How to optimize measurement and monitoring the environmental system:

need of public authorities for specific derived data products

Gert Verreet – 25 February 2010

EMODNET Biological data products workshop

Exciting times…

SCIENTIFIC ADVISORS HAVE CONVINCED POLICY MAKERS TO ADOPT THE ECOSYSTEM[-BASED] APPROACH ….

THE GENERALS ARE LEADING …

"*Marine Strategies shall apply an ecosystem-based approach to the management of human activities:*

- *ensuring that the collective pressure of such activities is kept within levels compatible with the achievement of good environmental status*
- *and that the capacity of marine ecosystems to respond to human-induced changes is not compromised,*
- *while enabling the sustainable use of marine goods and services by present and future generations."*

… ARE THE TROOPS FOLLOWING?

Figure 3. Food web illustration depicting the links among Baltic Sea communities (Hermann Backer).

We start to look at "systems" !

To provide the greater specificity for the purposes of the European Marine Strategy the Ecosystem Approach could be described as '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.' This description clearly places humans as part of natural ecosystems, and stresses that human activities in these ecosystems must be managed so that they do not compromise ecosystem components that contribute to the structural and functional integrity of the ecosystem.

An overall challenge is to put the ‘analytical’ (monitoring) data back into a meaningful ‘synthetic’ framework.

- Too often, the unstated hypothesis used is:

  component ≈ system

- whereas it would be better to have:

  Model f($component_{i-n}$) ≈ system

Two separate questions in title

- Data product needs
  - existing
  - evolving & emerging

- How to optimise measurement/monitoring
  - monitoring > assessment > monitoring
  - articulating policy needs to scientists through the science/policy interface

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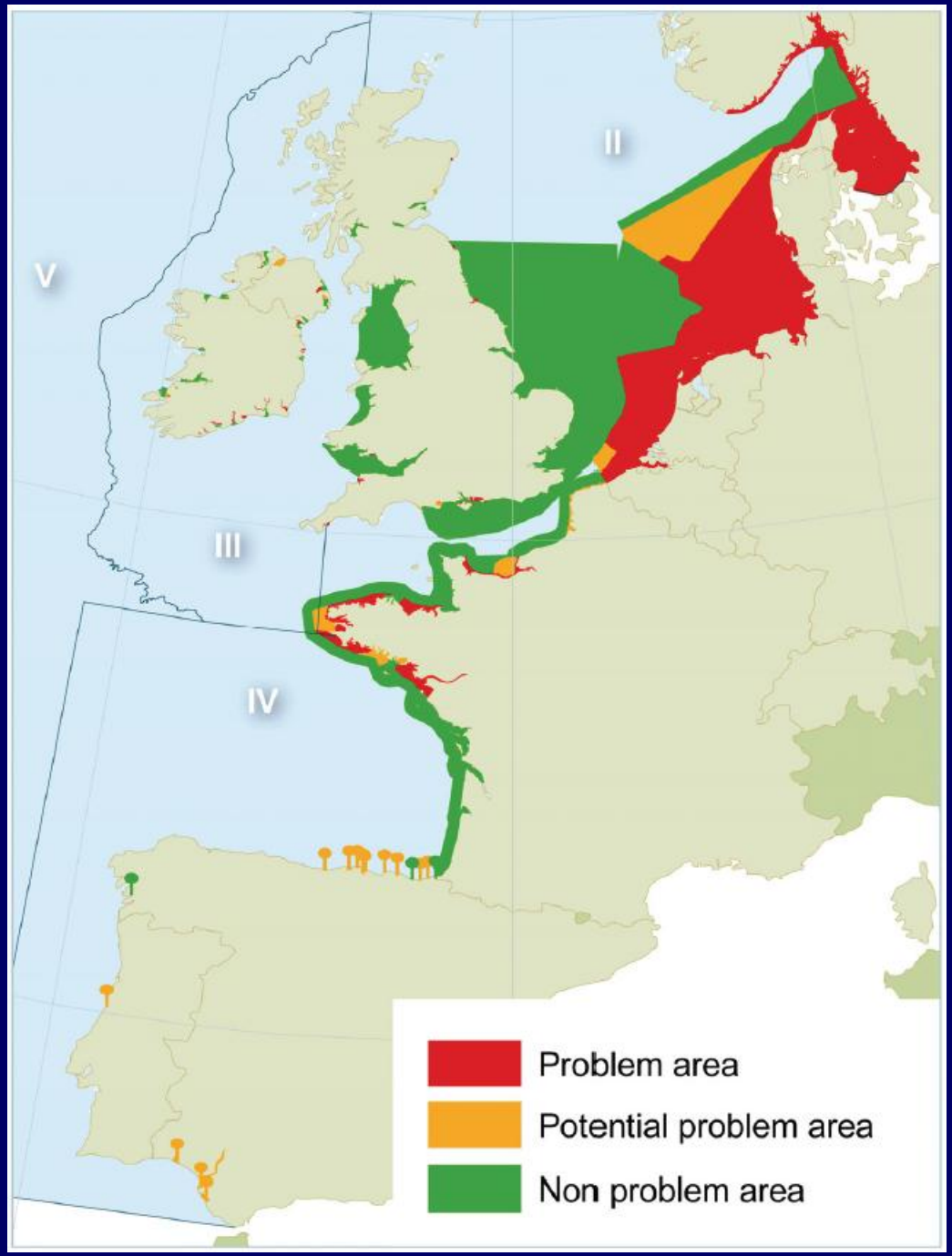
Traditional monitoring & assessment

- Countries monitor & generate data
  - data QA, assessment tools…
  - assessment process
  - example: OSPAR & HELCOM eutrophication

Table 3.2 Agreed harmonised assessment parameters (shaded) and additional voluntary parameters (*) applied and reported by Contracting Parties in the second application of the Comprehensive.

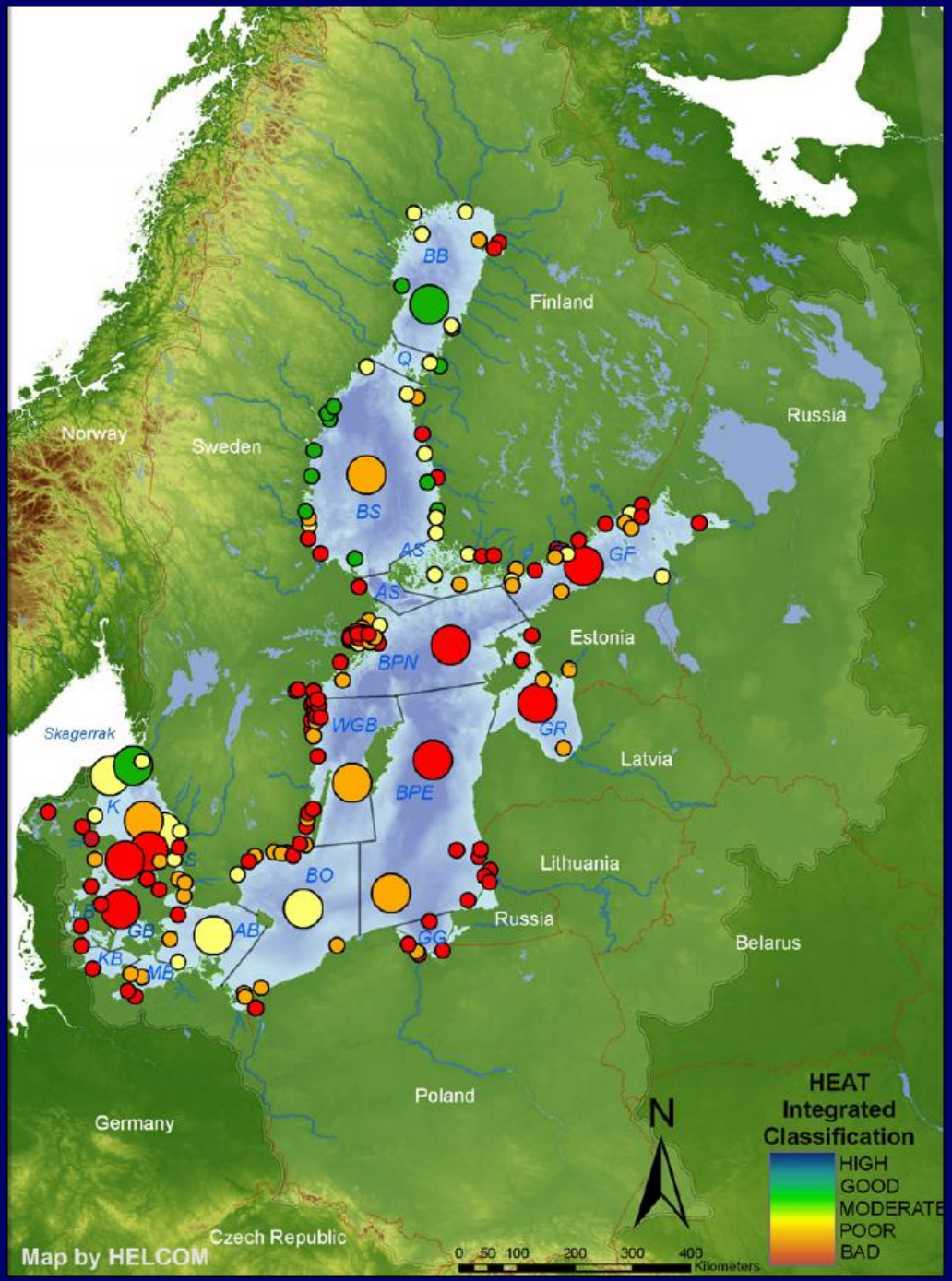
In the electronic version of this report, national explanatory notes on the inclusion ✓ or non-inclusion (?) of parameters can be obtained by mousing over any cell showing (in the electronic version only) a tick-off or question mark.

Category	Parameter	BE	DE	DK	ES	FR	IE	NO	NL	PT	SE	UK[4]
Cat. I	**Riverine inputs and direct discharges**	+	+	+	✓	+	-	+	+	+	+	+
	Winter DIN and DIP concentrations	+	+	+	+	?	✓	+	+	+	+[3]	+
	N/P ratio	+	+	?	+	?	+	✓	+	✓	✓	+
	*Total nitrogen, total phosphorus	-	+	+	-	-	-	+	+	-	+	-
	*Transboundary nutrient transport	+	+	+	-	-	-	+	+	-	+	+
	*Atmospheric nitrogen deposition	-	+	-	-	-	-	-	+	-	+	-
	*Silicate (and Si ratios)	-	+	-	-	-	-	+[2]	-	-	+	-
Cat. II	**Chlorophyll *a***	+	+	+	+	+	+	+	+	✓	+	+
	Phytoplankton indicator species	✓	+	+	?	+	+	+	+	?	+	✓[5]
	Macrophytes including macroalgae	?	+	+	?	+	+	✓	-	+	?	+
Cat. III	**Oxygen deficiency and lowered % saturation**	+	+	+	+	+	+	+	+	+	+	+
	Kills in fish and zoobenthos	✓	+	-	-	?	+	+	✓	+	+	+
	Long-term changes in zoobenthos biomass and species composition[1]	✓	+	+	?	?	?	✓	?	+	+	+
	Organic carbon	?	+	?	?	?	?	✓	+	+	+	?
	*Secchi depth	-	+	-	-	-	-	+	-	-	+	-
Cat. IV	**Algal toxins**	?	+	?	?	+	+	+	+	+	+	✓



OSPAR 2008 eutrophication assessment

- national assessments of nationally held data (no ICES role)
- not fully coherent result
- varying degree of biological datasets used by countries



HELCOM 2009 eutrophication assessment

- common assessment of nationally held data with common assessment tool
- methodology mix of OSPAR system + WFD
- varying degree of biological datasets used by countries
- more robust basin-wide outcome

“Rapid” autonomous developments & new levels of sophistication in assessment ambitions

Conventions are continuing the development of their assessment methodologies:

- OSPAR: pressures / status elements / impact levels ; MPA needs …
  → overall biodiversity monitoring and assessment strategy and workplan
- HELCOM: overall biodiversity assessment resulted in call to improve the underlying set of biodiversity indicators

OSPAR habitats & species developments

- List of species lacks mechanism for data collation (distribution and trends?)
- Habitats: a data collation programme exists
- OSPAR seems to want to trial, in its contribution to Member States' MSFD Art. 8 "initial assessment", an application of the "good environmental status" descriptors (MSFD Art. 9)

GES assessments (e.g. Descriptor 1 'biodiversity' guidance) there will be a need for:

- Data flows from national institutes and industry (EIA data and ongoing regulatory monitoring) in standard formats into national and then European portals to make best use of available data.
- Ability to process data will in multiple ways to support ongoing assessments – there are probably a number of standardised ways to do this and hopefully these will be considered at the workshop. Suspect a lot of these can be developed for ready web access/download.
- Historical data – these provide vital information on previous conditions (distribution and abundance of species/communities, composition of communities before they were impacted and maybe lost their sensitive fragile species). Whilst we wouldn't expect GES to mean getting back to historical conditions, they do provide valuable information on which to base targets for the future and means of comparison with areas that may currently be impacted.
- Linking biodiversity data to pressures – may be beyond scope of EMODNET, but for datasets that are made available, it is valuable to know where the sites are subject to particular pressures (e.g. organic enrichment, physical disturbance, etc) and associated environmental data – otherwise 'interpretation' of the data can be difficult.

Table 11.4. A
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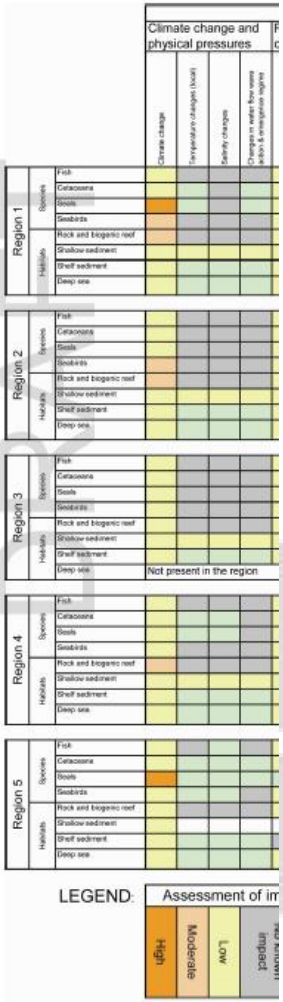
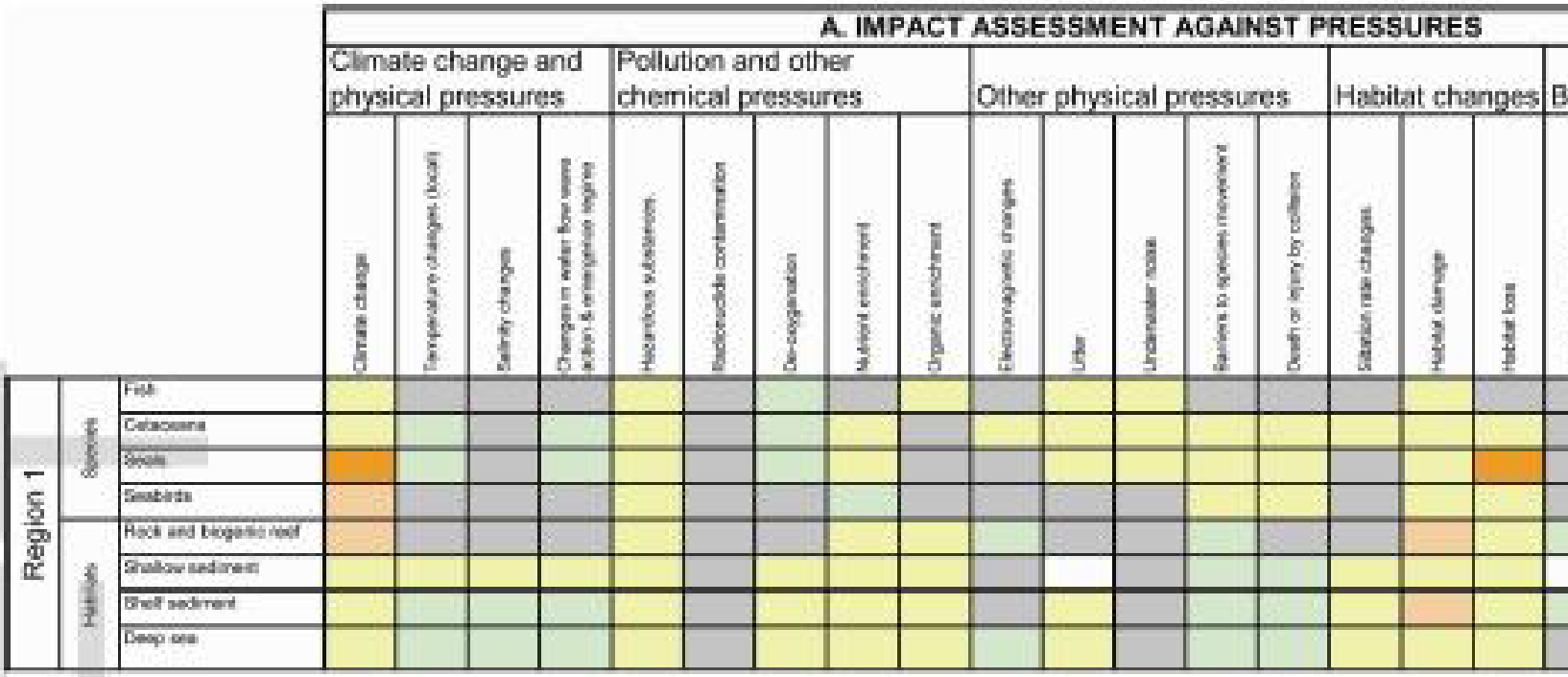
methodologies

of the degree of impact by each pressure, leading to a total impa
the individual impacts (A). An overall status assessment for the c
on the criteria in Table 11.3 and taking into account the assessm
the confidence level indicated. Limitations in the method used me
treated with caution. Status assessments with low confidence are
upon the expert knowledge available at the Utrecht workshop and
methodologies, may not exactly replicate the conclusions of the t





- To develop an **improved and comprehensive set of indicators** building on the current EcoQOs to enable assessment against OSPAR's objectives of a clean, healthy, biologically diverse and productive sea. **These indicators should cover the main ecosystem components**, the range of relevant pressures and should be suitable for assessing ecosystem functioning and cumulative effects.
- To **identify information needs** to enable a move from expert judgement to a more evidence-based assessment. Improvements in the accessibility of all marine data will support this.
- To extend the development of ecosystem assessment methodologies which bring together and build upon OSPAR's existing approaches for thematic assessments. This should include **a consideration of appropriate ecosystem components and their interactions as part of ecosystem functioning**. There is a need for assessment criteria (especially for species) that take into account regional differences and for agreement on the most appropriate geographic divisions. **Aggregation and integration techniques need to be developed**.

(OSPAR draft Quality Status Report 2010)

Table 4. Assessment results of the national case studies expressed as quality classes. The overall status is based on the use of the 'one out, all out'-principle, i.e., the worst performing category except for the Supporting features (SF) category. Key: ML = marine landscapes, CO = communities, SP = species, and SF = 'supporting features', F = Fish, Z = Zoobenthos, M = Macrophytes, P = Phytoplankton, Zp = Zooplankton, B = Birds, S = Seals, E = Endangered species, C = water Clarity, T = water Temperature, N = Nutrients, O = Oxygen, Sa = Salinity.

Case study areas	Indicator topics covered within category (see separate background document for details)				Category Status				Over-all
	ML	CO	SP	SF	ML	CO	SP	SF	
1. Kvädöfjärden	-	F(4)	F(2)	C(1), T(1)	-	High	High	Mod.	High
2. Askö-Landsort	-	Z(1), M(1), P(2)	-	C(1), N(6)	-	Good	-	Bad	Good
3. Forsmark (inner)	-	F(4)	F(2)	T(1), C(1)	-	High	High	High	High
4. Holmöarna	-	F(4)	F(2)	T(1), C(1)	-	High	Good	High	Good
5. Archipelago Sea	1	B(1), Z(2), P(2)	-	C(2)	Bad	Mod.	-	Mod.	Bad
6. Finbo	-	F(3)	F(3)	T(1),C(1), Sa(1)	-	Mod.	High	High	Mod.
7. Easten Gulf of Finland	-	Z(2), F(1)	S(1), E(2)	-	-	Bad	Bad	-	Bad
8. Neva Bay (inner)	2	Z(2), F(1)	-	-	Mod.	Bad	-	-	Bad
9. Gulf of Riga, N	1	M(2), Z(1), F(1), P(1)	F(6)	C(1), N(2)	High	Good	Poor	Bad	Poor
10. Pärnu Bay	-	M(2), Zp(3), P(1)	F(4)	C(1)	-	Mod.	Poor	Poor	Poor
11. Gulf of Riga, S	-	P (2), Z(2)	-	C(1), O(1)	-	Good	-	Mod.	Good
12. Curonian lagoon	-	M(2), Z(2), P(2)	-	N(4)	-	Bad	-	Bad	Bad
13. Puck Bay	5	M(3), F(1)	F(2)	-	Poor	Bad	Bad	-	Bad
14. Fehmarn Belt	2	M(6), Z(1), P(1)	-	N(2)	Bad	Poor	-	Bad	Bad
15. Neustadt Bay	2	M(6), Z(1), P(1)	-	N(2)	Bad	Bad	-	Poor	Bad
16. Bülk	2	M(6), Z(1), P(1)	-	N(2)	Good	Bad	-	Mod.	Bad
17. Gelting Bight	2	M(6), Z(1), P(1)	-	N(2)	Bad	Bad	-	Mod.	Bad
18. Odense Fjord	2	M(2), P(3)	-	N(7)	Poor	Bad	-	Bad	Bad
19. Limfjorden	-	Z(12), M(4)	-	C(2), N(2)	-	Bad	-	Mod.	Bad
20. Randers Fjord	-	M(2),Z(3), P(2)	-	N(4)	-	Bad	-	Poor	Bad
21. Ise-Roskilde fj.	-	M(2), Z(2)	-	N(1)	-	Bad	-	Bad	Bad
22. The Sound	1	Z(1), M(1), P(2)		C(1)	Poor	Mod.		Good	Poor

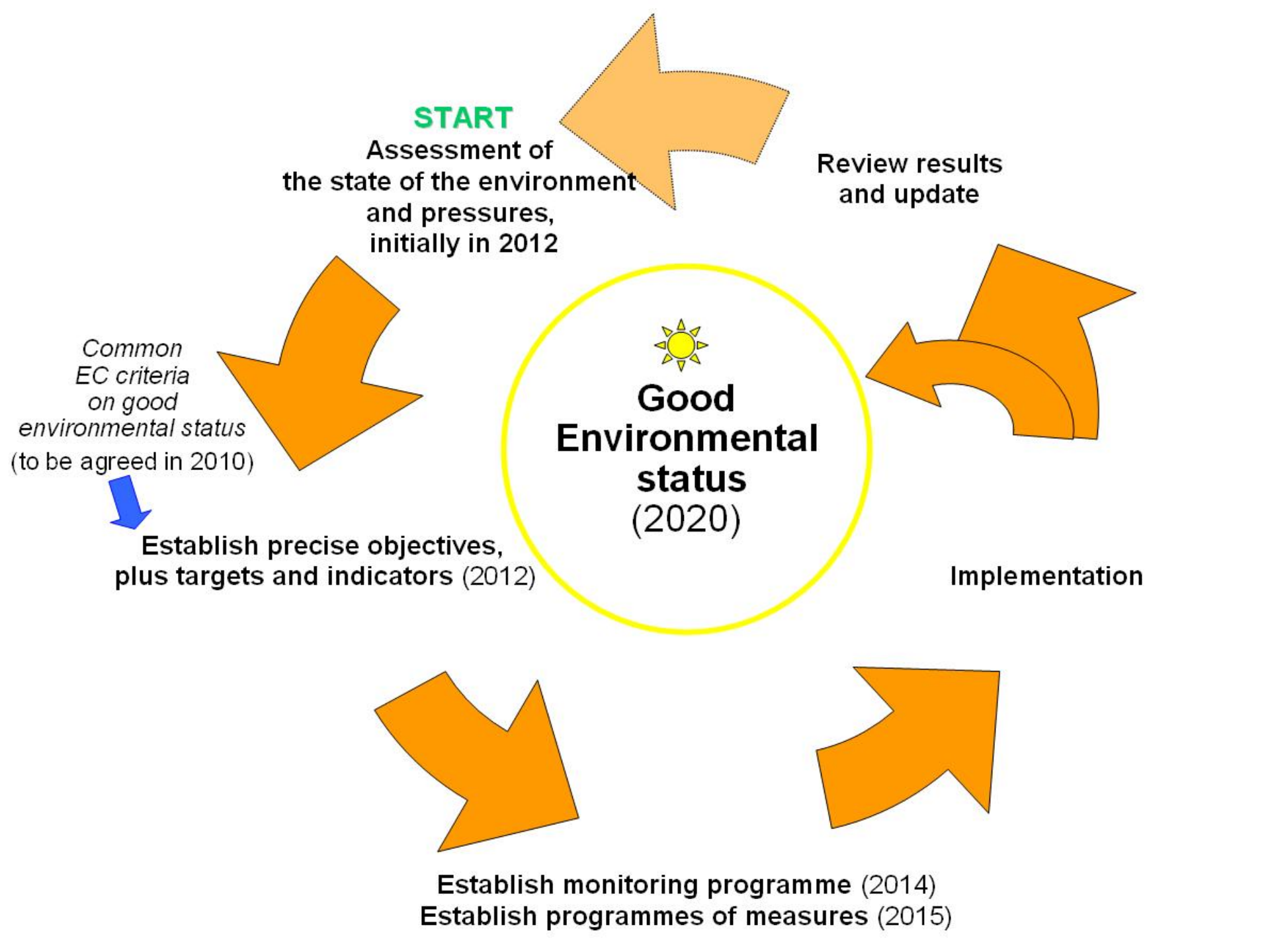
"When a core set of biodiversity indicators has been established for the Baltic Sea, the revision of monitoring programmes needs to be considered with the specific aim of collecting data that are needed for assessing the conservation status of Baltic biodiversity. Currently, due to lack of data, it is not possible to assess several of the targets set forth in the Baltic Sea Action Plan."

HELCOM (2009a). Integrated thematic assessment on biodiversity and nature conservation in the Baltic Sea. Baltic Sea Environment Proceedings 116B, Helsinki Commission, 188 pp

Main objective of the Marine Strategy Framework Directive

This Directive establishes a framework within which:

- Member States shall take **the necessary measures** to achieve or maintain
- **good environmental status** in the marine environment
- by the year **2020** at the latest.

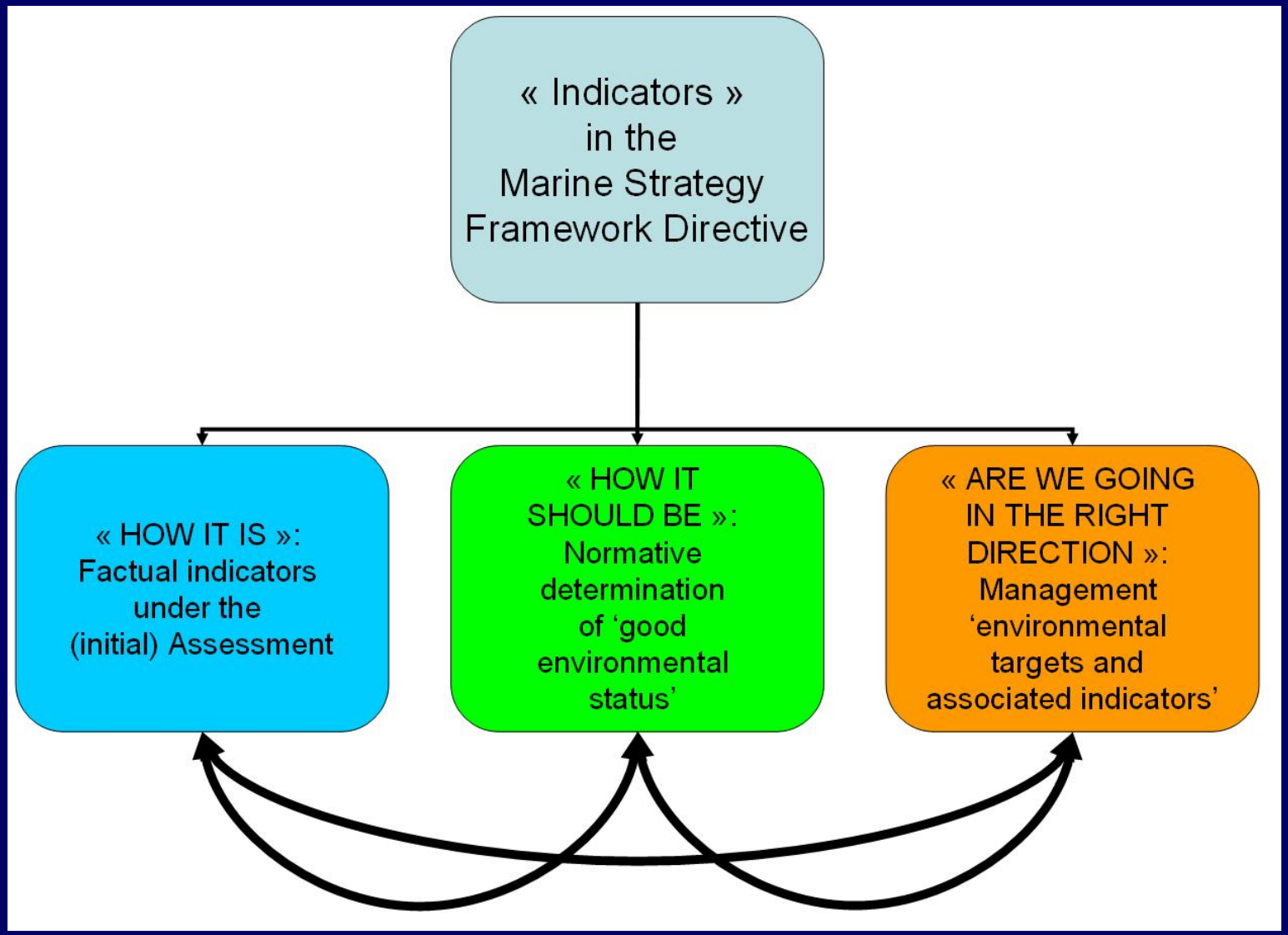

START
Assessment of the state of the environment and pressures, initially in 2012
Review results and update
Common EC criteria on good environmental status (to be agreed in 2010)
Good Environmental status (2020)
Establish precise objectives, plus targets and indicators (2012)
Implementation
Establish monitoring programme (2014)
Establish programmes of measures (2015)

How it should be: ongoing work on descriptors of GES

Scientific and technical basis (work by JRC, ICES, …) being converted into criteria and methodological standards for the Good Environmental Status (GES) descriptors:

1 – biodiversity
2 – non-indigenous species
3 – fish populations
4 – food web
5 – eutrophication
6 – sea-floor integrity
[7 – hydrographical conditions]
8 – contaminants (vs. effects)
9 – contaminants (vs. food standards)
10 – Litter
11 – energy (noise)

Art. 8, 9, 10 MSFD

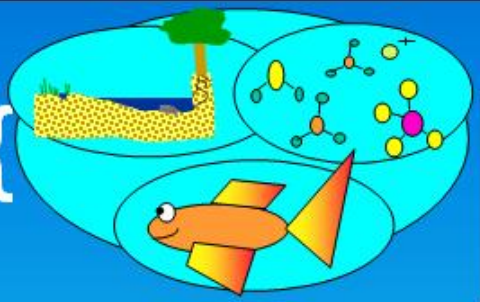


MSFD signals versus DPSIR

BIOLOGY

Art.	D	P	S	I	R
8 – Initial assessment	Descriptive	Descriptive	Descriptive	Descriptive	Descriptive
9 – Good Environmental Status	-	"Take into account"	**Normative**	"Take into account"	-
10 – Environmental targets and associated indicators	Established so as to … 'guide progress towards achieving good environmental status". This could mean a well-chosen selection spread over the whole DPSIR range.				

Ecological objectives



No or minimal

Slight

Moderate

Major

Severe

Ecological status

HIGH

GOOD

MODERATE

POOR

BAD

GOOD

NOT GOOD

Jorge RODRIGUEZ ROMERO

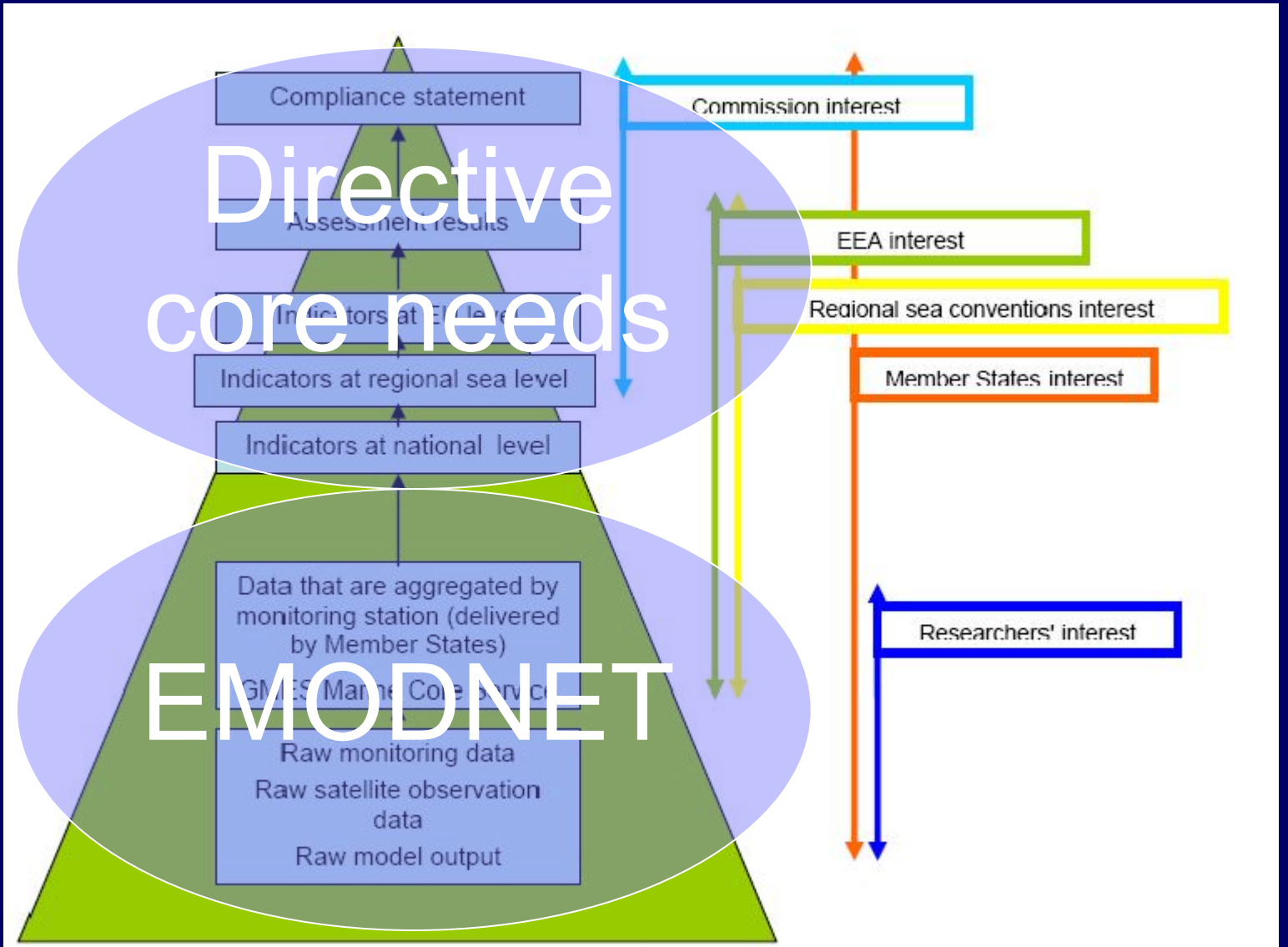
Courtesy Peter Pollard

Intercalibration results

Results achieved	Results partially achieved	No results

GIG ↓ BQE	Macroinvertebrates	Phytoplankton	Phytobenthos	Macrophytes	Macroalgae	Angiosperm	Fish
Rivers Alpine (6 countries)		Not applicable	IT missing		Not applicable	Not applicable	
Rivers Central Baltic (16 countries)	CZ, LT, EE missing		CZ, LT, DK, IT missing				
Rivers Eastern Cont. (5 countries)	RO, HU, CZ missing						
Rivers Mediterranean (6 countries)			CY, IT, EL missing				
Rivers Northern (5 countries)			NO missing				
Lakes Alpine (5 countries)				FR, IT, SI missing			
Lakes Atlantic (2 countries)							
Lakes Central Baltic (12 countries)				DK, FR, HU, LT, PL, IE missing			
Lakes Mediterranean (7 countries)							
Lakes Northern (5 countries)							
Coastal NE Atlantic (11 countries)			Not applicable	Not applicable			
Coastal Mediterranean (7 countries)	IT, FR, MT missing				IT, MT missing	SI, CY missing	
Coastal Baltic Sea (8 countries)	EE, LT, LV, PL missing						
Coastal Black Sea (2 countries)							

Simplified data-to-info pyramid



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  - existing
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- How to optimise measurement/monitoring
  - monitoring > assessment > monitoring
  - articulating policy needs to scientists through the science/policy interface

Assessments in policy context

OSPAR:

→ 1998 thematic strategies (eutrophication, biodiversity, radioactivity, hazardous substances, offshore)

→ Joint Assessment and Monitoring Programme (JAMP)

- continuous monitoring & data reporting activities
- Regular thematic assessments
- Development of new tools

leading up to Quality Status Report (1993, 2000, 2010)

→ Ministerial meetings reviewing & setting directions (1998, 2003, 2010, …)

Assessments in policy context

OSPAR:

→ QSR 2010 process leading to JAMP review

→ review in steps to get in sync with MSFD (2010, then 2013)

→ stronger emphasis on biodiversity monitoring and assessment (subgroup ICG COBAM)

Assessments in policy context

EC marine & maritime research strategy:

→ includes work on science-policy interface

→ expected to boost evidence based marine environmental policy in EU

EUROPEAN COMMISSION

Thank you… for your attention!