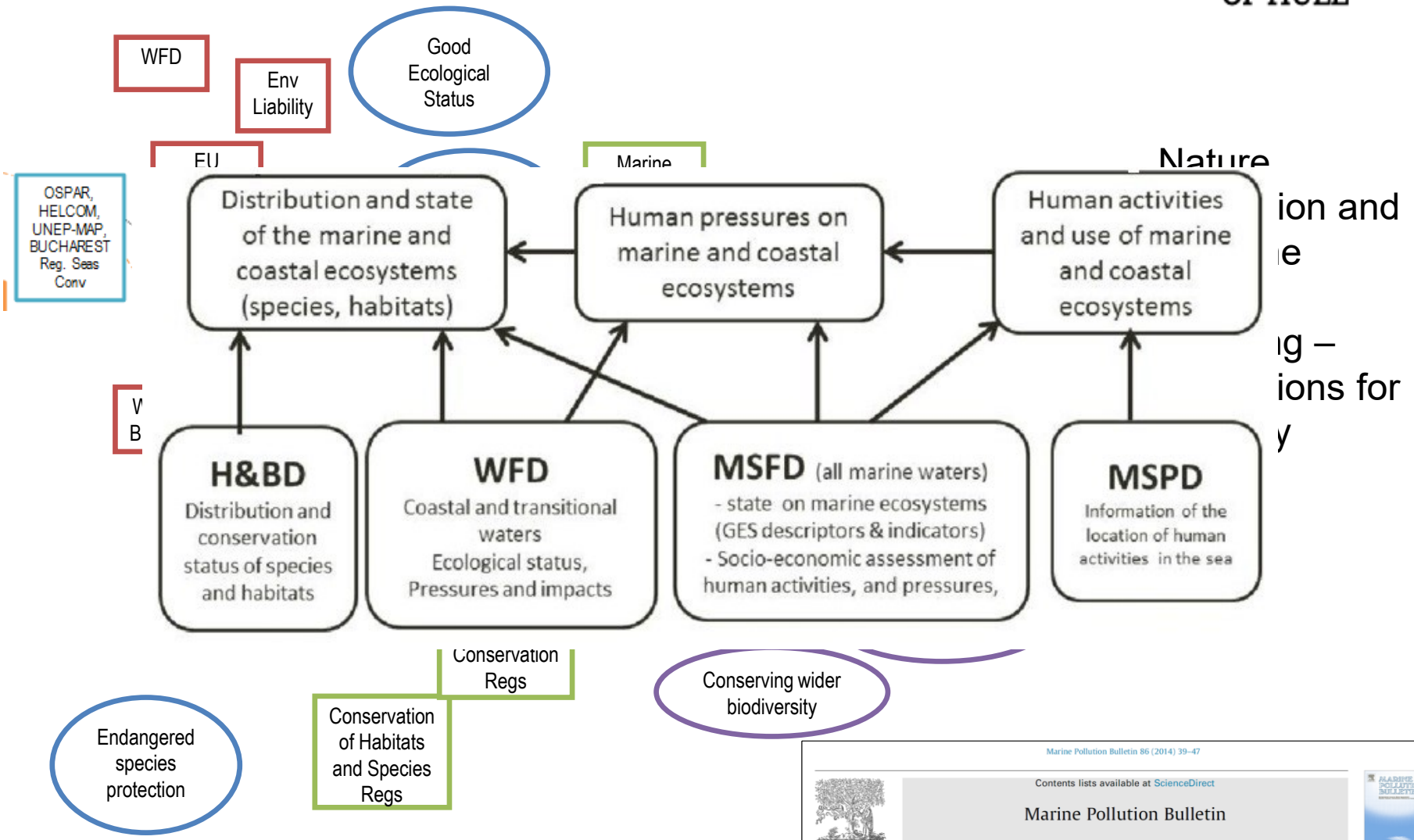
(3) The UK is not a signatory to this Convention however a number of public statements have been produced that confirm its endorsement of the rules in its Annex

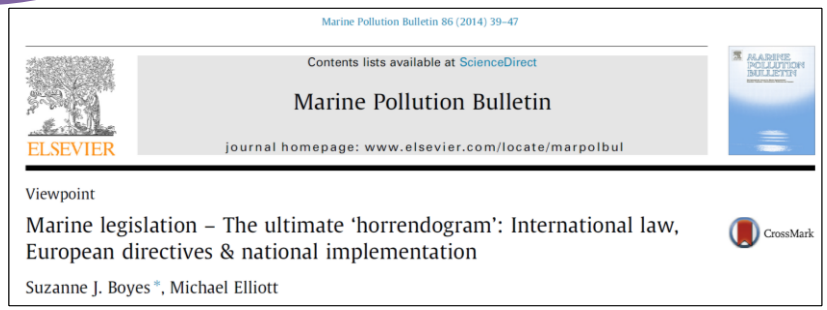
All regulated activities in the English marine environment consider UK marine policy drivers such as the UK High Level Marine Objectives 2009, the UK Marine Policy Statement (4) and various National Policy Statements

(5) In England, the newly adopted MSP Directive will most likely be implemented through the existing Marine and Coastal Access Act 2009

Boyes & Elliott (2014)

Complex environmental and legal situation




Marine Pollution Bulletin 86 (2014) 39–47

Contents lists available at ScienceDirect

Marine Pollution Bulletin

journal homepage: www.elsevier.com/locate/marpolbul

Viewpoint

Marine legislation – The ultimate 'horrendogram': International law, European directives & national implementation

Suzanne J. Boyes *, Michael Elliott

Management questions

- Where are the problems & What changes do they cause?
- What is the impact of these on ecosystem structure and functioning?
- What are the repercussions for ecosystem valuation based on economy-ecology interactions?
- What are the future environmental changes and economic futures (e.g. Blue Economy)?
- What governance framework is there, what do stakeholders need?
- What can we do about the problems?
- Where are the risks and how to address them now and in the future (Blue Economy, climate change)?
- What are the governance successes, failures and implications?

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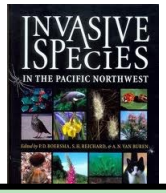
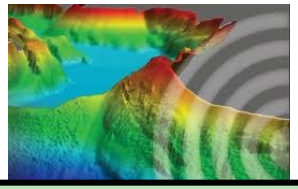
Marine Strategy Framework Directive (MSFD, 2008/56/EC) (the marine environmental quality directive!)

- Aim: 'to promote sustainable use of the seas and conserve marine ecosystems'
- Achieve Good Environmental Status (GES), by 2020 (2026)
- The concept of environmental status accommodates the structure, function and processes of the marine ecosystems together with natural physiographic, geographic and climatic factors, as well as physical and chemical conditions including those resulting from human activities in the area concerned

The Marine Strategy Framework Directive

Qualitative Descriptors





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.'

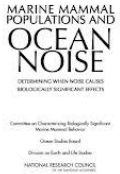
Fishing

Eutrophication

Hydrography

Pollution

Litter



Energy/noise

Framework Directive on Maritime Spatial Planning (MSP, 2014/89/EU) *(the marine blue economy directive!)*

Competition for maritime space has highlighted the need to manage seas more coherently and sustainably

Maritime Spatial Planning Directive

- Aim: “the sustainable growth of maritime and coastal economies and the sustainable use of marine and coastal resources”.
- MSP is about planning **when and where human activities take place at sea** – to ensure these are as efficient and sustainable as possible.
  - ensure a coordinated approach to MSP throughout Europe;
  - enable the efficient and smooth application of MSP in cross-border marine areas;
  - to favour the development of maritime activities; and
  - the protection of the marine environment based on a common framework

Challenges for science & management

There is only one big idea in marine management:

how to maintain and protect ecological structure and functioning while at the same time allowing the system to produce sustainable ecosystem services from which we derive societal benefits.

MSFD

MSPD

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Challenges for science & management

"clean, healthy, safe, productive, biologically diverse marine and coastal environments, managed to meet the long-term needs of people and nature"

In other words: "to look after the natural stuff and deliver the human stuff"

Challenges for science & management

Taken from Alec Taylor (WWF-UK)

Challenges for science & management

To be successful, management measures or responses to changes resulting from human activities should be (so-called 10 tenets):

- Ecologically sustainable
- Technologically feasible
- Economically viable
- Socially desirable/tolerable
- Legally permissible
- Administratively achievable
- Politically expedient
- Ethically defensible (morally correct)
- Culturally inclusive
- Effectively communicable

(I would add equity and justice)

Marine Pollution Bulletin 62 (2011) 651–655

Contents lists available at ScienceDirect

Marine Pollution Bulletin

journal homepage: www.elsevier.com/locate/marpolbul

Editorial

Marine science and management means tackling exogenic unmanaged pressures and endogenic managed pressures – A numbered guide

Marine Pollution Bulletin 74 (2013) 1–5

Contents lists available at ScienceDirect

Marine Pollution Bulletin

journal homepage: www.elsevier.com/locate/marpolbul

Editorial

The *10-tenets* for integrated, successful and sustainable marine management

ENVIRONMENTAL SCIENCE & POLICY 51 (2015) 181–191

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/envsci

The 10-tenets of adaptive management and sustainability: An holistic framework for understanding and managing the socio-ecological system

*Steve Barnard *, Michael Elliott*

FAQ - What are the benefits of MSP for the environment? How is the proposal related to the MSFD?

- *MSP will improve the implementation of environmental legislation in Europe and secure the link between coastal and maritime activities*
- *The MSFD specifically refers to MSP as a key implementation tool which is designed to properly manage and reduce the cumulative impact of all maritime activities in a given sea area.*
- *This will help Member States to reach good environmental status of their waters by 2020 (2026).*
- *Through the MSFD, Member States have the obligation to establish a coherent network of Marine Protected Areas.*
- *Cooperation on planning across borders is essential to reach that goal.*
- *The Directive will also help to reach the EU Biodiversity Strategy objective to cover 30% of marine waters with designated protected areas (more ambitious than SDG), and now also with the High Seas Treaty.*

But (*and there is always a 'but'*):

Does MSP mean an activity is allowed:

- where the developer wants it to be?
- where the regulator wants it to be?
- where all the stakeholders want it to be?
- where it can be?
- where it should be?
- where there is any space left for it?

Or

- where the assimilative capacity of the system can accommodate it?(*)

"I suppose I'll be the one to mention the elephant in the room."

(* and, if not, then will the environmental regulator say it cannot be allowed but the finance minister say it has to be allowed!!!)?

Assimilative capacity/carrying capacity

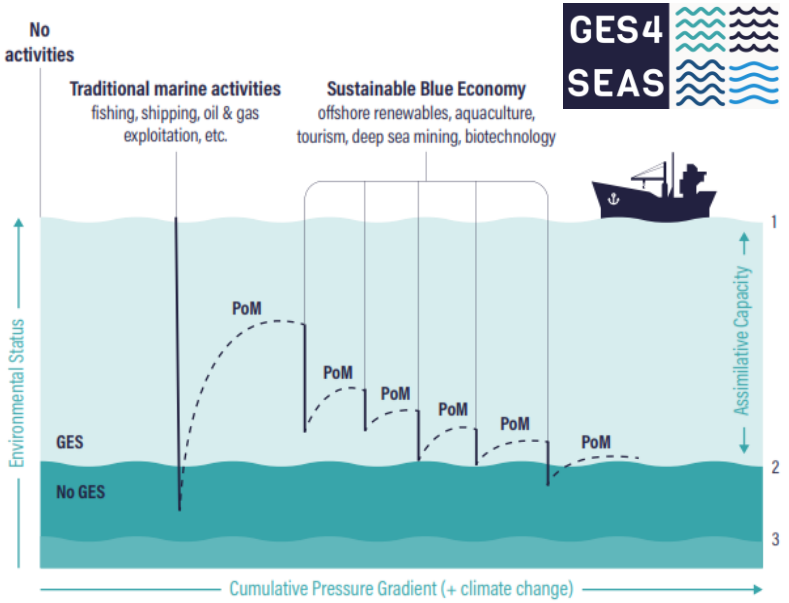
	Previously	Proposed
Assimilative capacity	the ability of a body of water to assimilate a contaminant without showing adverse changes	the amount of an activity or activities allowed in a body of water before it adversely affects the quality
Carrying capacity	the amount of biota (e.g. number of birds or fishes) that a given habitat can support	the ability of a body of water to support a given amount of activity or activities or ecological component

Borja et al., 2022. Applying the China's marine resource-environment carrying capacity and spatial development suitability approach to the Bay of Biscay (North-East Atlantic). *Frontiers in Marine Science*, ***9: 10.3389/fmars.2022.972448.***

GES and MSP: theoretical compatibility

Assumptions:

- That an area has a finite environmental quality status which is intact in the pristine state and then decreases with each activity permitted;
- That an area has an assimilative capacity to absorb the effects of an activity;
- That the reduction in environmental quality status and assimilative capacity in an area depends on the precise activity, its spatial and temporal footprint, and the cumulative and in-combination effects;
- That these also depend on any mitigation and/or compensation measures performed on any components/ habitat, and on the particular descriptor in question;
- That the environmental quality status and the assimilative capacity is regained with mitigation or compensation;
- That GES can still be achieved with the permitted activities in place.
- (but be careful with tipping-points!)




Marine Pollution Bulletin 76 (2013) 16–27

Contents lists available at ScienceDirect

Marine Pollution Bulletin

journal homepage: www.elsevier.com/locate/marpolbul

Viewpoint

Good Environmental Status of marine ecosystems: What is it and how do we know when we have attained it?

Angel Borja [a,*], Mike Elliott [b], Jesper H. Andersen [c], Ana C. Cardoso [g], Jacob Carstensen [c], João G. Ferreira [d], Anna-Stiina Heiskanen [e], João C. Marques [f], João M. Neto [f], Heliana Teixeira [g], Laura Uusitalo [e], María C. Uyarra [a], Nikolaos Zampoukas [g]


Marine Pollution Bulletin 60 (2010) 2175–2186

Contents lists available at ScienceDirect

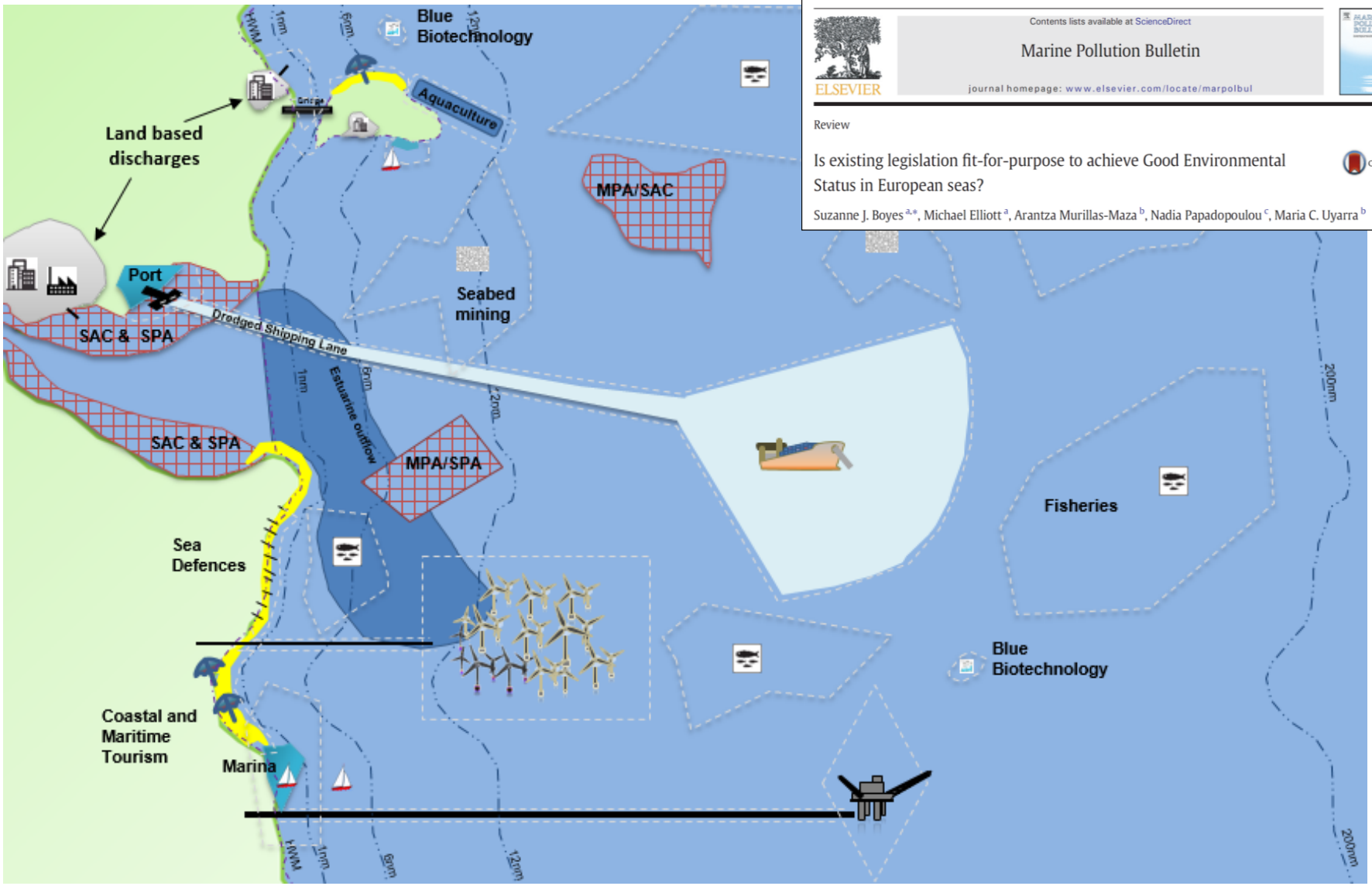
Marine Pollution Bulletin

journal homepage: www.elsevier.com/locate/marpolbul

Viewpoint

Marine management – Towards an integrated implementation of the European Marine Strategy Framework and the Water Framework Directives

Ángel Borja [a,*], Mike Elliott [b], Jacob Carstensen [c], Anna-Stiina Heiskanen [d], Wouter van de Bund [e]



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Challenge – to merge environmental quality management (e.g. MSFD) with maritime spatial planning and Blue Economy initiatives (e.g. MSPD)

Calculation of impact of activities and their footprints as a % of the whole marine area

Activity	Area (%)
Fisheries	14.8
Navigation and ports	6.4
Offshore energy (including cables)	3.7
Estuarine outflow (from mouth of estuary) (*)	3.7
Seabed Mining	2.4
Oil and gas (including pipelines)	1.8
Tourism/recreation	1.2
Infrastructure (bridges, groynes, sea-defences)	0.3
Aquaculture	0.3
Shore-based discharges	0.3
Biotechnology	0.1
Total Area (%)	34.9

(* a pressure rather than an activity but used here as a surrogate for the net result of all discharges (diffuse and point source) to the catchment)

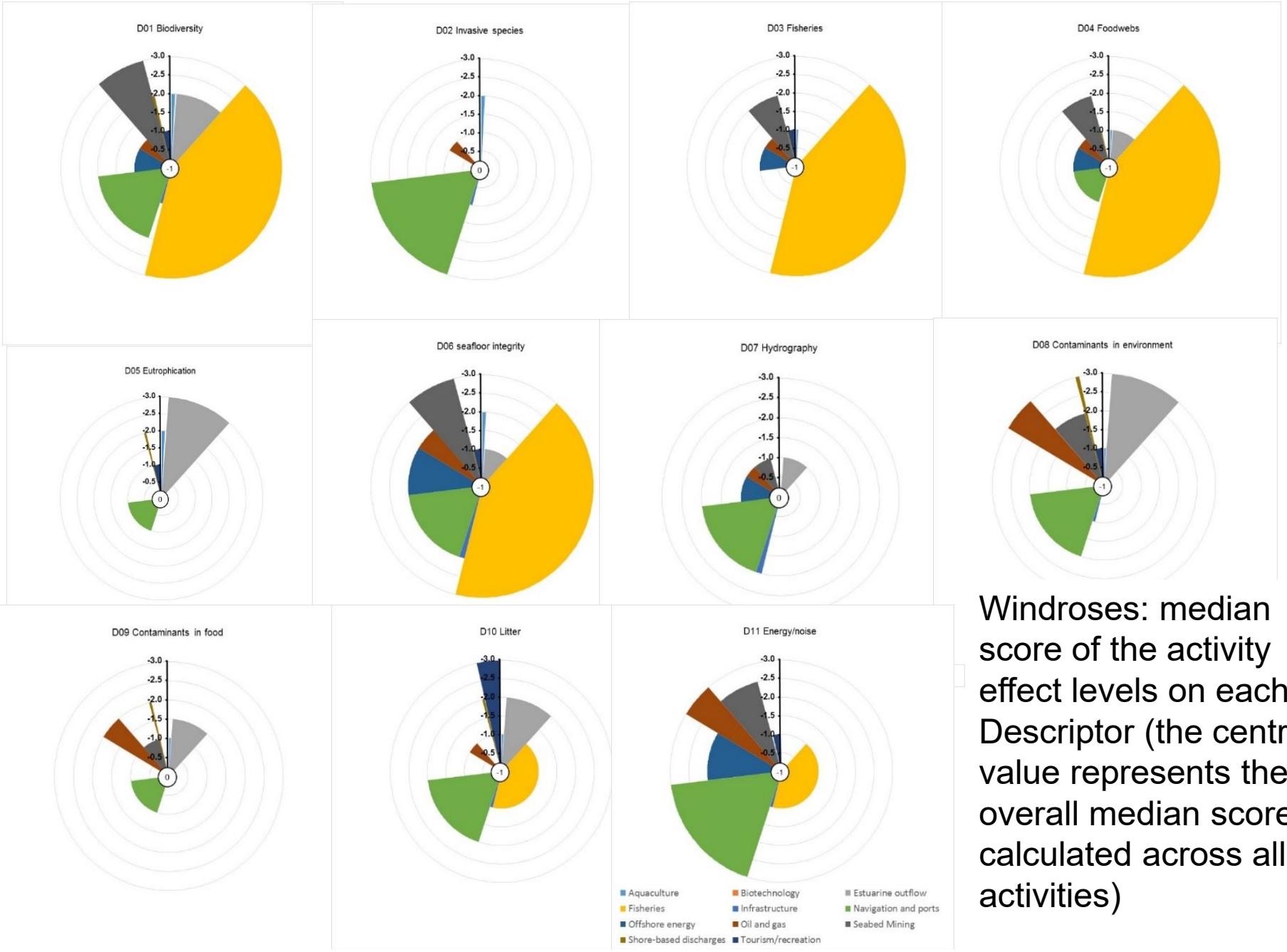
(from Elliott, M., S. J. Boyes, S. Barnard, A. Borja, 2018. Using best expert judgement to harmonise marine environmental status assessment and maritime spatial planning. Marine Pollution Bulletin, 133: 367-377)

Expert judgment to harmonise marine assessments

Blue Economy + Mature activities

Median values (50th percentiles) MSFD descriptors	Aquaculture	Biotechnology	Estuarine outflow	Fisheries	Infrastructure	Navigation and ports	Offshore energy	Oil and gas	Seabed Mining	Shore-based discharges	Tourism /recreation	Overall confidence in responses for given descriptor (across all activities)
D01 Biodiversity	-2	0	-2	-3	-1	-2	1	-1	-3	-2	-1	2.5
D02 Invasive species	-2	0	0	0	-1	-3	0	-1	0	0	0	2
D03 Fisheries	-1	0	0	-3	0	0	1	-1	-2	-1	-1	2
D04 Foodwebs	-1	0	-1	-3	0	-1	1	-1	-2	-1	0	2
D05 Eutrophication	-2	0	-3	0	0	-1	0	0	0	-2	-1	2
D06 seafloor integrity	-2	0	-1	-3	-2	-2	-2	-2	-3	-1	-1	3
D07 Hydrography	0	0	-1	0	-2	-2	-1	-1	-1	0	0	1.5
D08 Contaminants in environment	-1	0	-3	0	-1	-2	0	-3	-2	-3	-1	2
D09 Contaminants in food	-1	0	-1.5	0	0	-1	0	-2	-1	-2	0	1
D10 Litter	-1	0	-2	-1	-1	-2	0	-1	0	-2	-3	2
D11 Energy/noise	0	0	0	-1	-1	-3	-2	-3	-2.5	0	-1	2
Overall confidence in responses for given activity (across all descriptors)	2	1	2	2	2	2	2	2	2	2	2	

(from Elliott, M., S. J. Boyes, S. Barnard, A. Borja, 2018. Using best expert judgement to harmonise marine environmental status assessment and maritime spatial planning. Marine Pollution Bulletin, 133: 367-377)



Windroses: median score of the activity effect levels on each Descriptor (the central value represents the overall median score, calculated across all activities)

(from Elliott, M., S. J. Boyes, S. Barnard, A. Borja, 2018. Using best expert judgement to harmonise marine environmental status assessment and maritime spatial planning. Marine Pollution Bulletin, 133: 367-377)

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Integrative GES assessment

frontiers in Marine Science

REVIEW
published: 01 March 2016
doi: 10.3389/fmars.2016.00020

Overview of Integrative Assessment of Marine Systems: The Ecosystem Approach in Practice

Angel Borja[1], Michael Elliott[2], Jesper H. Andersen[3], Torsten Berg[4], Jacob Carstensen[5], Benjamin S. Halpern[6,7,8], Anna-Stiina Heiskanen[9], Samuli Korpinen[9], Julia S. Stewart Lowndes[7], Georg Martin[10] and Naiara Rodriguez-Ezpeleta[1]*

DEVOTES
www.devotes-project.eu
Development of innovative tools for understanding marine biodiversity and assessing good environmental status

NEAT

(Nested Environmental status Assessment Tool)

www.devotes-project.eu/neat

Integrative GES assessment

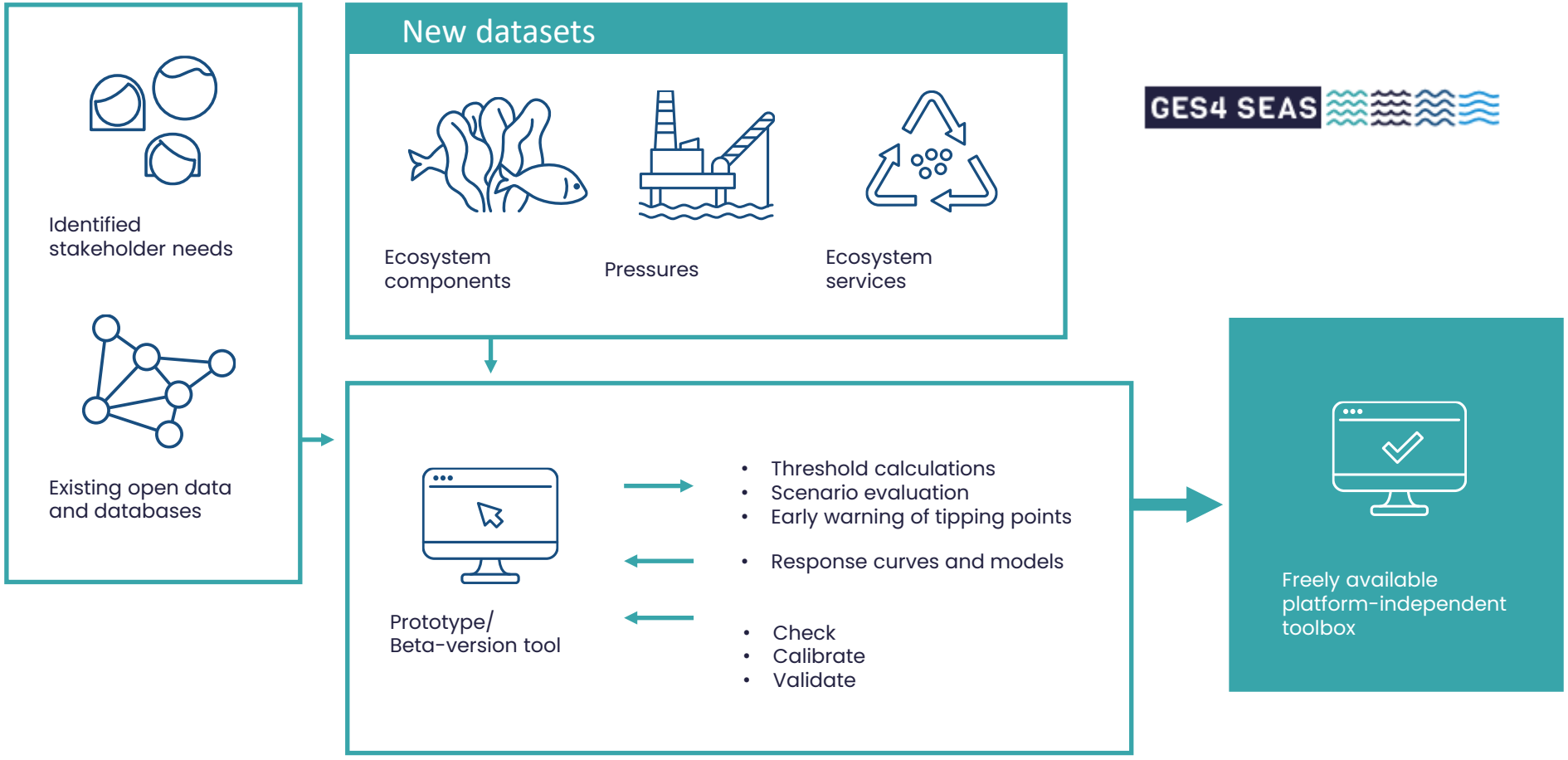
Descriptor/Indicator	Worst	Bad/ Poor	Poor/ Mod	Mod/ Good	Good/ High	Best	Source
D3: Commercial Fish							
F/F_{msy} (for 341 stocks)	15	5	2	1	0.5	0	Froese et al. (2018)
B/B_{msy} (for 341 stocks)	0	0.25	0.5	1	1.5	2	Froese et al. (2018)
D5: Eutrophication							
90th Percentile Chlorophyll (µg l^{-1})							
Baltic	20			2.49	1.83	0	European Commission (2018)
Adriatic	20			4	1.7	0	European Commission (2018)
Balearic/Sardinia	20			1.89	1.18	0	European Commission (2018)
Gulf of Lions	20			3.5	1.92	0	European Commission (2018)
Cyprus/Aegean/Ionian/Black Sea	20			0.53	0.29	0	European Commission (2018)
North-East Atlantic	20			1.52	1.18	0	European Commission (2018)
D8: Contaminants							
Anthracene (µg l^{-1})	10	0.9	0.3	0.1		0	European Commission (2013)
Fluoranthene (µg l^{-1})	10	0.057	0.019	0.0063		0	European Commission (2013)
Naphthalene (µg l^{-1})	100	18	6	2		0	European Commission (2013)
Cadmium (µg l^{-1})	10	1.8	0.6	0.2		0	European Commission (2013)
Nickel (µg l^{-1})	1000	77.4	25.8	8.6		0	European Commission (2013)
Lead (µg l^{-1})	100	11.7	3.9	1.3		0	European Commission (2013)

Integrative GES assessment

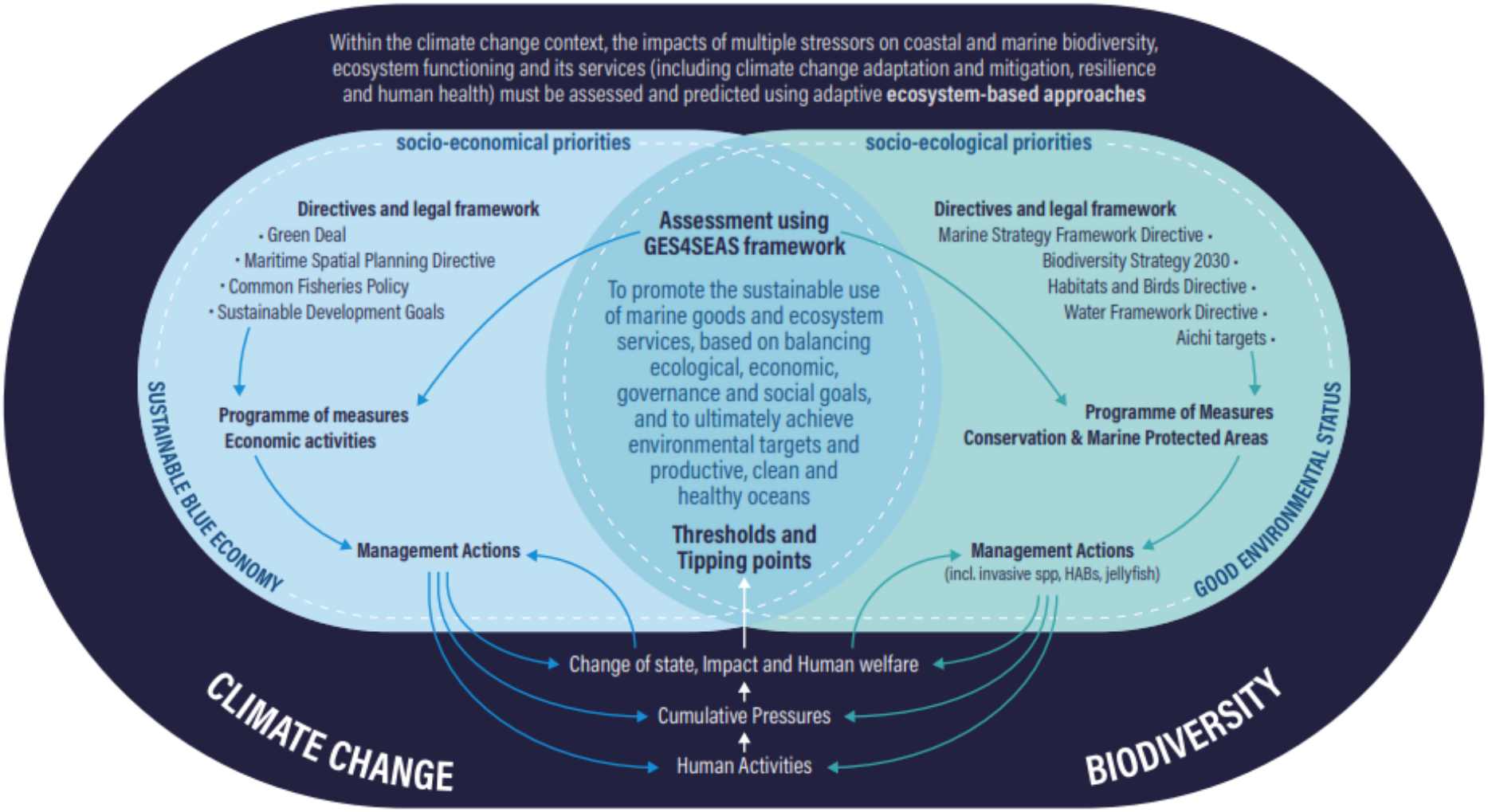
			Weighting by SAU area										Without weighting by SAU area					
Spatial Assessment Units	Area	SAU weight	NEAT value	Confid.	Ecosystem component & Descriptor						Habitat & Descriptor		Area	SAU weight	NEAT value	Confid.	Habitat & Descriptor	
	(km²)			(%)	WC	Phyto.	Fish	Moll.	Crust.	Com Fish	Pelagic	Dem/Ben				(%)	Pelagic	Dem/Ben
					D8	D5	D3	D3	D3	D3	D3, D5, D8	D3					D3, D5, D8	D3
EUROPE	15,833,850	0.000	0.586	99.9	0.857	0.871	0.514	0.466	0.429	0.511	0.660	0.468	1	0.000	0.612	100.0	0.656	0.457
Baltic Sea	392,215	0.012	0.577	99.3	0.631	0.418	0.528			0.528	0.577	0.574	1	0.063	0.638	100.0	0.647	0.574
North East Atlantic	12,447,708	0.393	0.603	85.1	0.982	0.874	0.517		0.541	0.518	0.691	0.480	1	0.083	0.626	100.0	0.712	0.494
No-MSFD	6,072,926	0.000	0.606	100.0	0.998	0.777	0.544		0.678	0.549	0.701	0.511	1	0.000	0.591	80.6	0.660	0.522
Barents Sea	1,619,945	0.051	0.648	100.0			0.641		0.772	0.663	0.592	0.704	1	0.017	0.648	100.0	0.592	0.704
Faroes	192,399	0.006	0.565	99.8		0.827	0.477			0.477	0.598	0.531	1	0.017	0.565	100.0	0.598	0.531
Greenland Sea	1,331,774	0.042	0.526	99.9		0.815	0.468			0.449	0.684	0.368	1	0.017	0.526	100.0	0.684	0.368
Iceland Sea	384,436	0.012	0.590	66.5		0.641	0.604		0.325	0.584	0.628	0.552	1	0.017	0.590	65.0	0.628	0.552
Norwegian Sea	2,544,373	0.080	0.627	100.0	0.998	0.755	0.503			0.503	0.799	0.456	1	0.017	0.627	100.0	0.799	0.456
MSFD	6,374,782	0.000	0.793	68.4	0.971	0.889	0.538		0.284	0.533	0.859	0.507	1	0.000	0.783	100.0	0.846	0.510
Greater North Sea	654,330	0.010	0.762	99.1	0.976	0.612	0.550		0.378	0.544	0.829	0.560	1	0.005	0.824	100.0	0.862	0.560
Celtic Seas & Rockall	949,453	0.015	0.774	99.6	0.972	0.829	0.549		0.486	0.554	0.874	0.471	1	0.005	0.855	100.0	0.910	0.471
BoB & Iberian coast	803,349	0.025	0.545	99.8	0.754	0.892	0.540		0.129	0.526	0.587	0.501	1	0.010	0.648	100.0	0.697	0.501
Macaronesia	3,967,649	0.000	0.853	99.2		0.891	0.514			0.514	0.891	0.514	1	0.000	0.806	67.2	0.903	0.514
Azores	795,788	0.025	0.727	100.0		0.939	0.514			0.514	0.939	0.514	1	0.010	0.727	100.0	0.939	0.514
Rest Macaronesia	3,171,862	0.100	0.885	99.9		0.885					0.885		1	0.010	0.885	100.0	0.885	
Mediterranean Sea	2,520,033	0.080	0.513	100.0	0.893	0.944	0.513	0.466	0.315	0.495	0.561	0.383	1	0.050	0.613	100.0	0.682	0.389
Western Mediterranean	844,630	0.000	0.435	100.0	0.639	0.956	0.413	0.420	0.382	0.410	0.486	0.383	1	0.000	0.494	100.0	0.551	0.381
Balearic Sea	468,191	0.015	0.442	100.0	0.530	0.949	0.431	0.374	0.382	0.421	0.508	0.376	1	0.008	0.486	97.9	0.523	0.376
Lions Gulf	62,702	0.002	0.438	100.0		0.967	0.418	0.393	0.393	0.413	0.500	0.376	1	0.017	0.438	100.0	0.500	0.376
Sardinia	313,737	0.010	0.423	100.0	0.698	0.964	0.382	0.454	0.382	0.392	0.451	0.394	1	0.008	0.558	99.6	0.612	0.394
Ionian Sea & Central Med	846,345	0.026	0.414	100.0	0.909	0.921	0.393	0.447	0.380	0.397	0.444	0.383	1	0.025	0.659	100.0	0.751	0.383
Adriatic Sea	98,666	0.002	0.558	100.0	0.786	0.976	0.447	0.466	0.473	0.454	0.638	0.417	1	0.017	0.680	86.3	0.732	0.417
Aegean-Levantine Sea	730,392	0.012	0.464	100.0	0.951	0.943	0.346	0.487	0.200	0.376	0.641	0.382	1	0.017	0.647	100.0	0.843	0.388
Aegean Sea	286,427	0.002	0.701	100.0	0.974	0.917	0.411	0.535	0.388	0.418	0.796	0.417	1	0.004	0.833	100.0	0.892	0.417
Cyprus	443,965	0.006	0.423	100.0	0.883	0.945	0.323	0.300		0.321	0.507	0.319	1	0.006	0.713	100.0	0.792	0.319
Black Sea	473,894	0.015	0.534	100.0	0.689	0.597	0.367			0.367	0.595	0.353	1	0.063	0.572	99.3	0.604	0.353

Integrative GES assessment

Linking pressure and status assessment with the capacity to supply ecosystem services into a unifying holistic framework and nested toolbox



A summary


Within the climate change context, the impacts of multiple stressors on coastal and marine biodiversity, ecosystem functioning and its services (including climate change adaptation and mitigation, resilience and human health) must be assessed and predicted using adaptive ecosystem-based approaches
socio-economical priorities
socio-ecological priorities
Directives and legal framework
• Green Deal
• Maritime Spatial Planning Directive
• Common Fisheries Policy
• Sustainable Development Goals
Programme of measures
Economic activities
Assessment using GES4SEAS framework
To promote the sustainable use of marine goods and ecosystem services, based on balancing ecological, economic, governance and social goals, and to ultimately achieve environmental targets and productive, clean and healthy oceans
Thresholds and Tipping points
Directives and legal framework
Marine Strategy Framework Directive • Biodiversity Strategy 2030 • Habitats and Birds Directive • Water Framework Directive • Aichi targets •
Programme of Measures
Conservation & Marine Protected Areas
Management Actions
Management Actions
(incl. invasive spp, HABs, jellyfish)
SUSTAINABLE BLUE ECONOMY
GOOD ENVIRONMENTAL STATUS
Change of state, Impact and Human welfare
Cumulative Pressures
Human Activities
CLIMATE CHANGE
BIODIVERSITY

A summary: Grand Challenges (to be addressed):

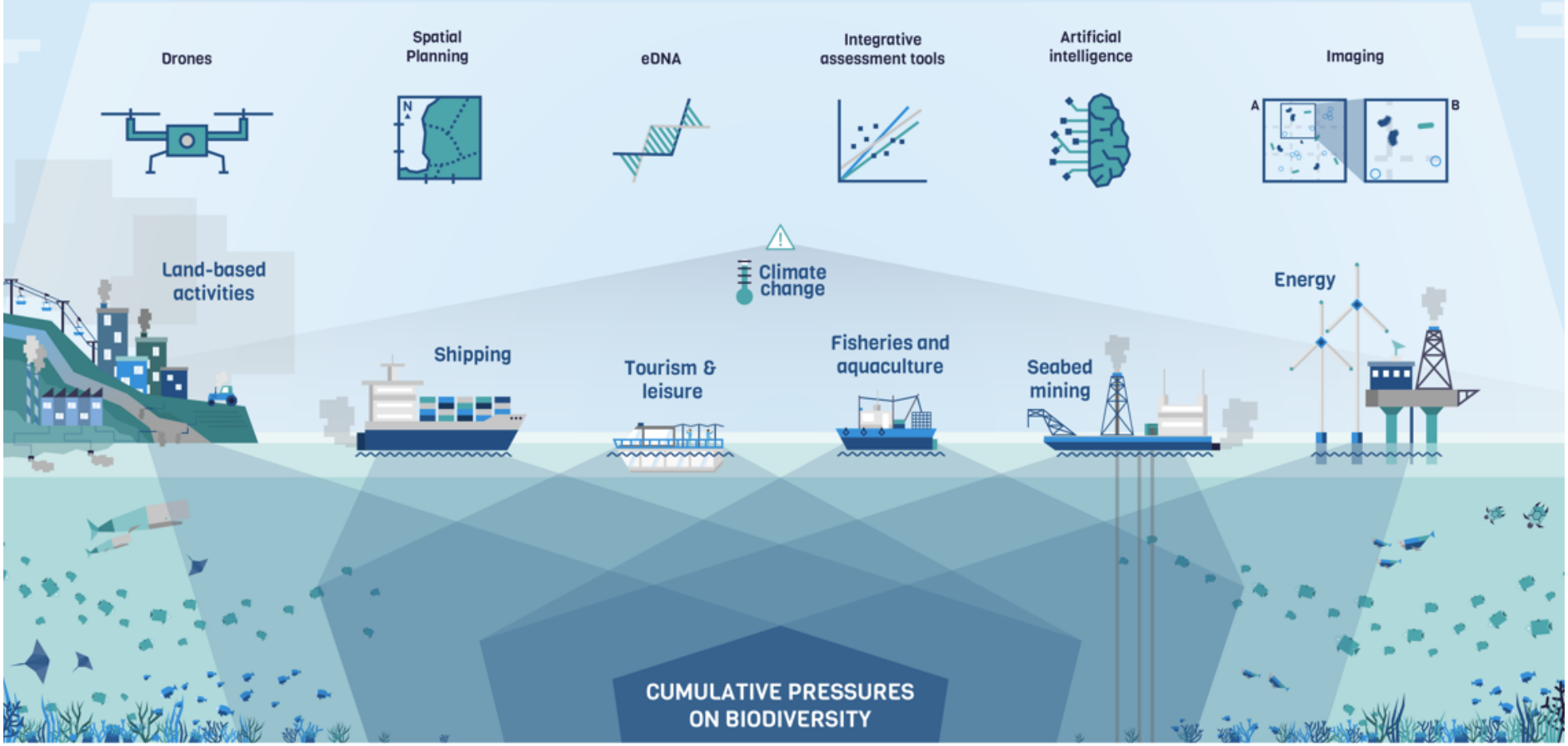
- Ensure competent authorities are the same for MSFD and MSPD or ensure good coordination if they are different
- Ensure Ecosystem Based MSP
- Ensure within and between Member States transborder coordination
- Resolve jurisdiction areas (e.g. Directive limits)
- Implementation using Regional Seas Conventions and harmonise assessments
- Encompassing national to global frameworks (e.g. SDGs)
- Determine if each activity affects each descriptor in different ways and has different spatial and temporal footprints
- Determine cumulative and in-combination pressures and impacts
- Determine how much assimilative capacity can you use (amount of activity allowed) before breaching GES
- Reframe (and rename) Blue Growth under Sustainable Blue Economy principles and Sustainable Development Goals
- Determine whether Blue Economy or GES-achievement takes precedence
- Investment in conservation as precondition for Blue Economy

A positive final message

- Is it possible to reconcile the objectives of the Marine Strategy Framework Directive and the Marine Spatial Planning Directive?
- Yes, if:
  - Monitoring is adequately designed, coordinated within the same eco-region and using adequate resources
  - Conservation is full part of Blue Economy debate
  - Any activity at sea is subjected to adequate evaluation of pressures and impacts produced, together with an investigation of its interaction with other activities
  - These activities are planned taking into account the assimilative capacity of the system, not focusing on growth but on sustainability and well-being
  - Adequate quantitative targets are set for indicators of good environmental status, and methods are harmonized across geographies
  - Integrative assessments are undertaken regularly, based upon the best knowledge available (e.g. NEAT)
  - Socio-ecological marine ecosystems are consider in a holistic way, including humans as part of the system,
  - GES is the ultimate measure of Blue Economy's success

Innovative and practical tools for monitoring and assessing multiple human pressures in marine systems

Summer school, 5th to 7th June 2023, San Sebastián (Spain)



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Ocean health and resilience, and provision of ecosystem services

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