Musing on the concept of Good Environmental Status:
the complexity of the status & the status of complexity

Online, 2 - 4 December 2020

Welcome by JPI Oceans lead countries of the S4GES Joint Action

[Koen Lefever. BELSPO, Belgium]

11 participating countries **29** members in Group of Experts

Policy target

- Marine Strategy Framework Directive

Implementation elements

- Knowledge sharing expert workshops (transdisciplinary "Knowledge Hub")
- Joint integrated monitoring ("Infrastructure Sharing")
- Augmented observatories ("Joint Public Procurement")

Timeline Joint Action S4GES

20 member countries, represented by
funding agencies and ministries

EU and national policies

+ association with CAN, US, NZ
+ intl. participation in joint calls

Increasing value and impact by ...

... aligning national R&I priorities
... aligning resources
... implementing joint priorities.

... informing decision making
... helping countries meet their policy obligations.

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THANK YOU

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The JPI Oceans Action S4GES and scope of the workshop

[Patrick Roose, RBINS, Belgium]

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Why now?

The JPI Oceans Action S4GES and scope of the workshop

[Patrick Roose, RBINS, Belgium]

S4GES IS A TIMELY ACTION FOLLOWING THE RECENT COMMISSION STAFF WORKING DOCUMENT

'Background document for the Marine Strategy Framework Directive on the determination of good environmental status and its links to assessments and the setting of environmental targets'

Brussels, 25.6.2020 SWD(2020) 62 final

…The Commission's assessment of the first implementation stage (Article 12 report, COM(2014)97) found a considerable divergence in approaches amongst Member States, particularly regarding the determination of GES, the use of Decision 2010/477/EU and the relationship between the determination of GES under Article 9 and the setting of environmental targets under Article 10. ..

…Good Environmental Status (GES) is the core concept to be achieved by Member States in implementing the MSFD. All operational provisions of the Directive are in one way or another linked to GES. Successful implementation depends on having sufficient clarity in the determination of GES to enable adequate decision-making in implementation of the Directive…

The determination of GES is progressively refined from its overall definition in MSFD Article 3(5), through the descriptors of MSFD Annex I, elements in MSFD Annex III and criteria of the GES Decision to the region- and subregion- specific determinations of Article 9(1).

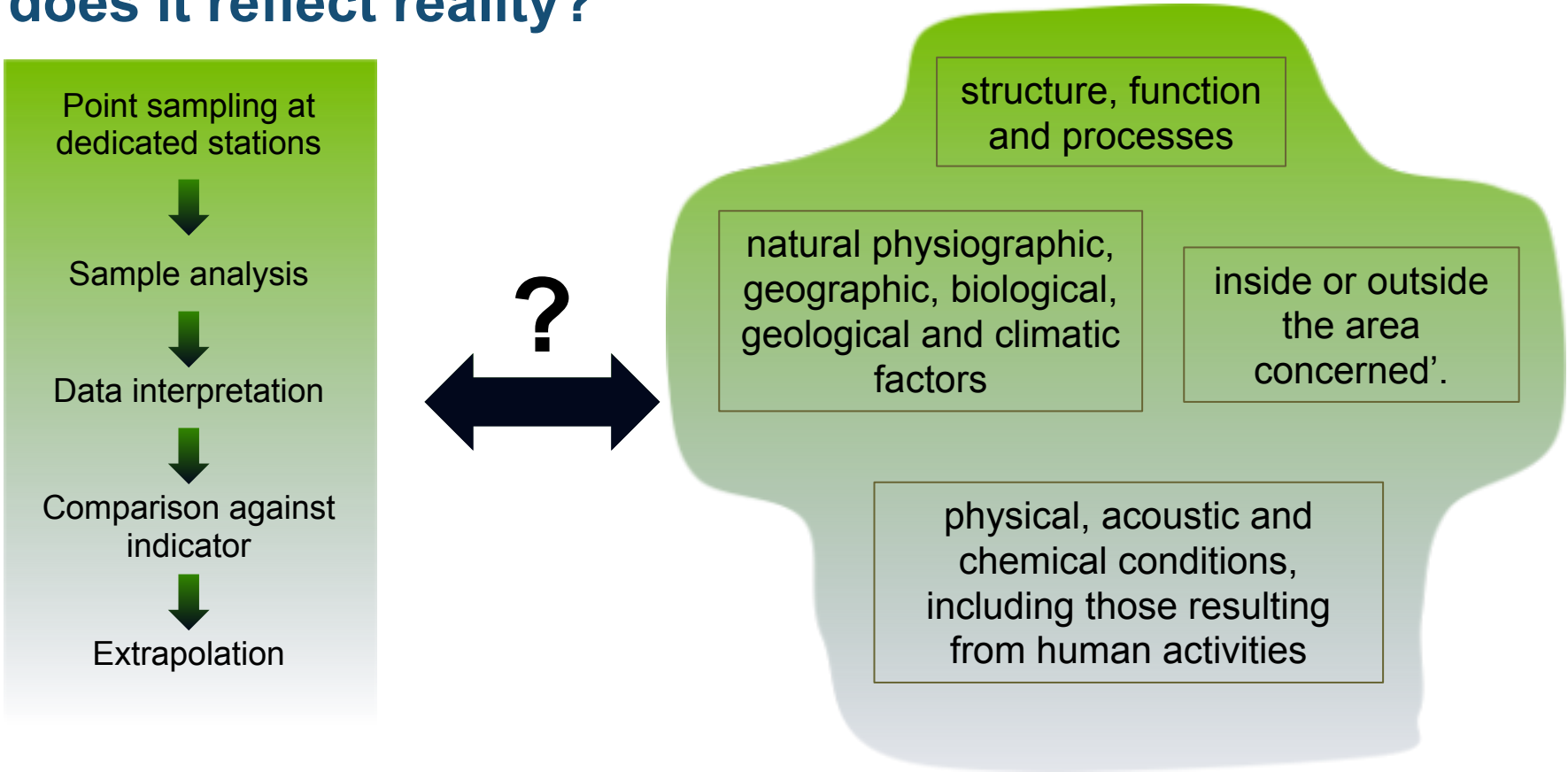
The definition of environmental status in Article 3(4) provides a high-level perspective on what needs to be taken into account when assessing the 'state' of the environment:

- 'the structure, function and processes of the constituent marine ecosystems together with natural physiographic, geographic, biological, geological and climatic factors, as well as physical, acoustic and chemical conditions, including those resulting from human activities inside or outside the area concerned'.

The definition of good environmental status (GES) in Article 3(5) further elaborates on this by defining the high-level goal of the Directive:

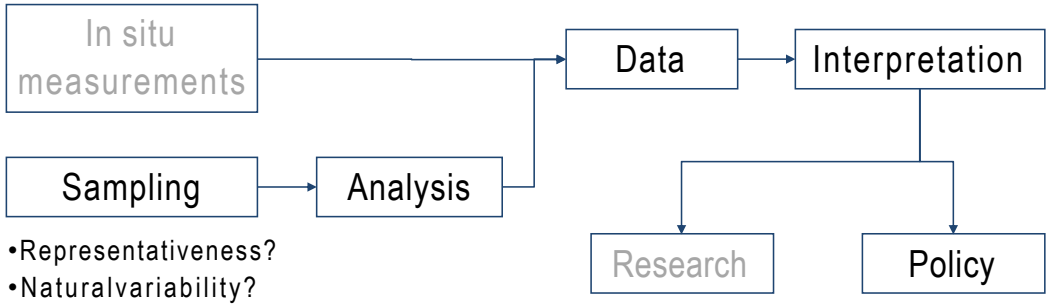
- 'good environmental status' means the environmental status of marine waters where these provide ecologically diverse and dynamic oceans and seas which are clean, healthy and productive within their intrinsic conditions, and the use of the marine environment is at a level that is sustainable, thus safeguarding the potential uses and activities by current and future generations, i.e.:
- the structure, functions and processes of the constituent marine ecosystems, together with the associated physiographic, geographic, geological and climatic factors, allow those ecosystems to function fully and to maintain their resilience to human-induced environmental change. Marine species and habitats are protected, human-induced decline in biodiversity is prevented and diverse biological components function in balance;
- hydro-morphological, physical and chemical properties of the ecosystems, including those properties which result from human activities in the area concerned, support the ecosystems as described above. Anthropogenic inputs of substances and energy, including noise, into the marine environment do not cause pollution effects.'

MSFD in current practice: does it reflect reality?

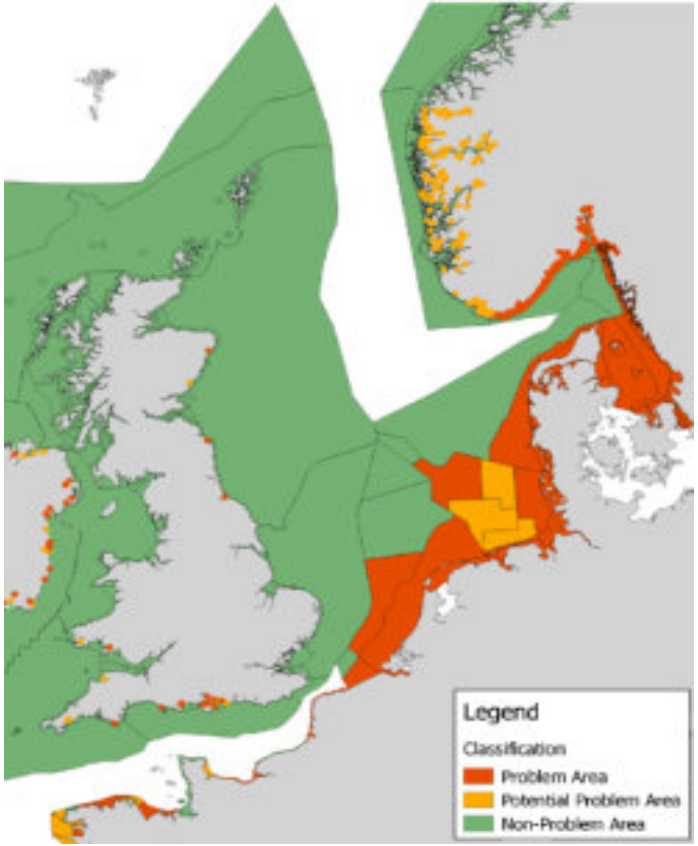


An example: chlorophyl a as a proxy for primary production

In situ observations with research vessels, limited in space and time



- Representativeness?
- Naturalvariability?
- Extrapolationtolargearea
- Expensive&timeconsuming



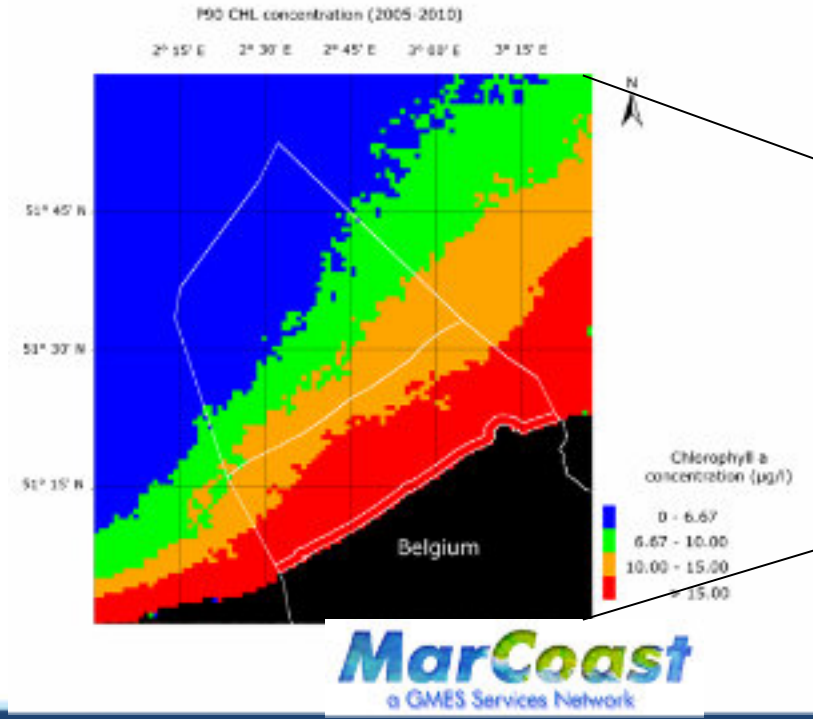
An example: chlorophyl a as a proxy for primary production

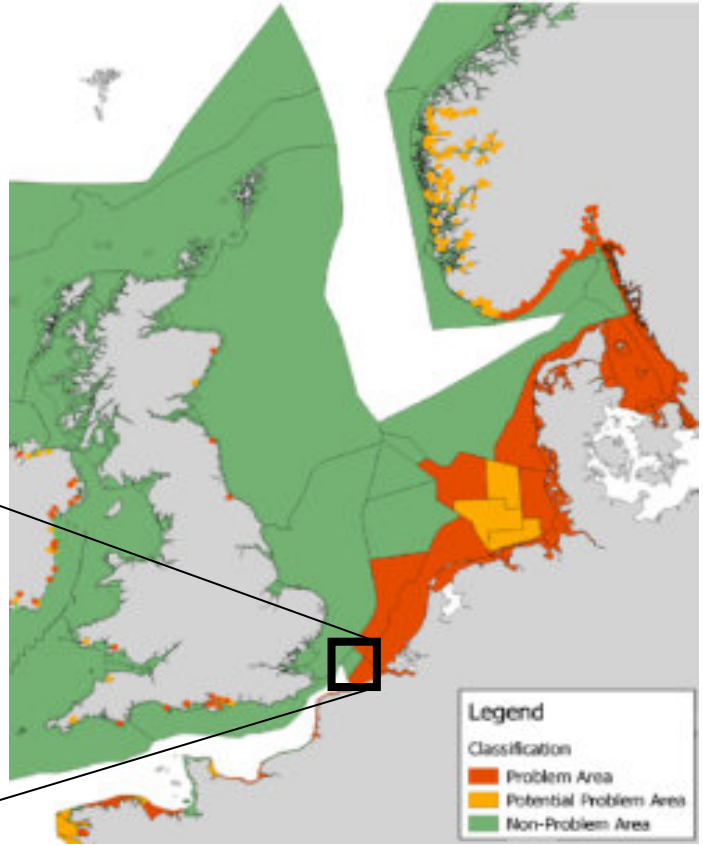
Satellite-based eutrophication assessment for the same OSPAR convention zone

CHLa 90 percentile (MERIS,2005)

Belgian CHLa 90% Mar-Oct 2005-2010, Water Framework Directive product

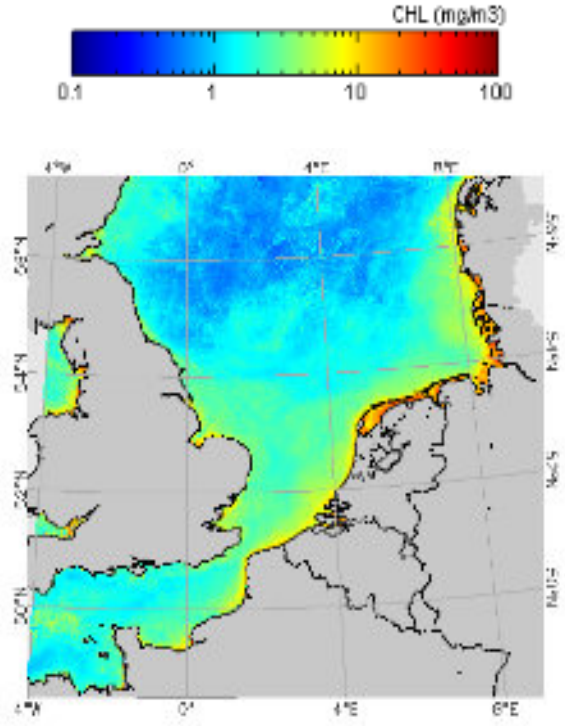
[Image: D. Vanderzande]



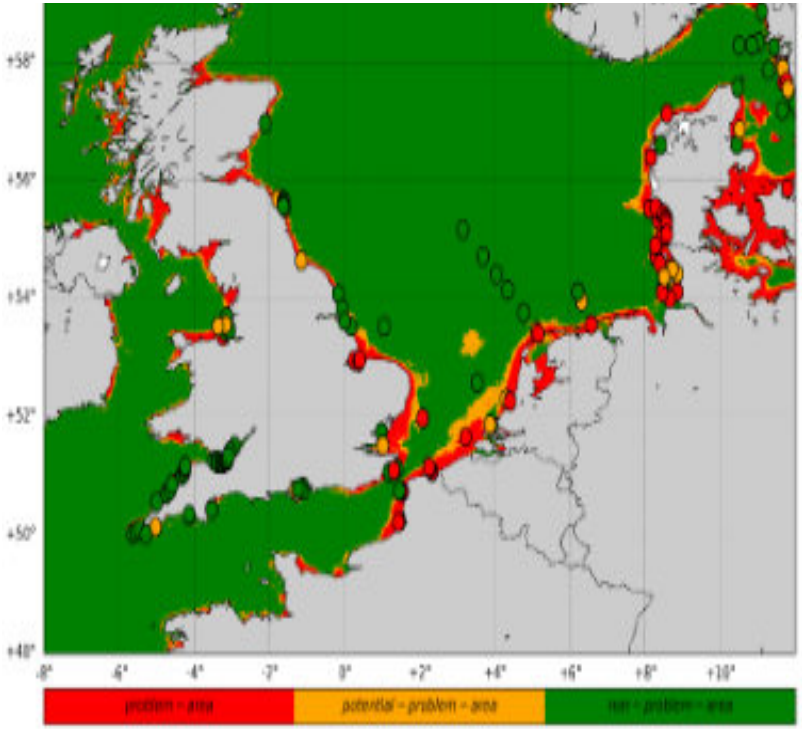


What we need!

CHLa (MERIS,2003)

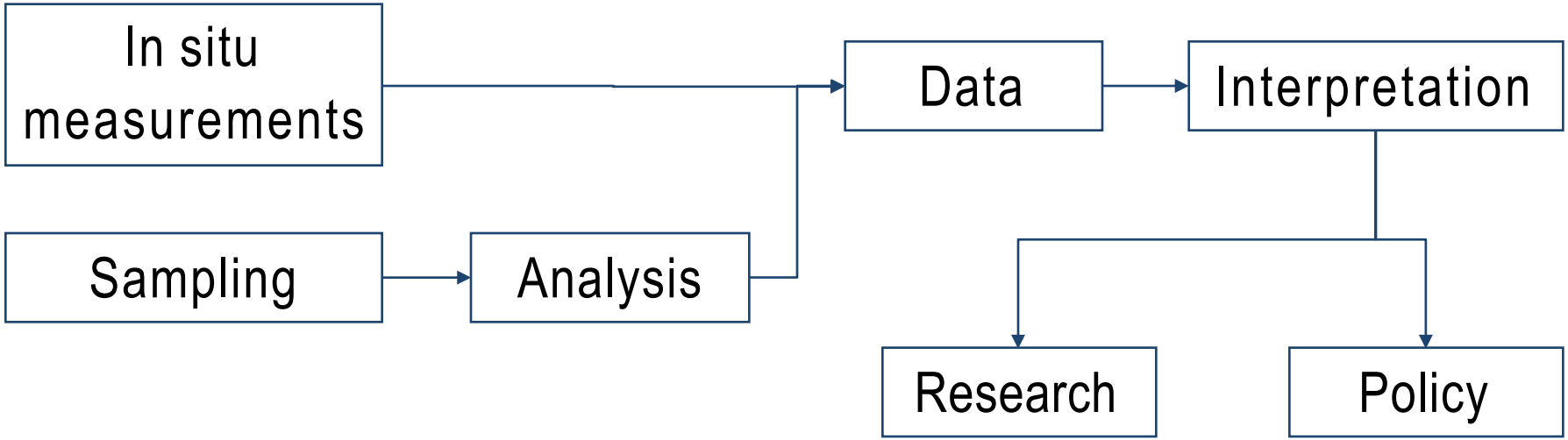


EC Water quality (eutrophication) report based on RBINS-processed satellite data (~300 images over 6 years)



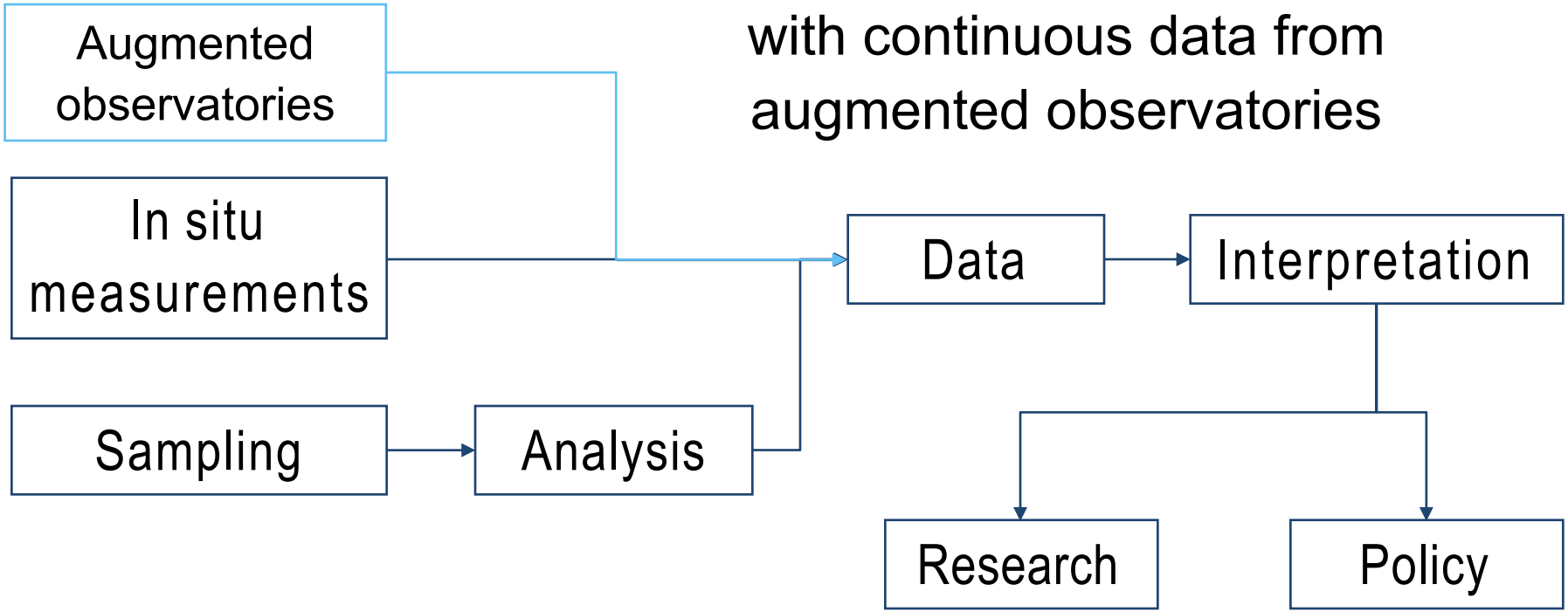
What we need: a more holistic approach

From in situ observations with research vessels, limited in space and time



What we need: a more holistic approach

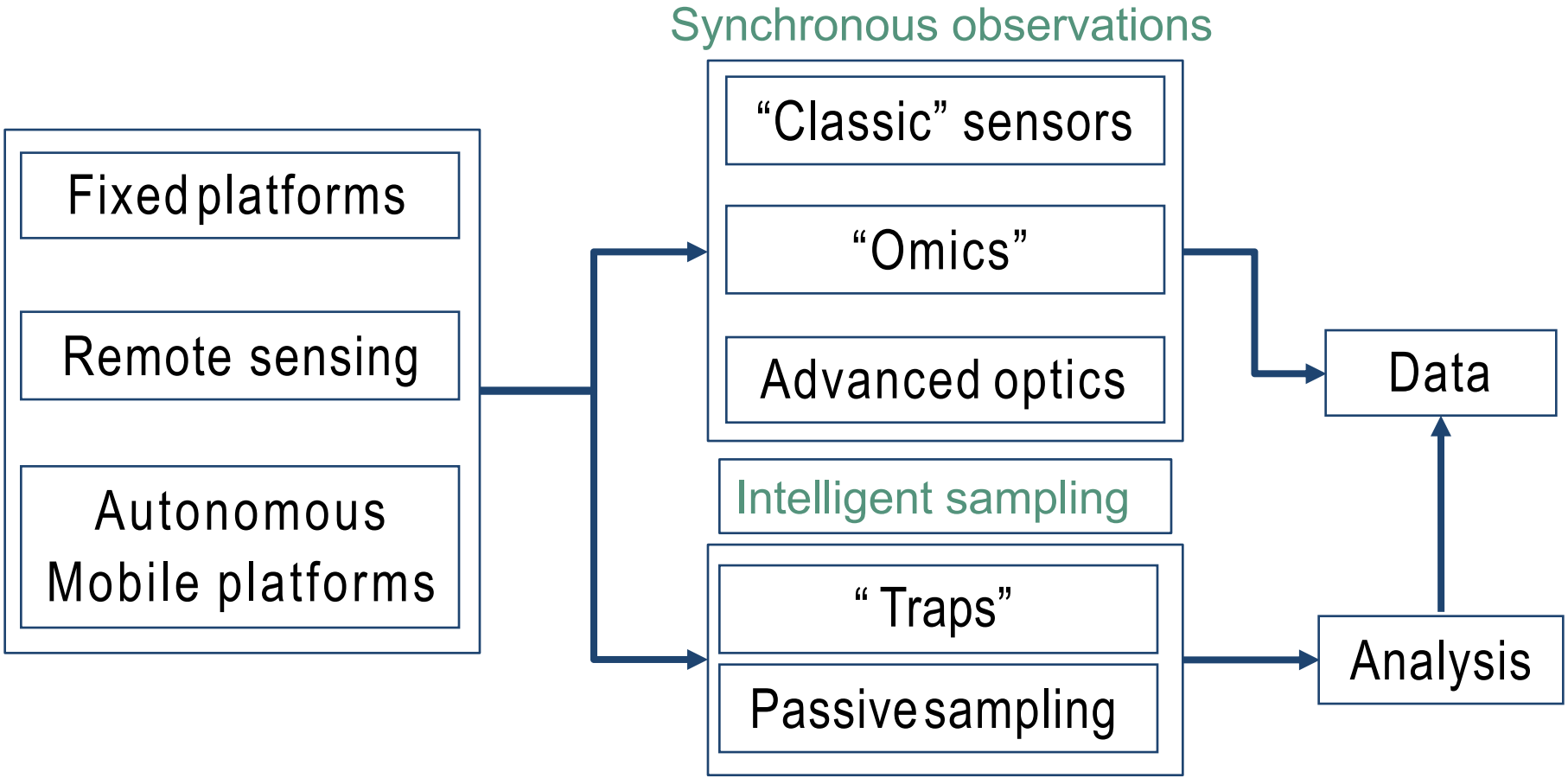
To in situ observations combined with continuous data from augmented observatories



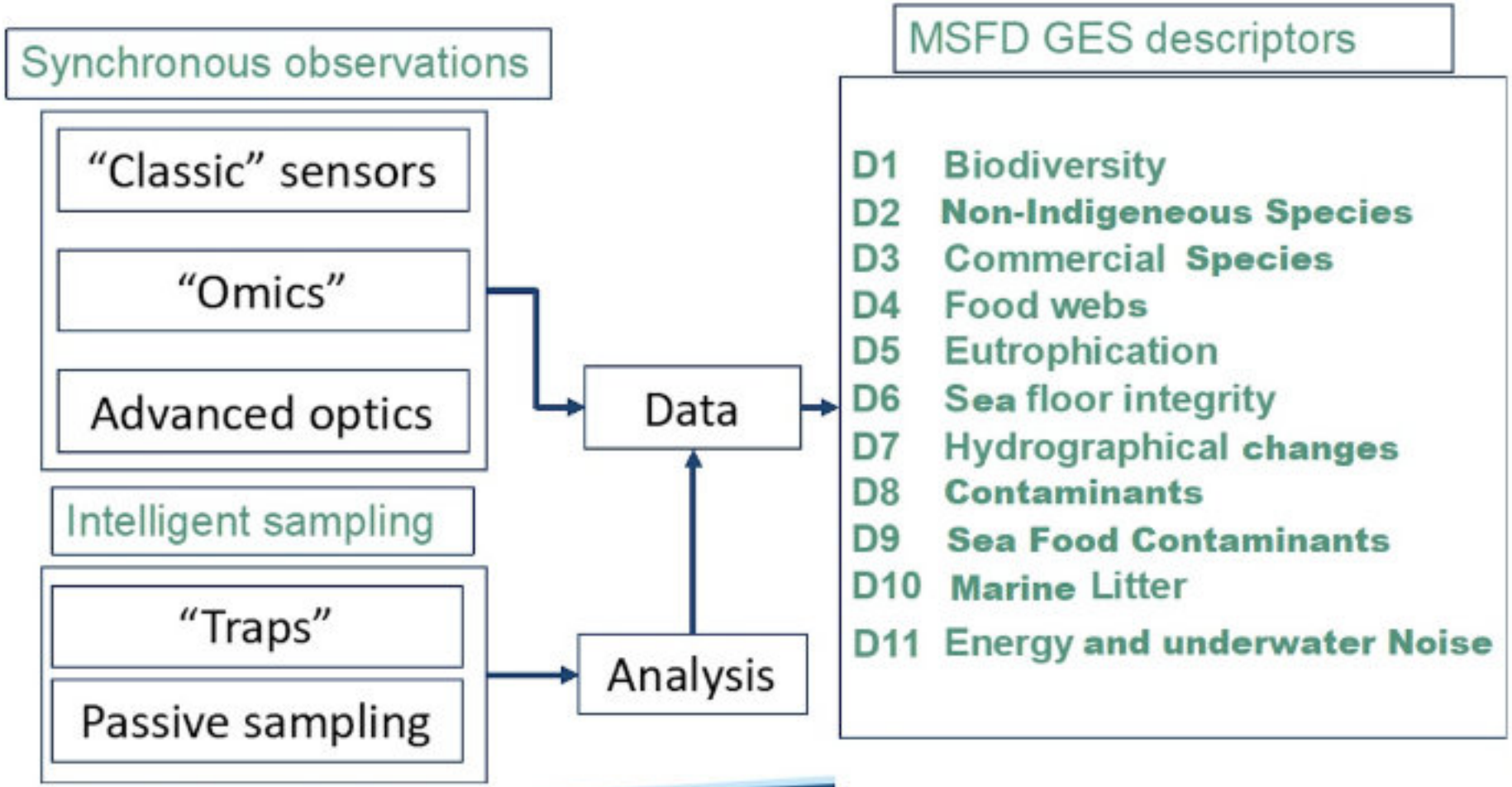
What we need: Augmented observatories

- Integrated observing, monitoring, and experimenting infrastructures
- High resolution data collection
- Automated and autonomous
- Multidisciplinary measurements
- Real or near-real time link with the mainland
- Co-localization and synopticity of observations

What we need: Augmented observatories



What we need: Augmented observatories



Joint activities and monitoring actions

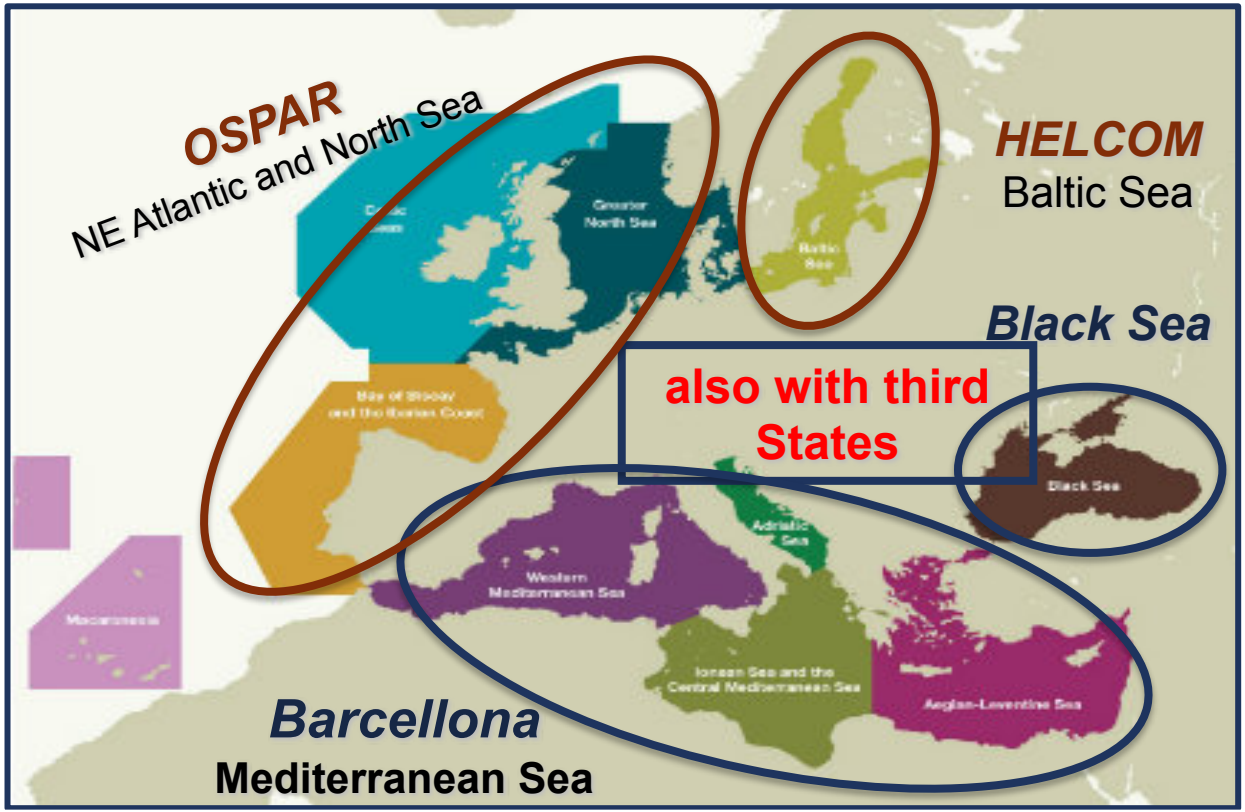
MSFD Task Group

Other options for joint actions could also envisage the support and direct involvement by a dedicated Task Group.

- organisation and conduction of national scale monitoring campaigns in collaboration with national entities, leading to transfer of common practices and methodologies through a hands-on approach

- support national assessments and link to regional scale trans-boundary studies

Reaching out to the non-EU countries



Importance for the Mediterranean of the full harmonization of the activities of the EU Directives and of the Barcelona Convention ***IMAP***

National Systems in EOOS

EOOS design with NSs serving as building blocks for coastal and HR marine data

Setting EC targets for commitments to invest in national capacities for coastal sea observations & forecasting

EMODnet
European Marine Observation and Data Network

COPERNICUS

coastal and high resolution observations, models and data

National System
National System
National System
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National System
National System

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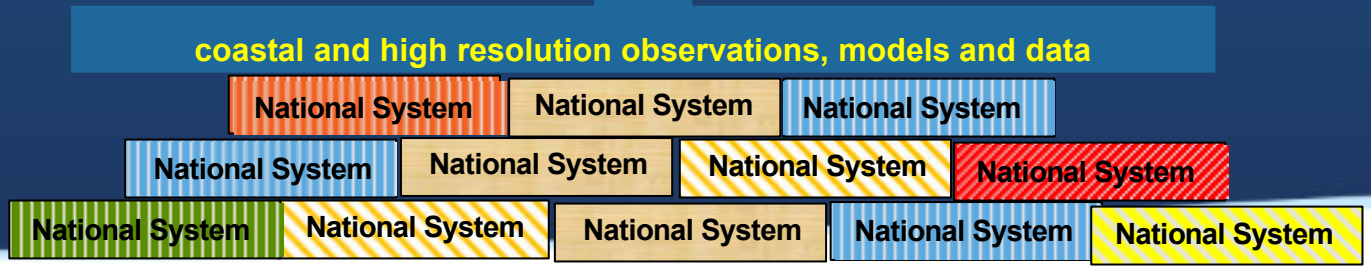
National Systems in EOOS

EOOS design with NSs serving as building blocks for coastal and HR marine data

COPERNICUS-like national marine core data systems linked to CMEMS and EMODnet

National desk(s) to link to local users

Setting EC targets for commitments to invest in national capacities for coastal sea observations & forecasting



A WORKSHOP SERIES FOR THE MSFD COMMUNITY

ACTIVITY: knowledge sharing

A series of scientific MSFD European workshops will be organized for **sharing new knowledge and its practical understanding, conceptual approaches, identification of needs and clues**, as a structured learning process to **support "official task groups", the Marine Strategy Competence centre and, in general, the entire community working and addressing the MSFD…it's a scientific transformative action**

The vision

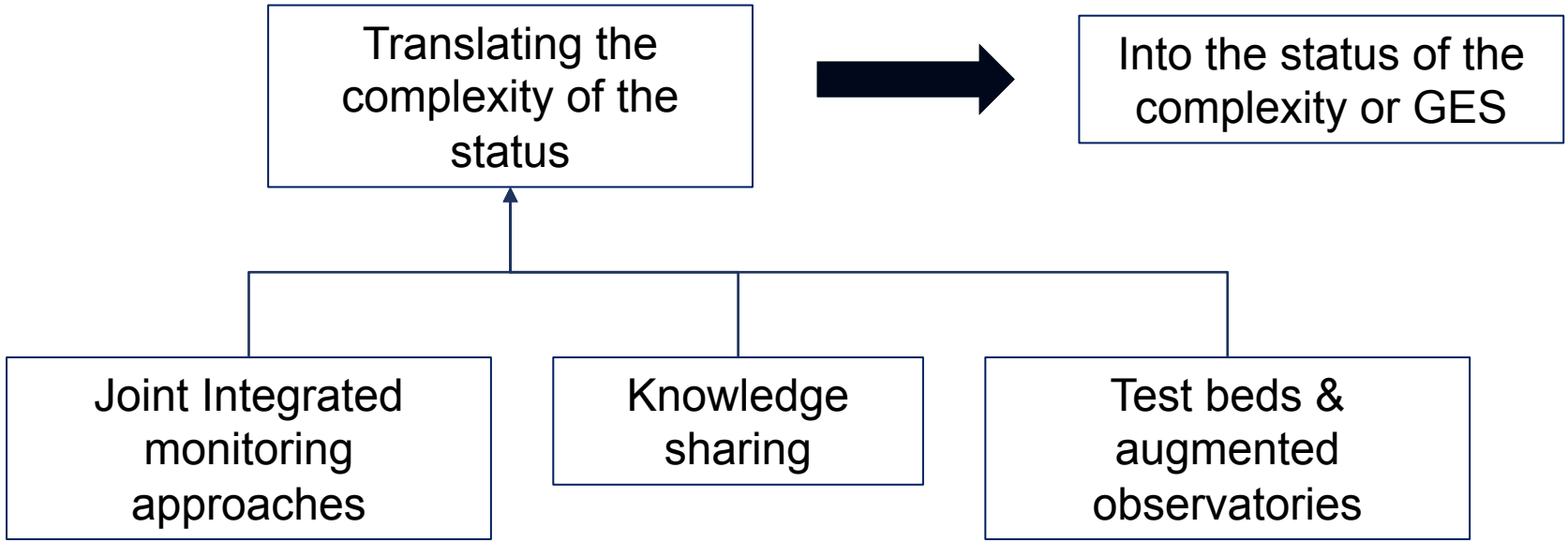
From large scale overarching patterns and observations

To in depth analysis of deviations and trends

Translating the complexity of the status

Into the status of the complexity or GES

The vision


Translating the complexity of the status
Into the status of the complexity or GES
Joint Integrated monitoring approaches
Knowledge sharing
Test beds & augmented observatories

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Online, 2 - 4 December 2020

- Please modify your name and affiliation accordingly.
- Please type in your questions and comments in the chat box. If you have a question directed to a specific speaker please type in the name of the speaker.

Programme - Day II

3 December 2020 (9:00 - 13:30)

9:00 - 9:10 **Wake up talk**

Key outcomes from Day I, *Sandra Ketelhake, JPI Oceans, Belgium*

9:10 - 11:40 **Session III: success stories**

Introduction to Session III, *Chair: F. Falcini, ISMAR-CNR, Italy, 9:10-9:15*

The Human Microbiome, *T. Van Rossum, EMBL, Germany, 9:15 - 9:45*

Forests as complex adaptive systems, *M.J. Sanz, Basque Centre for Climate Change, Spain, 9:45 - 10:15*

Coffee break, *10:15 - 10: 25*

The soil and cognitive control *G. Masciandaro, CNR-ISE, Italy, 10:25 - 10:55*

Characterizing integrated ecosystems, *C. Gaucherel, AMAP Laboratory, France, 10:55 - 11:25*

Coffee break, *11:25 - 11: 40*

11:40 - 12:45 **Session IV: The ocean domain**

Introduction to Session IV, *Chair: P. Mariani, National Institute of Aquatic Resources, DTU, Denmark, 11:40 - 11:45*

The bottom-up view of marine ecosystems, *M. Ribera d'Alcalà, Stazione Zoologica Anton Dohrn, Italy, 11:45 - 12:15*

Diversity, interactions and marine ecosystems functioning, *A. Djurhuus, University of the Faroe Islands, Faroe, 12:15 - 12:45*

Wake up talk

[Sandra Ketelhake, JPI Oceans, Belgium]

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Programme - Day III

4 December 2020 (9:00 - 13:45)

9:00 - 9:10 **Wake up talk**

Key outcomes from Day II, *Sandra Ketelhake, JPI Oceans, Belgium*

9:10 - 11:55 **Session V: how to manage MSFD and enhance the science-policy interface**

Introduction to Session V, *Chair: J. Tronczynski, IFREMER, France 9:10 - 9:15*

Did MSFD fail? Contrasting approaches to MSFD implementation and regulatory transition, *W. Bonne, DG RTD, Belgium, 9:15 - 9:45*

Marine Strategy beyond borders, part I, *T. Hema, UNEP-MAP, 9:45 - 10:15*

Coffee break, *10:15 - 10: 25*

Marine Strategy beyond borders, part II, *I. Boujmil, BlueMed Ambassador & H. Jaziri, scientist in charge of the National Plastic-Hub, Tunisia, 10:25 - 10:55; M. Snoussi, BlueMed GSO, Morocco & A. Hamza-Chaffai, Tunisian Academy of Science, Tunisia, 10:55 - 11:25*

How to manage the MSFD machine: what are the keys? *A. Borja, AZTI, Spain, 11:25 - 11:55*

Coffee break, *11:55 - 12:05*

12:05 - 12:45 **Open Discussion** *Moderator: Sandra Ketelhake, JPI Oceans, Belgium*

12:45 - 13:30 **Presentation of a joint EU-JPI Oceans MSFD oceanographic cruise in 2021** *P. Roose, Royal Belgian Institute of Natural Sciences, Belgium, 12:45 - 13:00*

Q&A and discussion, *13:00 - 13:30*

13:30 - 13:45 **Conclusion and end of workshop** *Moderator: M. Sprovieri, IAS-CNR, Italy*

Wake up talk

[Sandra Ketelhake, JPI Oceans, Belgium]

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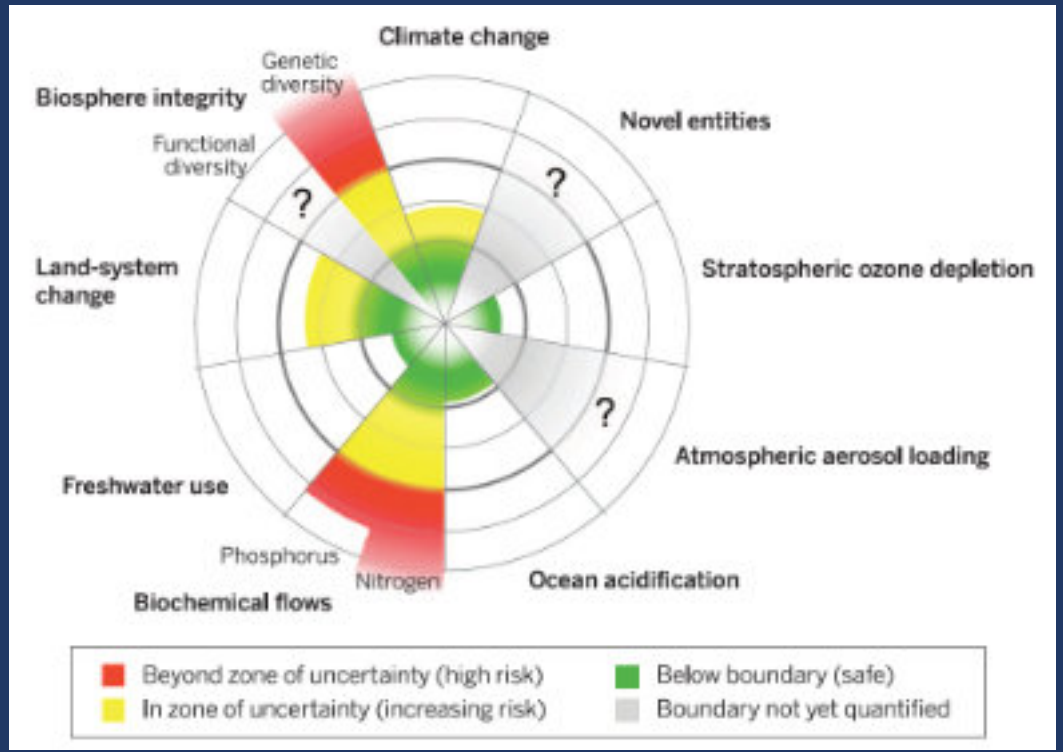
The MSFD and sustainable use of marine ecosystems: experiences from Bluemed

Fabio Trincardi
Director DSSTT-CNR
Bluemed Coordinator

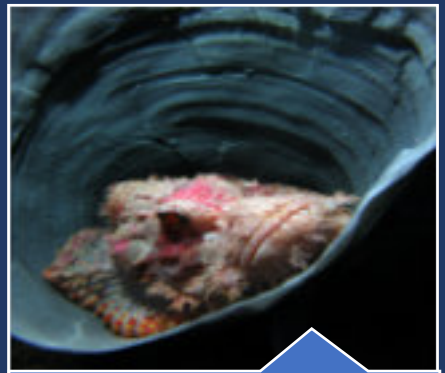
Beyond the planetary boundaries?



Steffen et al., 2015 SCIENCE
Rockstroem et al., 2009 NATURE

- A "safe" limit of **CO_2** is 350 ppm (we are at 410)
- A "safe" limit for **biodiversity** is 10 extinctions every 10000 species in 100 yr (we are at 24-100 extinctions)
- The limit for **biogeochiemical cycles** is 11 10^6T di P e 63 10^6T di N (we reached twice)
- The limit for deforestation is > 75% of pre-industrial forests but but we are already < 62%

Can we define "regional boundaries"?

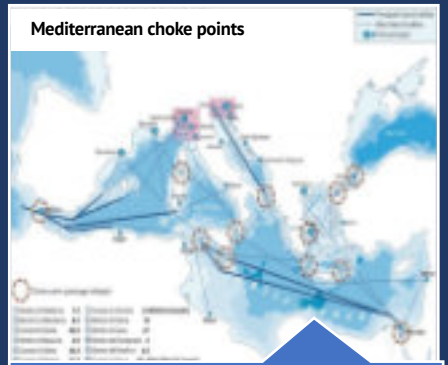


Unique biodiversity

- 400 UNESCO sites and 236 Marine Protected Areas
- Culture of environmental healthy life

Coast & Sea Uses

- Maritime traffic (30% of global sea-borne trade by volume and ¼ oil traffic)
- Coastal & Maritime Tourism
- Fisheries & aquaculture
- O & G



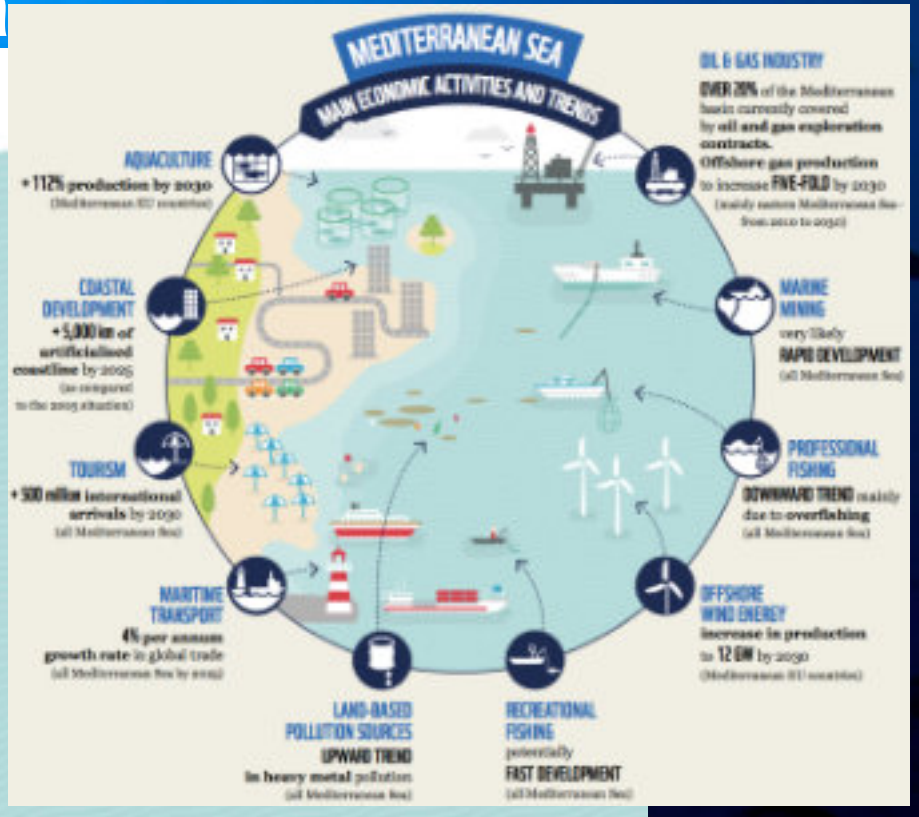
Geopolitical complexity

- Safety and security issues
- Coastal pressure
- Resources over-exploitation

BLUEMED and the Framework for Sustainable Growth in the Mediterranean


5 - LA RETE PORTUALE DEL MEDITERRANEO
PRINCIPALI PORTI DEL NORTHERN RANGE PER MOVIMENTO CONTAINER (2019)
Rotterdam Paesi Bassi 14.810.504
Anversa Belgio 11.870.000
Amburgo Germania 9.257.683
Brema Germania 4.856.873
Le Havre Francia 2.786.000
Zeebrugge Belgio 1.710.000
Dunkerque Francia 450.000
Amsterdam Paesi Bassi 56.191 (2017)
Porti del Northern Range (Ue)
Porti del Mar Mediterraneo e del Mar Nero
Rotta principale
Rotte secondarie
Paesi dell'Unione Europea
Russia
Altri paesi
PRIMI 10 PORTI ITALIANI PER MOVIMENTAZIONE CONTAINER, 2019
Genova 2.613.325
Gioia Tauro 2.522.874
La Spezia 1.409.381
Livorno 788.833
Trieste 789.640
Napoli 681.929
Venezia 593.070
Salerno 413.227
Ravenna 218.338
Cagliari 151.045
Fonte: Assoporti su statistiche di sistema portuale
PRIMI 10 PORTI PER MOVIMENTAZIONE CONTAINER, MAR MEDITERRANEO E MAR NERO (2019)
Pireo Grecia 5.648.030
Valencia Spagna 5.439.827
Algeciras Spagna 5.125.385
Tanger-Med Marocco 4.801.733
Port Said Egitto 2.658.759
Barcellona Spagna 3.324.196
Ambarli Turchia 3.110.000
Marsaxlokk Malta 2.720.000
Mersin Turchia 1.939.029
Alessandria Egitto 1.814.950
IRLANDA
REGNO UNITO
DANIMARCA
SVEZIA
ESTONIA
LETTONIA
LITUANIA
POLONIA
BELGIO
GERMANIA
REP. CECA
SLOVACCHIA
AUSTRIA
UNGHERIA
ROMANIA
BULGARIA
UCRAINA
FED. RUSSA
FRANCIA
SPAGNA
PORTOGALLO
MAROCCO
ITALIA
CROAZIA
GRECIA
TURCHIA
CIPRO
LIBANO
ISRAELE
EGITTO
Oceano Atlantico
Mar Nero
Mar Mediterraneo
Amsterdam
Rotterdam
Zeebrugge
Anversa
Amburgo
Brema
Dunkerque
Le Havre
Trieste
Venezia
Ravenna
Genova
La Spezia
Savona-Vado
Marsiglia
Livorno
Civitavecchia
Napoli
Bari
Salerno
Taranto
Gioia Tauro
Palermo
Catania
Cagliari
Barcellona
Valencia
Castellón
Alicante
Algeciras
Malaga
Tanger-Med
Odessa
Novorossijsk
Costanza
Salonicco
Alessandria
Port Said
Ashdod
Haifa
Beirut
Mersin

Conflicting uses of the Sea



18 economic activities identified by the European Parliament!

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The BlueMed Italian White Paper, an overview of relevance, obstacles and proposals of the key sectors for a Blue Growth

03. FROM SOCIETAL/ECONOMIC DRIVERS TO THEMATIC BLUE OBJECTIVES

FISHERIES & AQUACULTURE

3.2

BILLION €

TRANSPORT & SHIPBUILDING

8.0

BILLION €

BLUE BIOTECHNOLOGIES

~0.5

BILLION €

OIL AND GAS (FROM THE SEA)

4.4

BILLION €

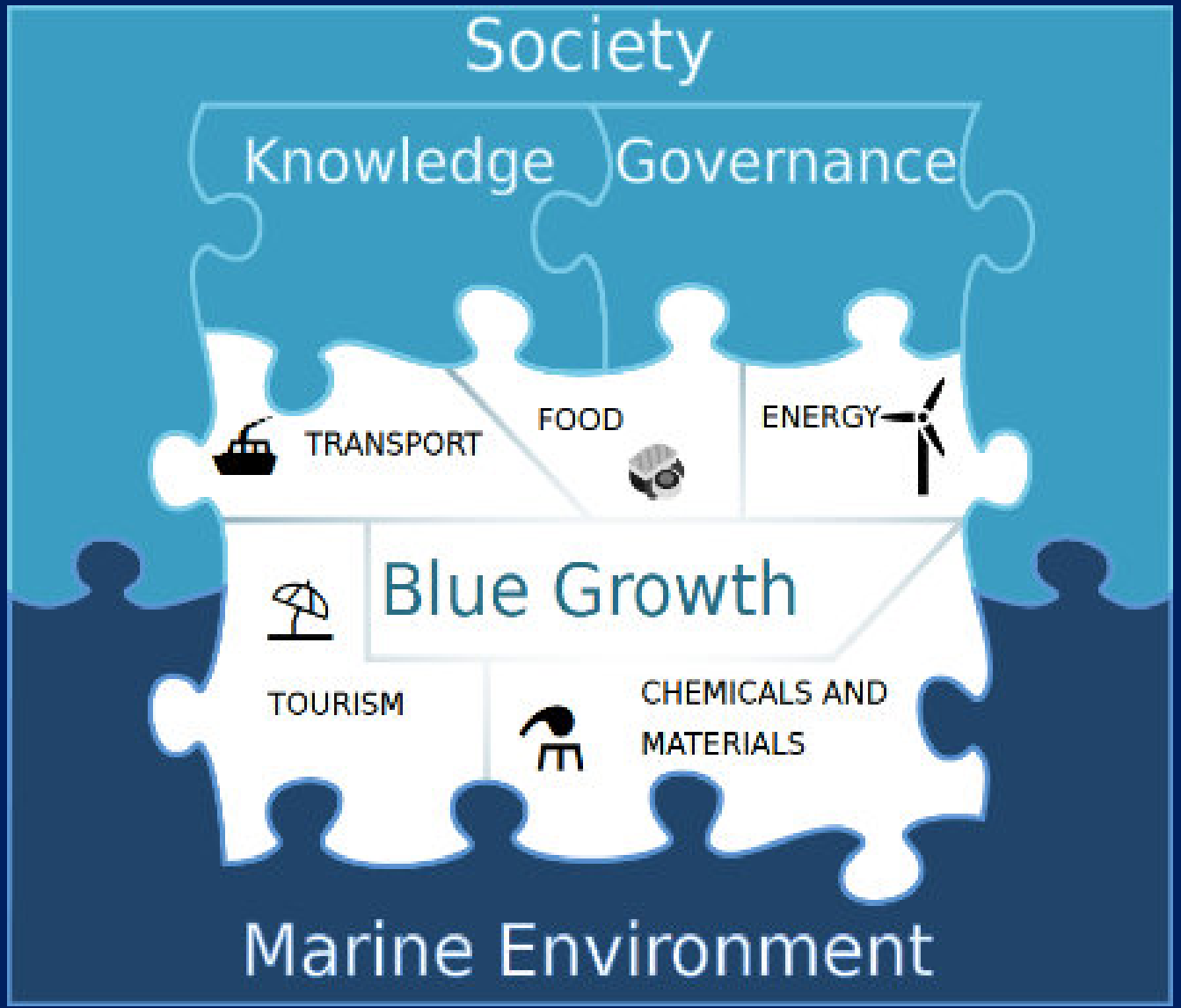
COASTAL TOURISM

16.1

BILLION €

The BLUEMED tale
Adopting an evidence based governance for the Med area

An Holistic architecture



The Bluemed Platforms: enabling environments for dialogue & engagement

Platforms: thematic dialogue groups where national representatives from different sectors meet to discuss the BlueMed agendas updates and implementation. They work as multidisciplinary observatories, trans-national interaction fora, and laboratories to get the Mediterranean blue growth concept across.

National Pivots: representatives from the countries on each of the platforms' themes. They bring their knowledge and experiences, and gather the national actors' instances to the platforms.

Policy platform: Science to Policy for Blue Growth

Knowledge platform: Knowledge of Mediterranean Sea dynamics and ecosystems

Economy platform: Economic sectors of Blue Growth economy in the Mediterranean

Technology platform: Enabling technologies for Blue Growth in the Mediterranean

blueMed tour in non-EU countries

June 25th 2018 in Algiers, Algeria
June 26th 2018 in La Marsa, Tunisia
June 27th 2018 in Ankara, Turkey
July 3rd 2018 in Amman, Jordan
July 16th 2018 in Alexandria, Egypt

blue growth
Mediterranean
research
sustainability
jobs
collaboration

13 priority goals were selected by countries of the Basin from the BlueMed Strategic Research and Innovation Agenda: their implementation will foster sutainable, non-conflicting Blue Growth in the Mediterranean.

sustainable food production

open data, open science, open innovation

effective maritime spatial planning

greening vessels, facilities and services

understanding pollution impacts, mitigation and remediation

building capacities, blue skills and blue professionals

towards an observing system of systems

preparing to climate change adaptation and mitigation and define measures

exploring the potential of blue biotech

strengthen synergies among science, industry, policy-makers and society

linking tourism, tourists and environment

promote the role of marine renewable energies in the energy transition phase

from traditional maritime economic to blue growth activities

blueMed
Research and Innovation for blue jobs and growth in the Mediterranean Area

ACTING FOR THE MED SEA

The BlueMed Implementation Plan

Priority

understanding
pollution
impacts, mitigation and remediation

Operational receipts

Develop **maps** of potential **pollution sources**

Quantify **impact of plastic waste** in terms of economic activities, jobs, well-being of citizens and ecosystems and **reduce** its generation

Define distribution, concentration and provenance of all forms of **garbage** raise awareness through **literacy** and **citizen science**

Explore and propose solutions to **reduce** the input of **pollutants**

Measure and identify **emerging** chemical compounds from terrestrial sources determining **contaminant dispersal** in all marine matrices

fill gaps in **understanding** the Mediterranean Sea dynamics, biogeographic patterns, biodiversity, and ecosystem functions

Strategic Actions

Scale up of the BlueMed Pilot Action on Healthy Plastic Free Mediterranean Sea

Joint JPI-Oceans Action on 'Science for Good Environmental Status'

Promotional Actions

BlueMed e-training course on marine litter

BlueMed & JPI-Oceans joint workshop on 'Science for Good Environmental Status'

more info
http://www.bluemed-initiative.eu/strategic-research-and-innovation-agenda/#prioritization

Objectives

Support the proper management and improvement of the marine environment and connected activities from filling the knowledge gaps to identifying recycling solutions, in the perspective of the blue circular economy and the Green Deal. Improve in parallel the understanding on the functioning of the Mediterranean Sea ecosystem.

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blueMed Research and Innovation for blue jobs and growth in the Mediterranean Area

ABOUT TOOLS & ACTIONS PUBLICATIONS OUTREACH

WHY AN ACTION ON PLASTIC LITTER IN THE MEDITERRANEAN?

1% of the World's waters

the Med Sea is a "plastic trap"

7% of all global microplastics

About 8 million tons of plastic litter enters the ocean every year, threatening marine wildlife and ecosystems, and indirectly the human health, and the sea based economies. **Plastic pollution represents a transboundary problem** and thus it requires **global coordination and long-term multiple approaches to develop shared solutions.** Mediterranean Sea is strongly impacted by

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blueMed

Pilot Action for a plastic-free, healthy Mediterranean Sea

Joining forces to address marine litter in the Mediterranean

The **BlueMed Pilot Action** consists in **mapping and assessing the actions** on place regarding **marine plastic pollution** in the EU and non EU countries of the Mediterranean in order to share of **good practices**, **R&I** actions but also **demonstration, communication and education** activities.

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Actions to reduce the generation of plastic waste

Actions to prevent littering and leakage of plastics into environment

Actions to collect and use plastic already in the environment

Overarching actions

Photo credits Legambiente

The sea floor and the MSFD

- **Exploitation of goods**
  - Mining
  - Fish Trawling
- **Area of waste disposal**
  - Dumping (legal and illegal)
  - Littering
- **Interface for further exploitation**
  - Foundation for infrastructures (oil rigs, wind farms)
  - Pavement for global networks (pipelines, cables)

Ramirez-Llodraet al., 2011

All these uses root on (implicit) assumptions

- Marine resources are **not limited**
  (false!!!)
- **Insignificance** of human impacts
  (false!!!!)
- **Static view** of the submarine landscape
  (false!!!!)

Musings on the temporal dimension

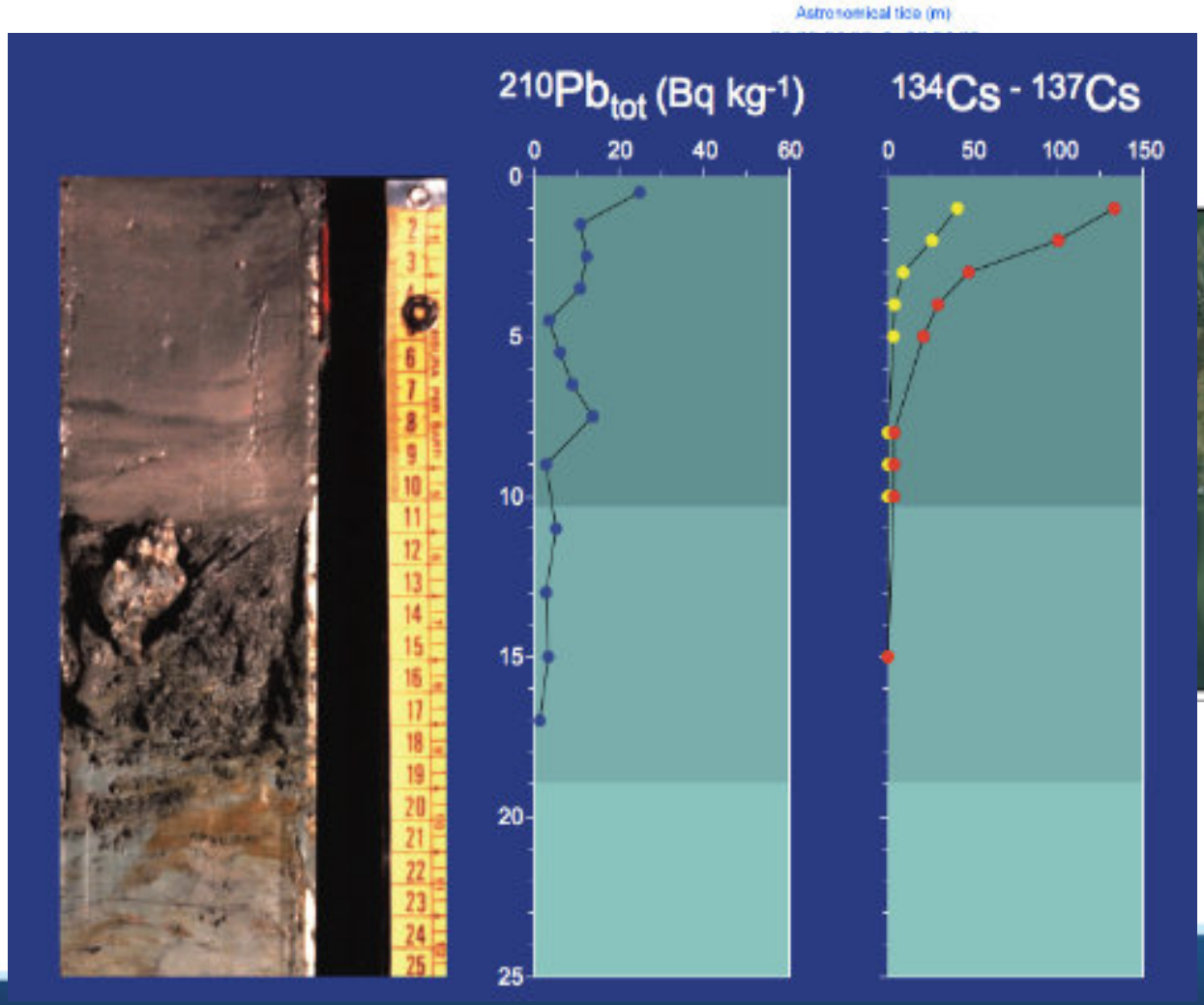
- **1. The importance of deep time:** consider changes that are going on on a very slow frequency as they may interfere positively with changes that occur on very high frequency

- **2. *À la recherche du temps perdu***: time intervals can recorded in the stratigraphic record or may be lost for ever

- **3. Assaulting the obvious:** a thickness of 10 cm of sediment can represent 100s of thousands of years in a site and few days in another

Sampling strategies to define the «status» of the seafloor and its evolution through time should take fully into account these facts

An example from the modern Po delta



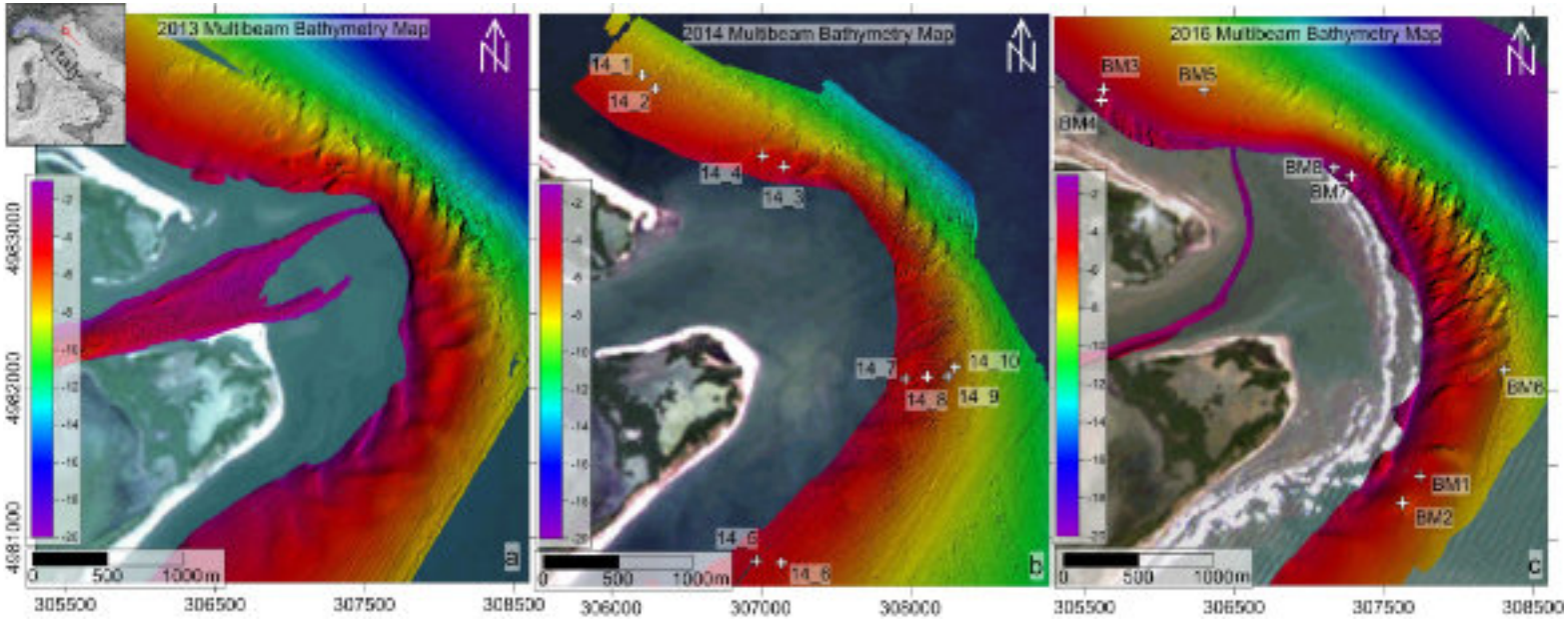
Maselliet al, 2020Geology

Musings on the spatial dimension

- **1. The seafloor in 3D:** new technologies allow mapping with centimetric resolution
- **2. The seafloor in 4D:** we must identify the most dynamic areas where seafloor is rapidly transformed
- **3. Assaulting the obvious:** the Anthropocene seafloor worldwide is heavily impacted but nobody seems to care

Sampling strategies to define the «status» of the seafloor and its evolution through time should take fully into account these facts

Ephemeral submarine landscapes in dynamic areas



Bosman et al., 2019
Trincardi et al., 2020

- High-resolution multibeam time lapses of Po della Pila lobe
- High morphologic complexity
- High variability in time
- Take into account this fact in repeated seafloor sampling

Ritmare

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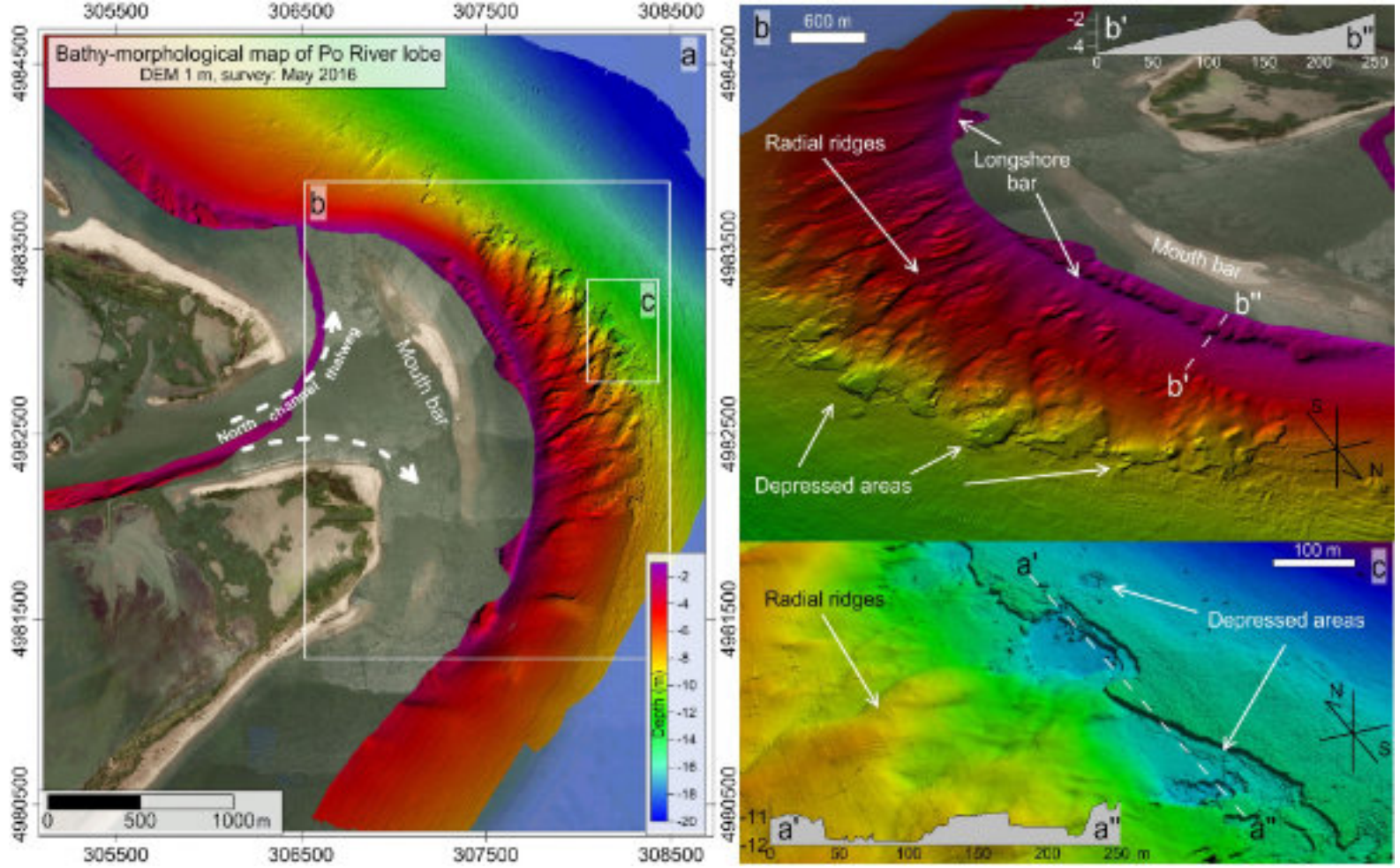
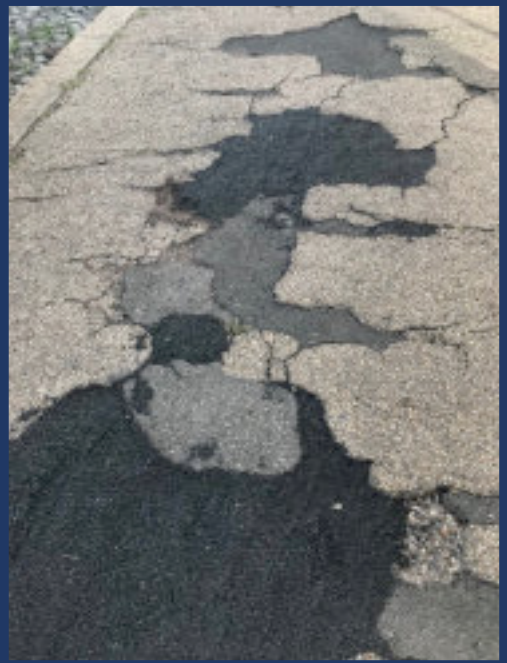
Ephemeral submarine landscapes in dynamic areas



The Mediterranean “seascape” (which we need to map)



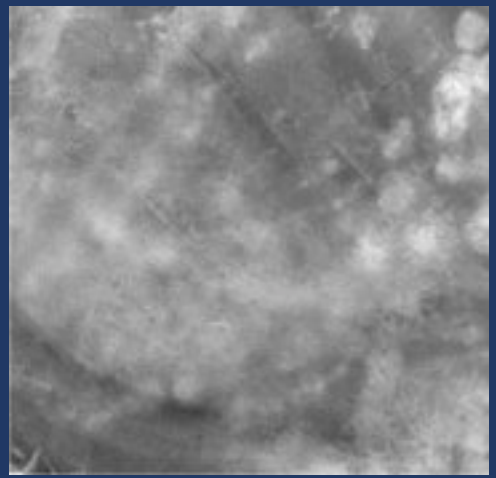
Sophisticated geophysical images (morphology and backscatter) of the seafloor show the equivalent of potholes and asphalt patches in the streets of Rome

The Mediterranean “seascape” (which we need to map)

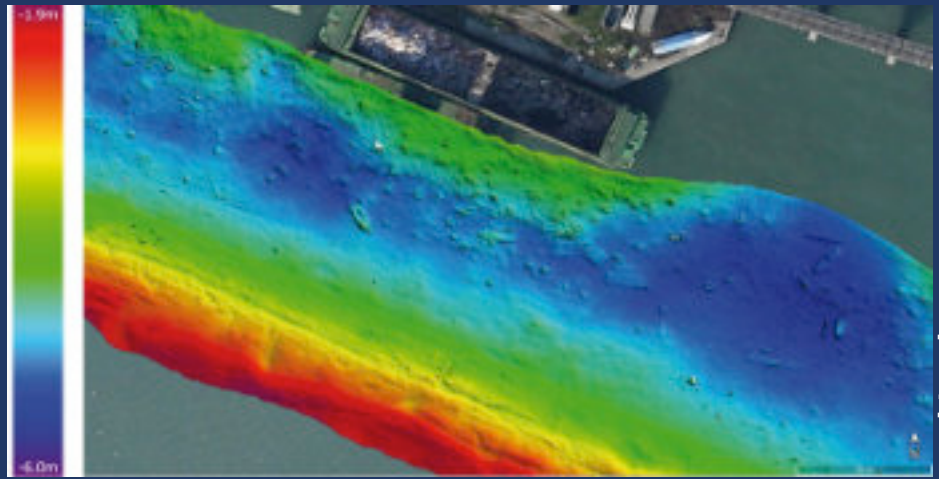
Sophisticated geophysical images (morphology and backscatter) of the seafloor show the equivalent of potholes and asphalt patches in the streets of Rome

Areas of illegal dumping on the continental slope off Gioia Tauro, Tyrrhenien Sea

Illegal dumps and littering on the sea floor



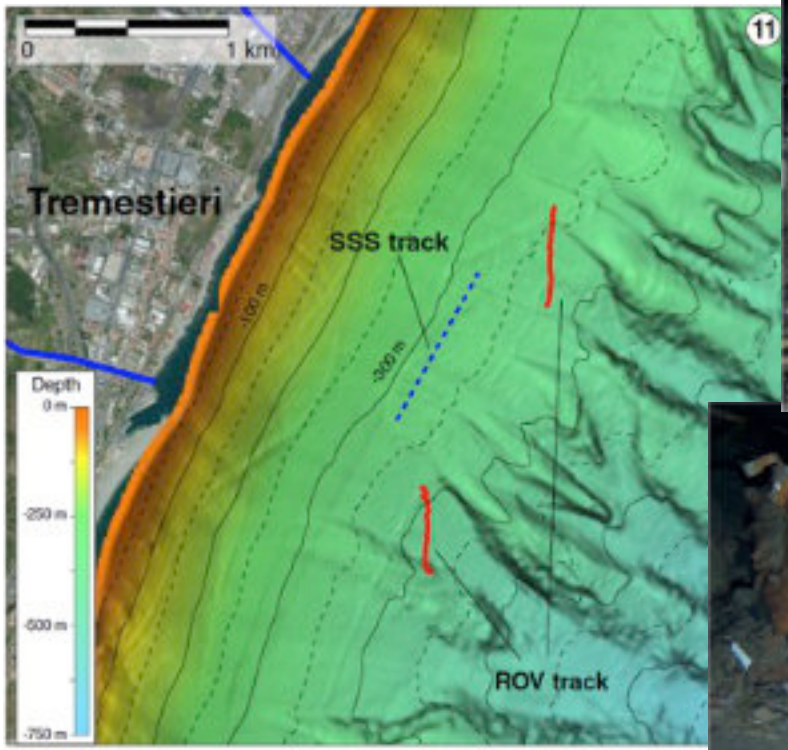
Chemical dumps in a trawling area on the continental shelf North of Milazzo, Sicily (100-130 m)

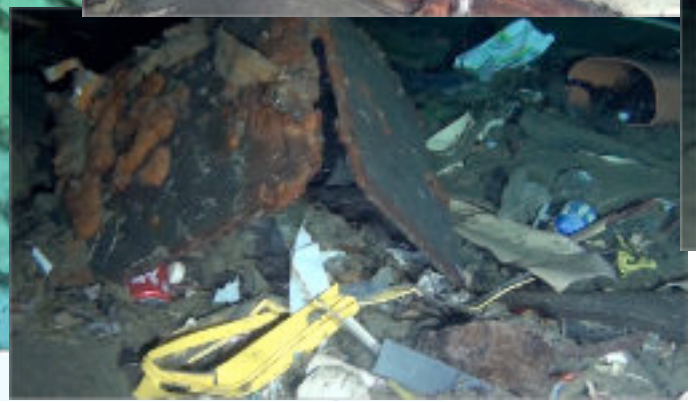


Madricardo et al, 2019 Sci. Reports

"Garbage" on the bottom of the Venice Lagune 3-6 m water depth

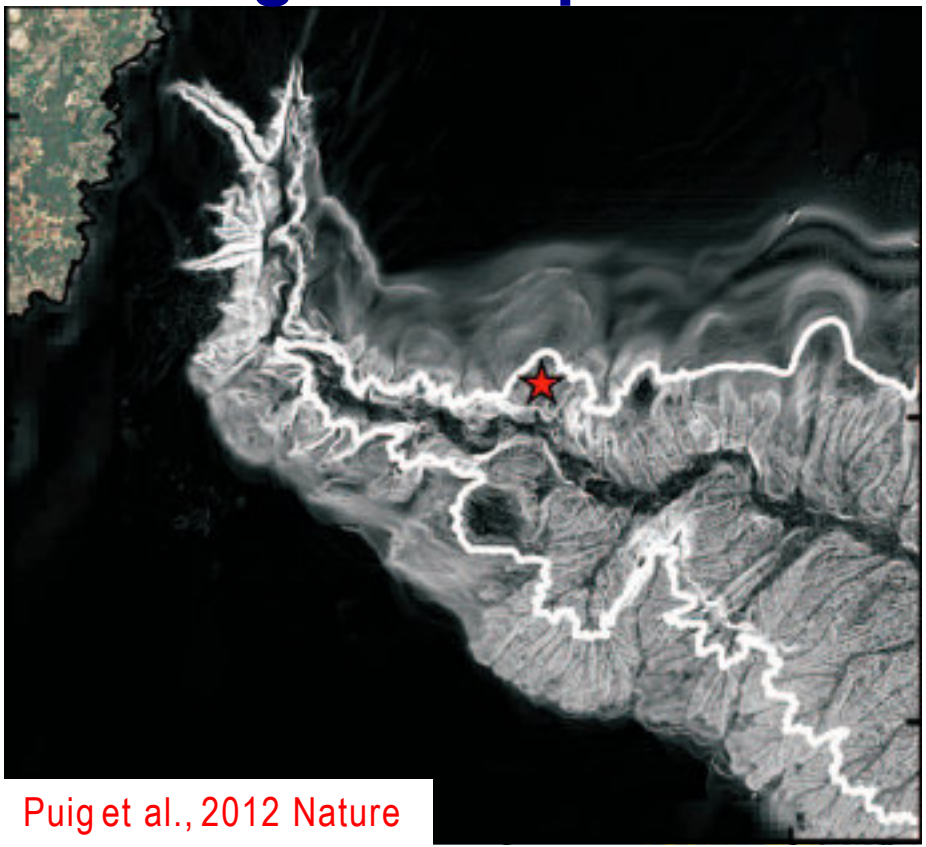
The Mediterranean "Plastic Trap"





Pierdomenicoet al., 2019Sci. Reports

Bottom trawling as a “geological” agent causing seascape alterations



Puig et al., 2012 Nature

1. Alteration of natural deep-sea sediment fluxes,
2. Modification of the shape of the upper continental slope

In these portions of the margin, drastic reduction of:

- the morphological complexity,
- the benthichabitat heterogeneity,
- species diversity(by regulating levels of competition, predation and physiological stress),
- the seascapealterationcould also affect ecosystem functioning, that rely upon the original morphology

Much of MSFD and MSP rely on geospatial mapping, but remember that …

… The map is not the Territory

Gregory Bateson, Mind and Nature

The territory evolves (also under the pressure of humans)

The techniques for measuring and mapping evolve through time

The "interest" on the territory (either scientific or economical) also evolves

Musings on amplification and irreversibility

- **1. the illusion of keeping things under control at regional level:** even if we achieved the “perfect Mediterranean”, clean, sustainable, just … what happens when ice caps are melting, permafrost is thawing, the jet stream is swinging?

- **2. irreversible changes at regional scale:** what are the tipping points of the Mediterranean?
- - the interruption of cold water formation?
- - the onset of anoxia events (like precession-modulated Sapropels)?
- - a dramatic turnover in ecosystems structure and functioning?

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THANK YOU

Fabio Trincardi