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Estuarine Management in the Context of Future Global Challenges

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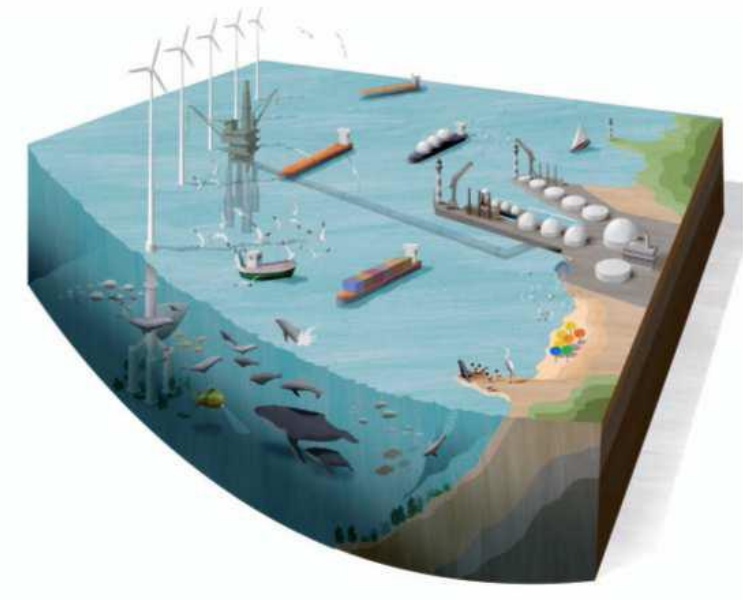
With thanks and acknowledgements to Drs Angel Borja, Roland Cormier and Jemma Lonsdale and Sue Boyes!

Challenges for estuarine/marine science & management:



There is only one big idea: *how to maintain and protect ecological structure and functioning while at the same time allowing the system to produce ecosystem services from which we derive societal benefits.*

- Recovery/coping with historical legacy
- Endangered coastal and marine ecosystem functions
- Legal & administrative framework
- Economic prosperity and delivery of societal benefits
- Coping with climate change & moving baselines & unbounded boundaries

In other words:

"to look after the natural stuff and deliver the human stuff"

Main Messages – Contents (1):

3 major sets of global challenges and changes against which estuarine management needs to be judged in the coming decades:

(i) the estuarine environment,

(ii) the endogenic and exogenic pressures facing estuaries, and

(iii) the management of estuaries.

Each of these cannot be uncoupled from the features of the catchment and the adjoining marine and coastal areas and hence successful connectivity between these systems is paramount.

Main Messages – Contents (2):

The management of climate change and our responses has to relate to dominant themes in estuaries:

- the protection and use of space and its habitats,
- the presence of contaminants and resulting pollution at one or more levels of biological organisation,
- the productivity and organic balance of the system including effects on water quality,
- the connectivity between systems and the presence or development of temporary or permanent barriers, and
- the sediment balance and dynamics of the systems.

(from Cutts & Elliott, 2022 Humber Functioning Report for Env. Agency)

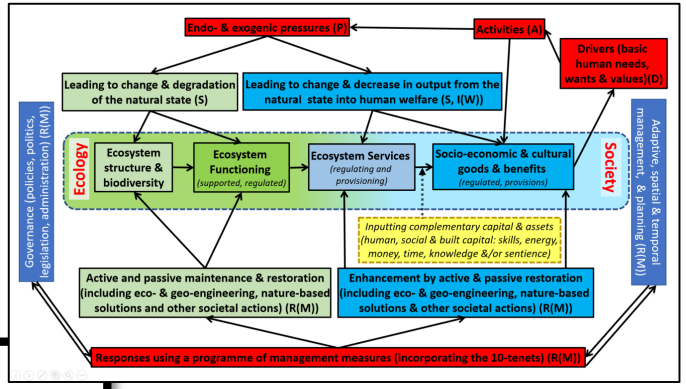
And to ensure:

- the physical, chemical and ecological structure and functioning then has to be maintained and, where possible given historical changes, enhanced and restored.
- that the ecological carrying capacity for the higher trophic levels (wading birds and fishes) and the socio-economic carrying capacity for human activities have to be maintained.
- that there is the need to ensure that the assimilative capacity of any estuary for human actions and any materials discharged is not exceeded.

Using for varying spatial and temporal scales of estuarine management:

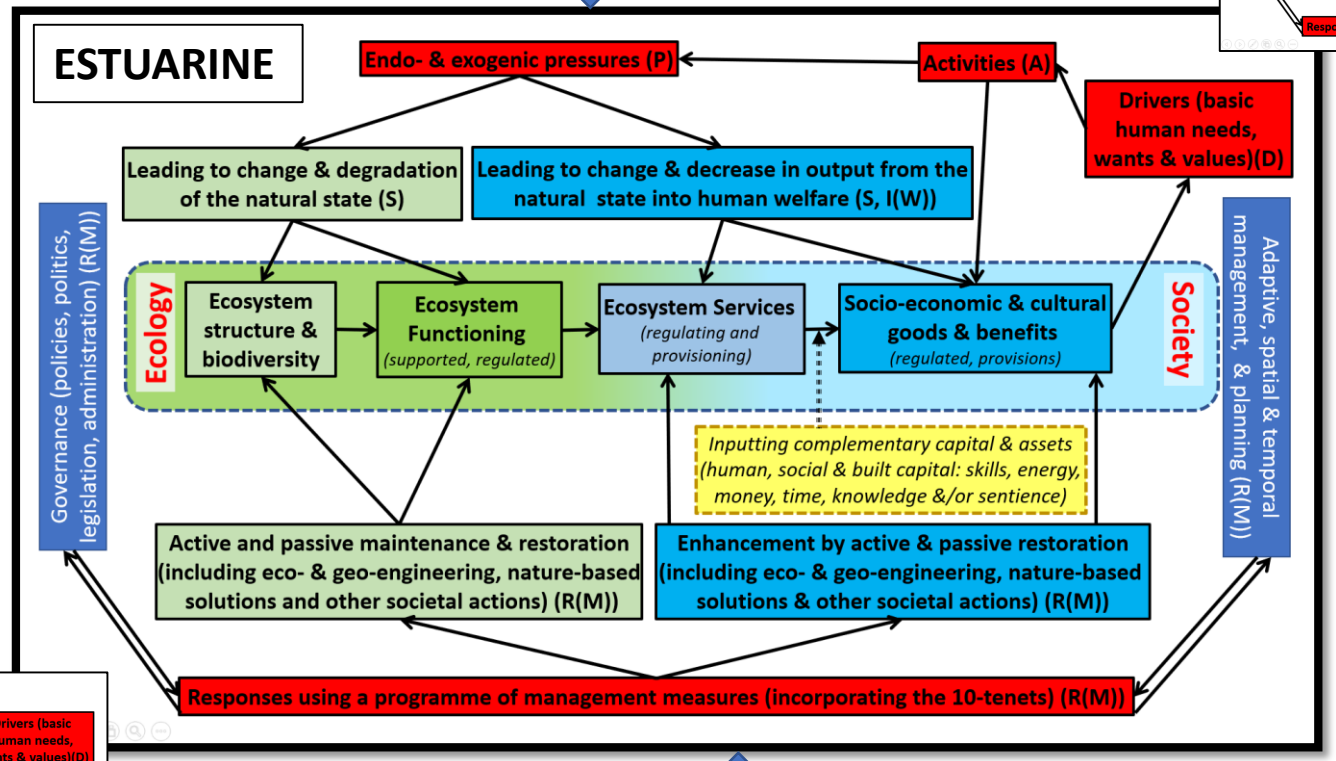
- the hazard and risk typology,
- the ten-tenets of sustainable and successful management,
- the determination of activity-, pressures- and effects-footprints on the natural and human systems, and
- the management response-footprint pyramid

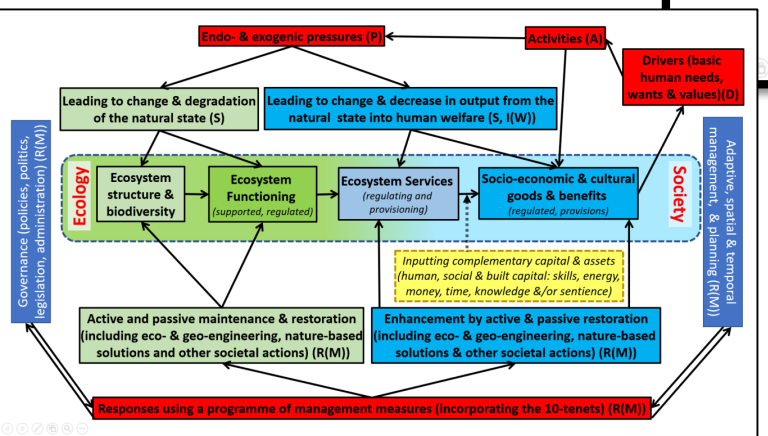
The coast-estuary-catchment socio-ecological continuum



COAST & MARINE

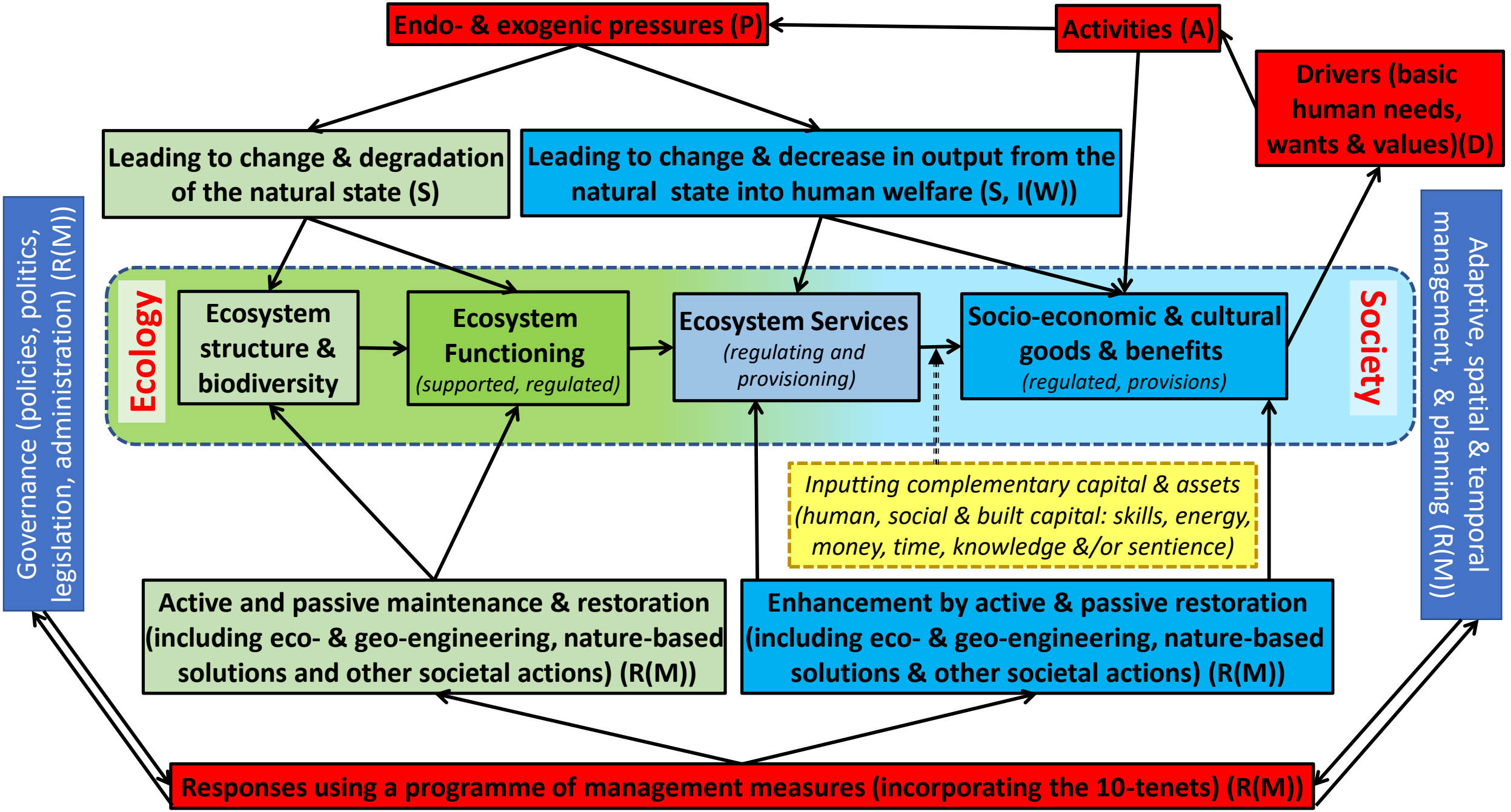
Connectivity to and from the coast





Connectivity to and from the catchment

CATCHMENT


Endo- & exogenic pressures (P)
Activities (A)
Drivers (basic human needs, wants & values)(D)
Leading to change & degradation of the natural state (S)
Leading to change & decrease in output from the natural state into human welfare (S, I(W))
Governance (policies, politics, legislation, administration) (R(M))
Ecology
Ecosystem structure & biodiversity
Ecosystem Functioning (supported, regulated)
Ecosystem Services (regulating and provisioning)
Socio-economic & cultural goods & benefits (regulated, provisions)
Society
Adaptive, spatial & temporal management, & planning (R(M))
Inputting complementary capital & assets (human, social & built capital: skills, energy, money, time, knowledge &/or sentience)
Active and passive maintenance & restoration (including eco- & geo-engineering, nature-based solutions and other societal actions) (R(M))
Enhancement by active & passive restoration (including eco- & geo-engineering, nature-based solutions & other societal actions) (R(M))
Responses using a programme of management measures (incorporating the 10-tenets) (R(M))

What are we managing? - Hazards, risks and their prevention, from single activities to whole areas

Exogenic unmanaged pressures ***(where the consequences are managed in the management area but the causes require global action)***	**Endogenic managed pressures** ***(where the causes and consequences are managed within the management area)***
Alien species	New infrastructure
Sea level rise (or loss?)	Energy generation
Increased temperature	Petrochemical industries
Increased storminess	Dredging and navigation
Flooding and erosion	Wetland loss and gain
Changes to catchment run-off	Urban discharges
Repercussions of NAO	Mine-water discharges
Agricultural runoff in catchment	Subsidence
Saline ingression	Historical pollution residues

And opportunities!

Hazard & Risk Typology: Source of Problems & Cause for Management

Hazard leading to Risk (depending on assets)
A) Surface hydrological hazards (e.g. flooding)
B) Surface physiographic removal by natural processes - chronic/long-term (e.g. erosion)
C) Surface physiographic removal by human actions - chronic/long-term (e.g. land-claim, space removal)
D) Surface physiographic removal - acute/short-term (e.g. cliff failure)
E) Climatological hazards - acute/short term (e.g. storminess)
F) Climatological hazards - chronic/long term (e.g. NAO changes, sea-level rise)
G) Tectonic hazards - acute/short term (e.g. earthquakes, land-slip)
H) Tectonic hazards - chronic/ long term (e.g. subsidence, isostatic rebound)

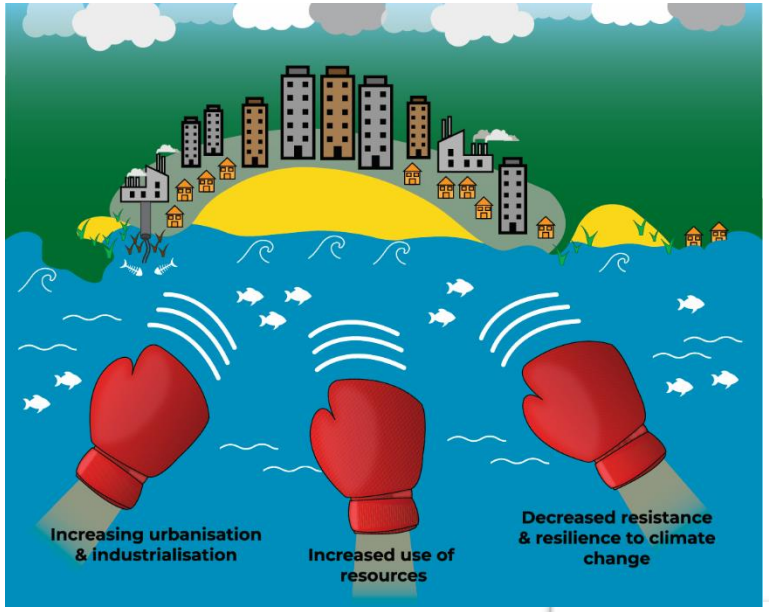
(Elliott et al., 2019)

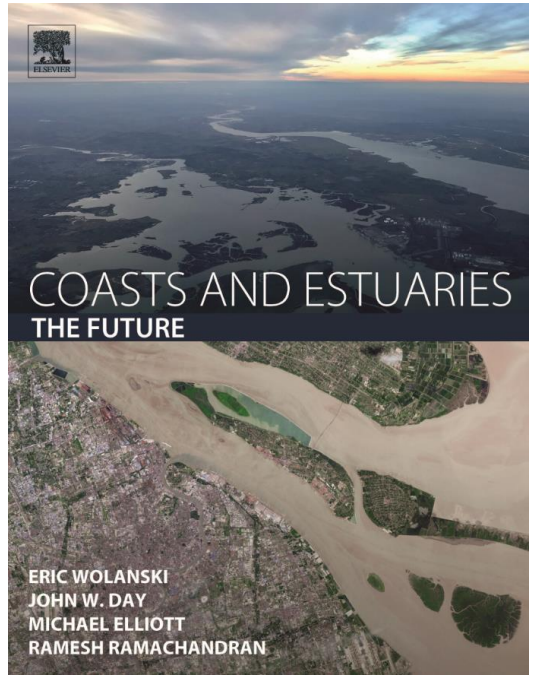
Hazard leading to Risk (depending on assets)
I) Anthropogenic microbial biohazards (e.g. sewage pollution)
J) Anthropogenic macrobial biohazards (e.g. non-indigenous species)
K) Anthropogenic introduced technological hazards (e.g. infrastructure, sediments)
L) Anthropogenic extractive technological hazards (e.g. fishing, aggregates)
M) Anthropogenic acute chemical hazards (e.g. oil spills)
N) Anthropogenic chronic chemical hazards (e.g. diffuse and point-source contaminants)
O) Anthropogenic acute geopolitical hazards (e.g. wars, unrest, terrorism)
P) Anthropogenic chronic geopolitical hazards (e.g. human migrations, civil-war)

All hazards & risks are influenced, caused and/or exacerbated by climate change and its mitigation/adaptation!

The ‘Triple Whammy’ – Present & future threats for estuaries and coasts worldwide

- Increased industrialisation and urbanisation
- Increased use of physical (space, energy, water, etc.) and biological (fish, shellfish) resources
- Decreased resistance and resilience to climate change (temperature, acidification, storminess, species distribution changes, alien species, etc)






Chapter 1

A Synthesis: What Is the Future for Coasts, Estuaries, Deltas and Other Transitional Habitats in 2050 and Beyond?

Michael Elliott*, John W. Day†, Ramesh Ramachandran‡, Eric Wolanski§


Marine Pollution Bulletin 163 (2021) 111832

Contents lists available at ScienceDirect

Marine Pollution Bulletin

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ELSEVIER

Editorial

The ‘triple whammy’ of coasts under threat – Why we should be worried!

(Defeo & Elliott Mar. Poll. Bull. 2021)

Why are we managing?

- To stop causes and consequences
- To maintain and protect biodiversity, ecosystem structure and function
- To support ecosystem services and societal goods and benefits
- To allow activities and stop their consequences
- To look for opportunities
- To make up for the past environmental mistakes/abuse and to restore/recreate
- To ensure adaptation to wider pressures such as climate change
- Because the law tells us to
- Because we are nice people and want to (‘duty of care’)

Activity-footprint

That area and/or time, based on the duration, intensity and frequency of an activity which ideally has been legally sanctioned by a regulator in an authorisation, licence, permit or consent.

Pressures-footprint

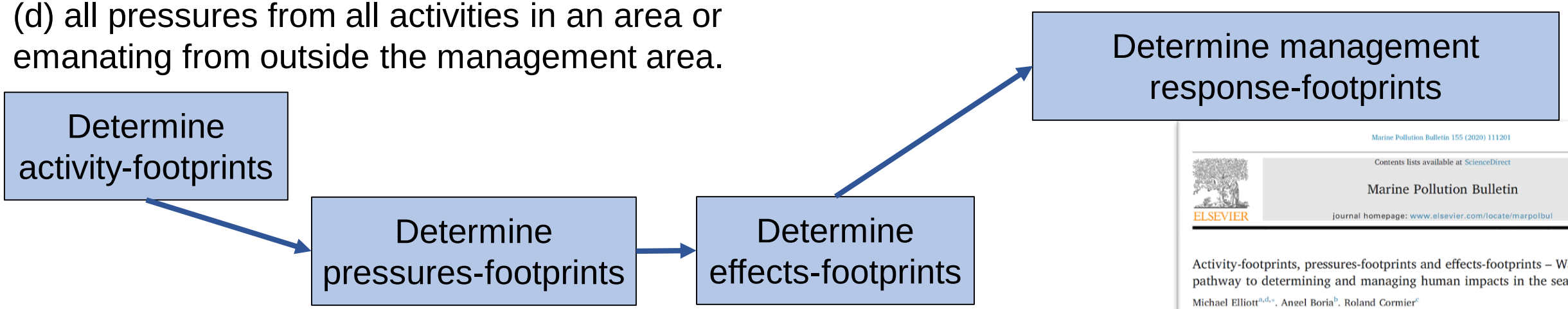
The mechanism(s) of change resulting from a given activity or all the activities in an area once avoidance and mitigation measures have been employed (the endogenic managed pressures).

Effects-footprint

The spatial (extent), temporal (duration), intensity, persistence and frequency characteristics resulting from (a) a single pressure from a marine activity, (b) all the pressures from that activity, (c) all the pressures from all activities in an area, or (d) all pressures from all activities in an area or emanating from outside the management area.

Management response-footprint

The area and/or time covered by the marine management action and measures (or programme of measures), including the distribution range of a species.



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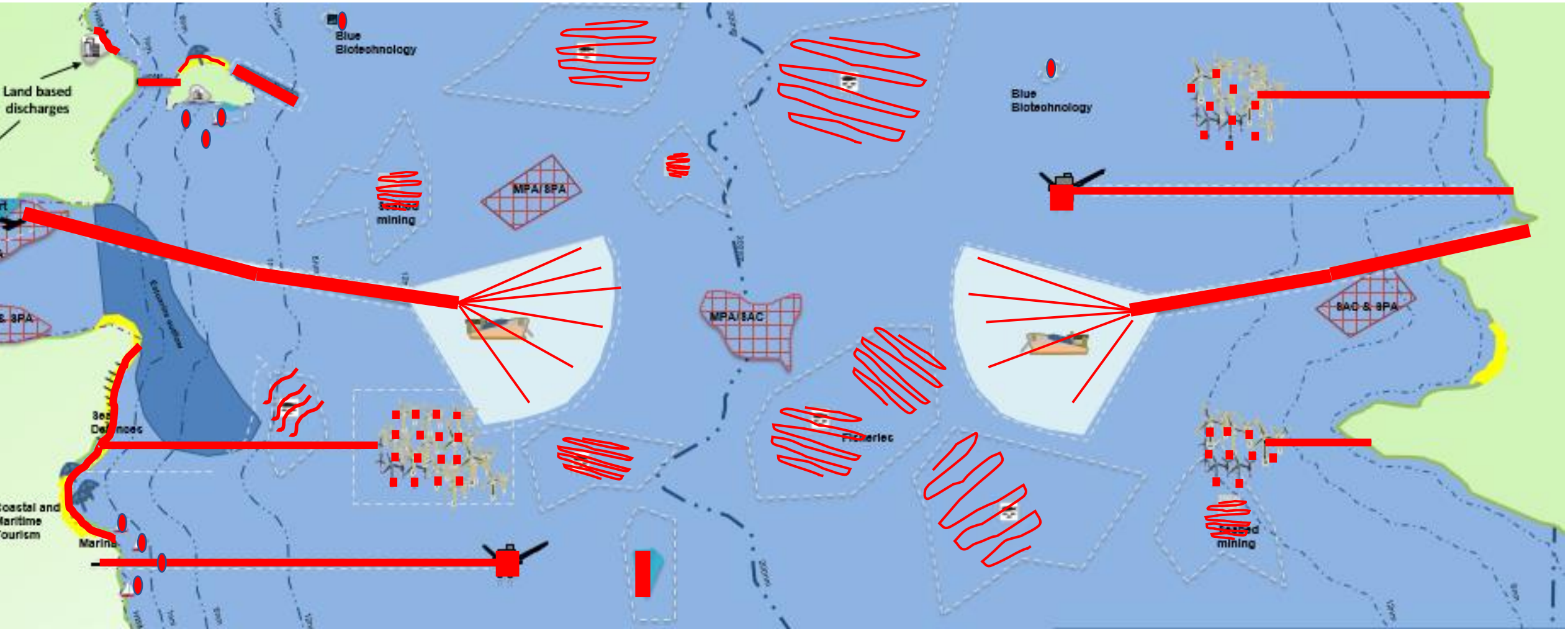
Activity-footprints, pressures-footprints and effects-footprints – Walking the pathway to determining and managing human impacts in the sea

Michael Elliott[a,d,*], Angel Boria[b], Roland Cormier[c]

(Elliott, Borja & Cormier 2020 Mar. Poll. Bull.)

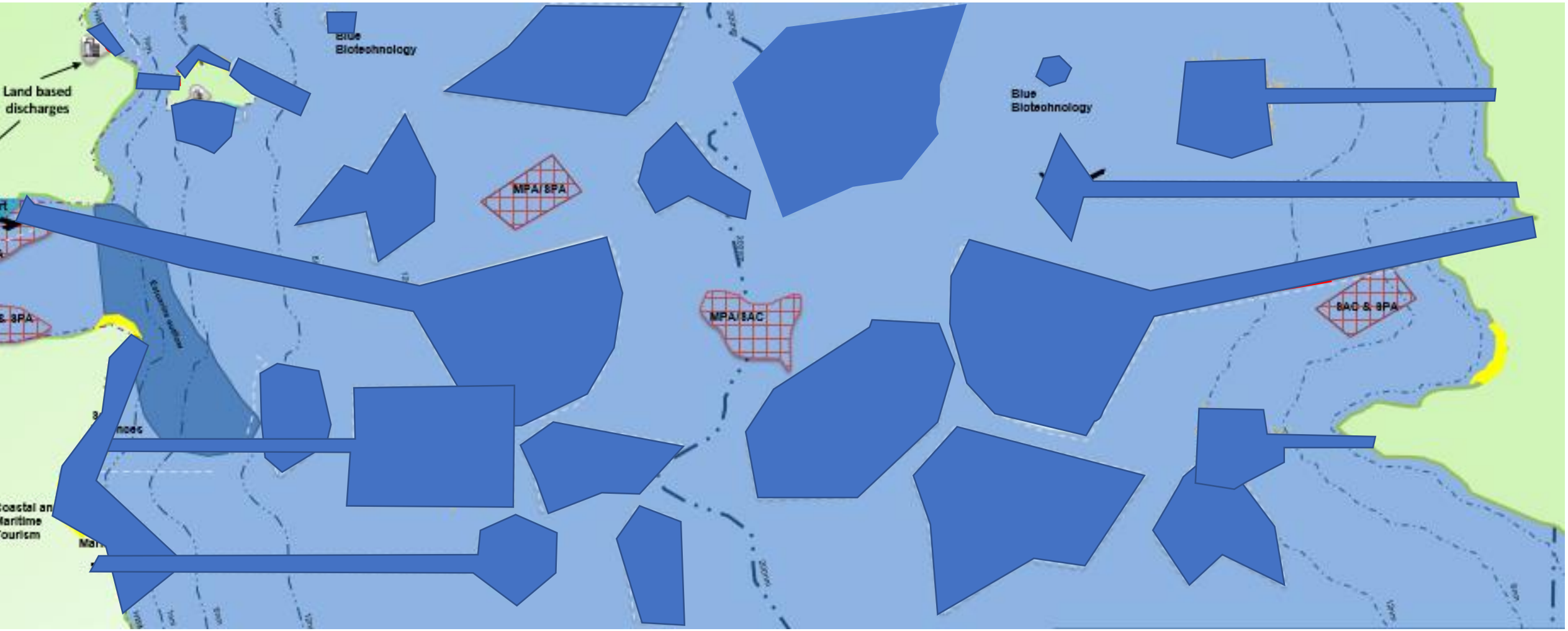
Challenge of multi-use international seas: Stylised transnational sea area showing activity footprints and transboundary Marine Protected Areas and fishing grounds – to reflect the challenges of complex marine management

Management of a complex transboundary area



Activity-footprint

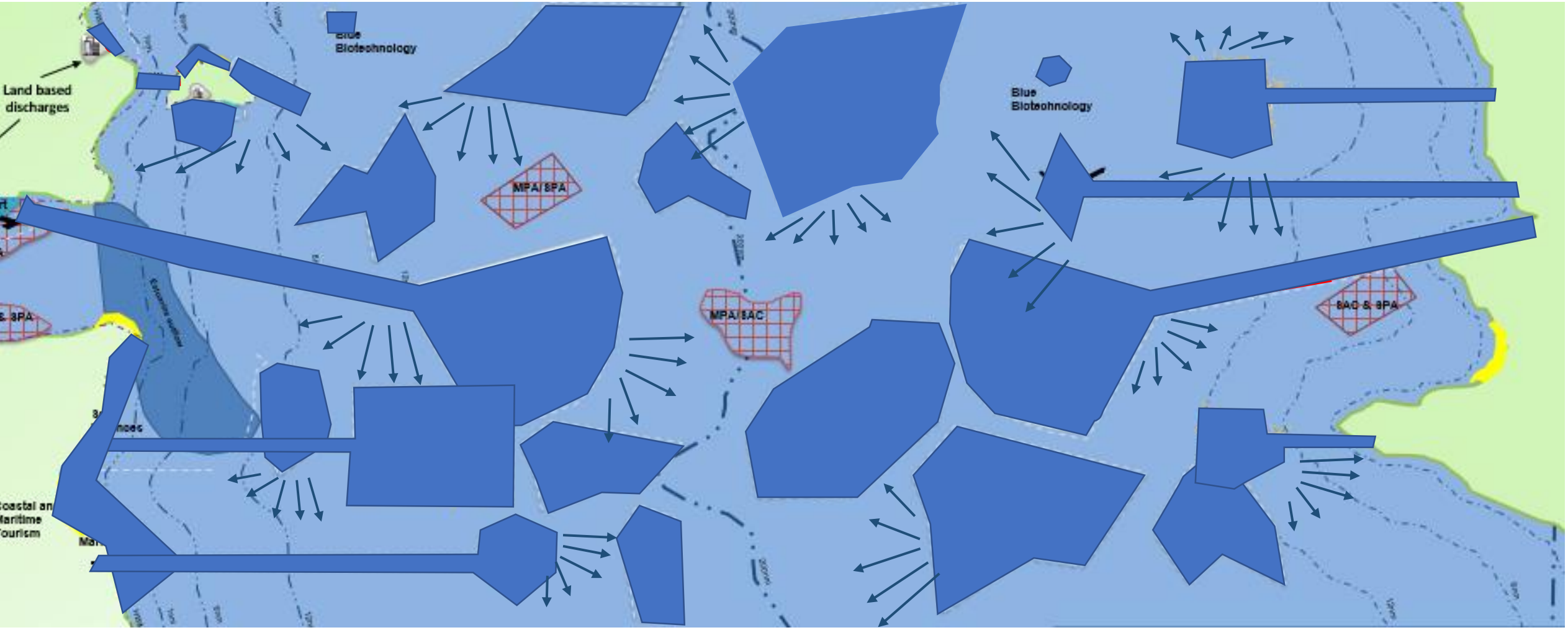
Management of a complex transboundary area



Activity-footprint

Pressures-footprint & EIA area? = Σ
Cumulative Effects Assessment?

Management of a complex transboundary area



Activity-footprint

Pressures-footprint & EIA area? = Σ
Cumulative Effects Assessment?

Effects-footprint

Management of a complex transboundary area

Activity-footprint

Pressures-footprint & EIA area? = Σ
Cumulative Effects Assessment?

Effects-footprint

Static feature conservation management

Highly mobile feature conservation management

AND RESPONSES-FOOTPRINTS?

Management of a complex transboundary area

How to manage the impacts and what are we trying to protect and restore: 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


Marine Pollution Bulletin 133 (2018) 367–377

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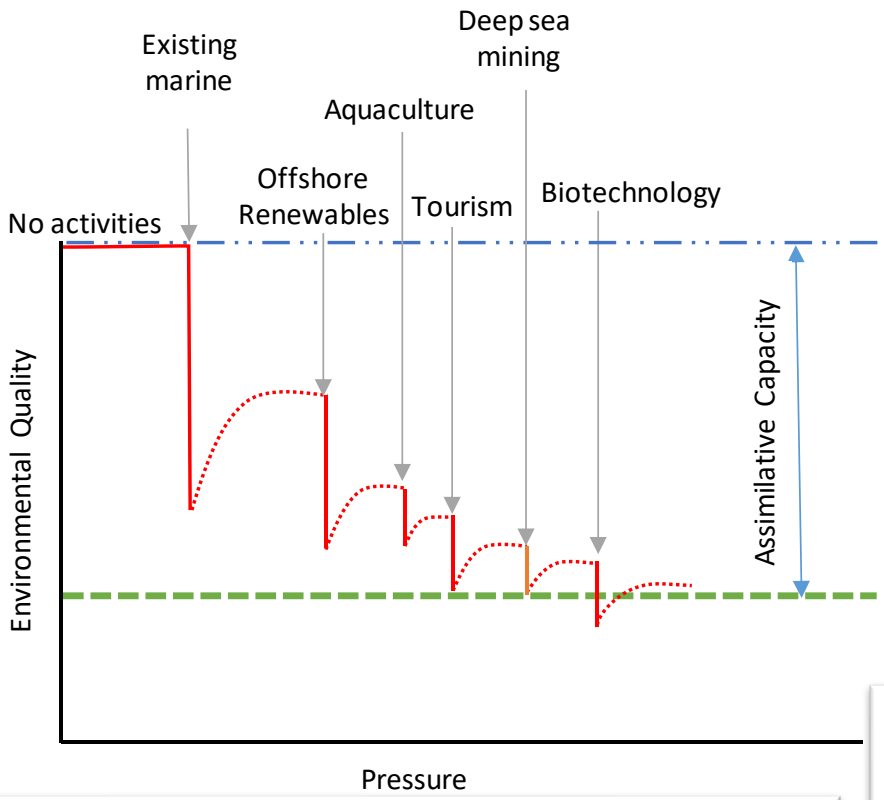
Viewpoint

Using best expert judgement to harmonise marine environmental status assessment and maritime spatial planning

Michael Elliott[a,*], Suzanne J. Boyes[a], Stephen Barnard[a], Ángel Borja[b]

Environmental Quality Model incl. mitigation measures for cumulative Blue Growth Activities

(Elliott et al., 2018, Mar. Poll. Bull.)



KEY

- Pristine marine environment with no activities
- GES threshold (∑ of 11 MSFD Descriptors)
- Trajectory of environmental quality as the marine area is used by multiple activities
- Regained environmental quality with mitigation and/or compensation measures


Marine Pollution Bulletin 76 (2013) 16–27
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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]


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Viewpoint

Using best expert judgement to harmonise marine environmental status assessment and maritime spatial planning

Michael Elliott [a,*], Suzanne J. Boyes [a], Stephen Barnard [a], Ángel Borja [b]

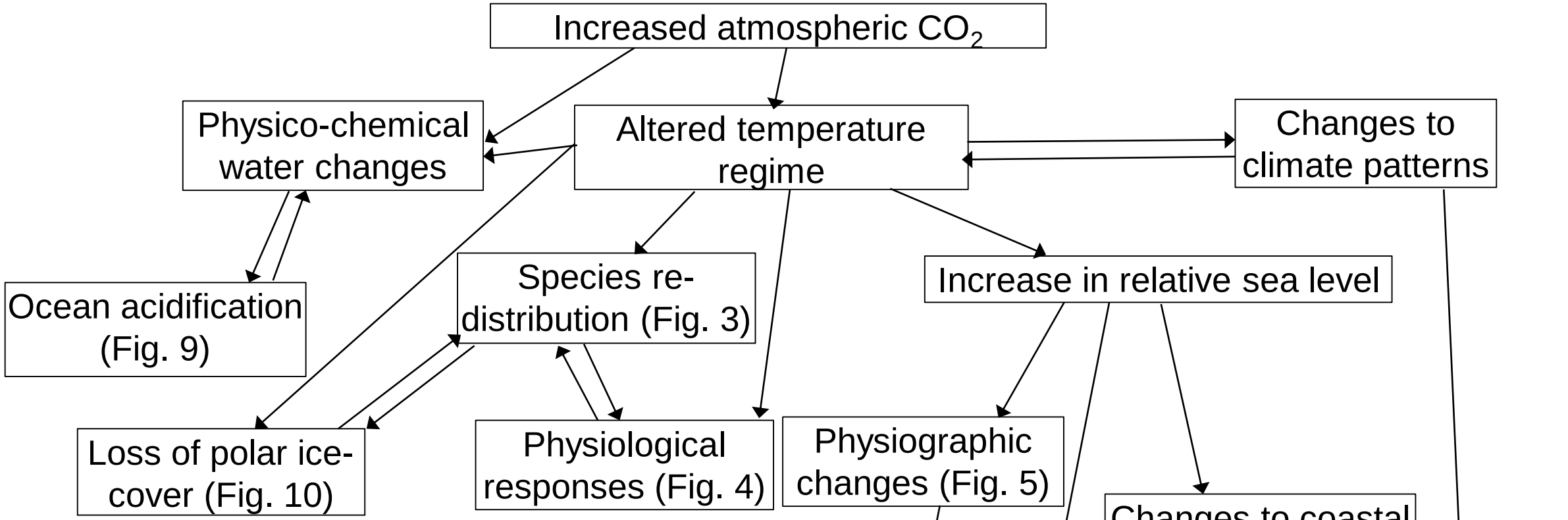
Climate Change Environmental Summary

Causes	Consequences	Solution examples
Hotter, drier summers	More droughts, water supply problems	Permanent inland water storage systems; water use reduction education, water transfer schemes
Greater frequency of rainstorms	More fluvial/pluvial flooding	Temporary inland water storage systems, ecoengineering of wetlands, increased water run-off mechanisms
Increased Sea Level Rise	Increase in tidal flooding/erosion	Greater defences in urban/industrial areas, roll-back policies,
Greater storminess/ surges	Increase in tidal flooding/erosion	Marine and estuarine defences, estuarine storage areas
Increase in non-indigenous species	Ecological repercussions	Greater biosecurity, marine controls

Focus on the global primary activity footprint for causes to climate change and the response activity footprint for the consequences

Climate change - Basic Premise:

- Exogenic (outside the management area) and endogenic (inside the management area) pressures produce individual, in-combination and cumulative effects.
- Global climate change is an *exogenic unmanaged pressure* where management has to respond to the consequences rather than the causes of that change.
- We can summarise our understanding as conceptual models (‘*horrendograms*’) to inform future natural and social science research and management.
- This presents managers with the sequence of responses by the natural and human systems, and hence indicate impediments to the implementation of legislation such as European Directives.



Marine Pollution Bulletin 95 (2015) 7–27

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Marine Pollution Bulletin

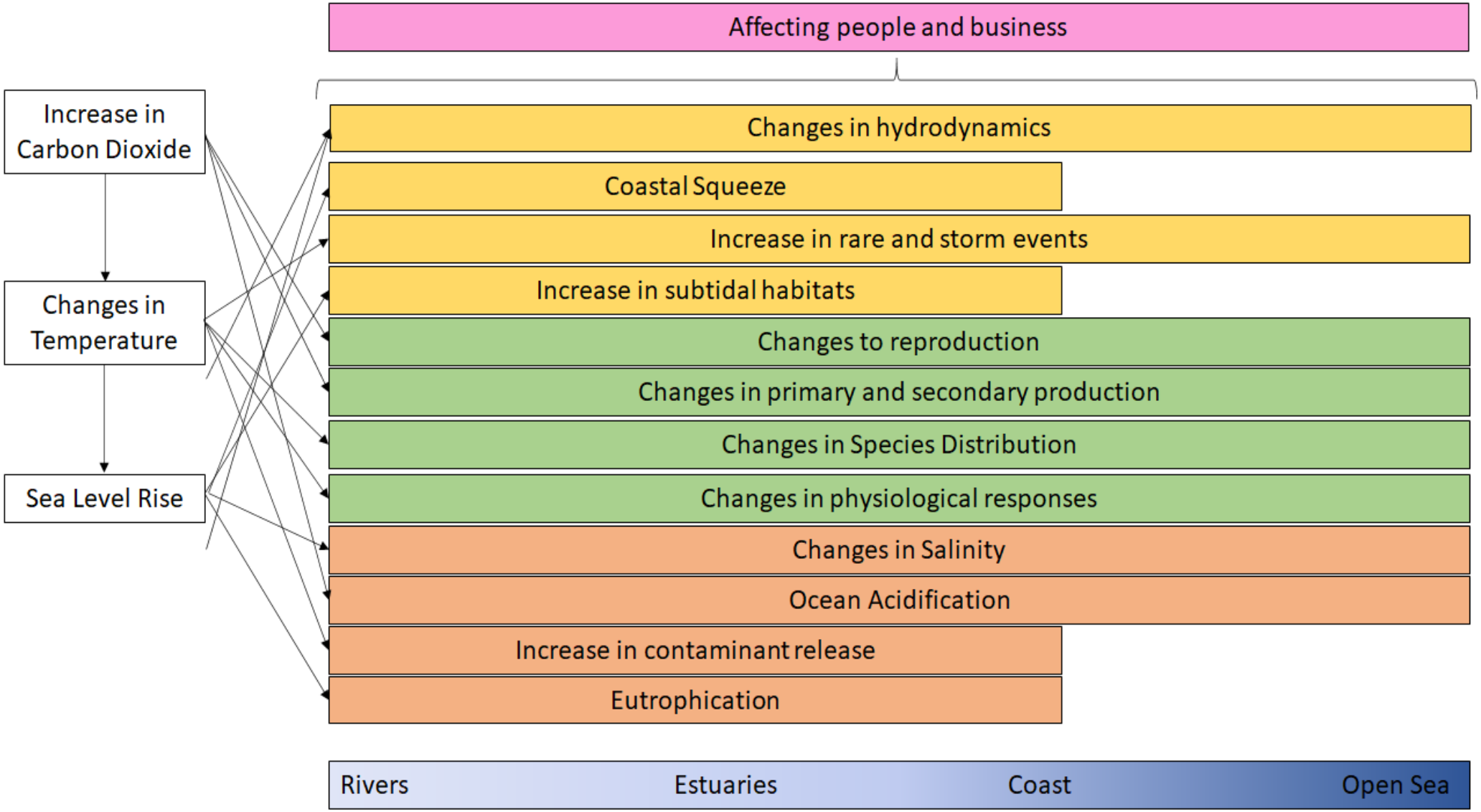
journal homepage: www.elsevier.com/locate/marpolbul

Viewpoint

Force majeure: Will climate change affect our ability to attain Good Environmental Status for marine biodiversity?

Michael Elliott [a,*], Ángel Borja [b], Abigail McQuatters-Gollop [c], Krysia Mazik [a], Silvana Birchenough [d], Jesper H. Andersen [e], Suzanne Painting [d], Myron Peck [f]

Primary drivers and consequences of marine global climate change (cross-referring to other figures in Elliott et al., 2015)



The catchment to coast continuum of climate change causes

(from Lonsdale, Leach, Elliott & Parsons, in revision).

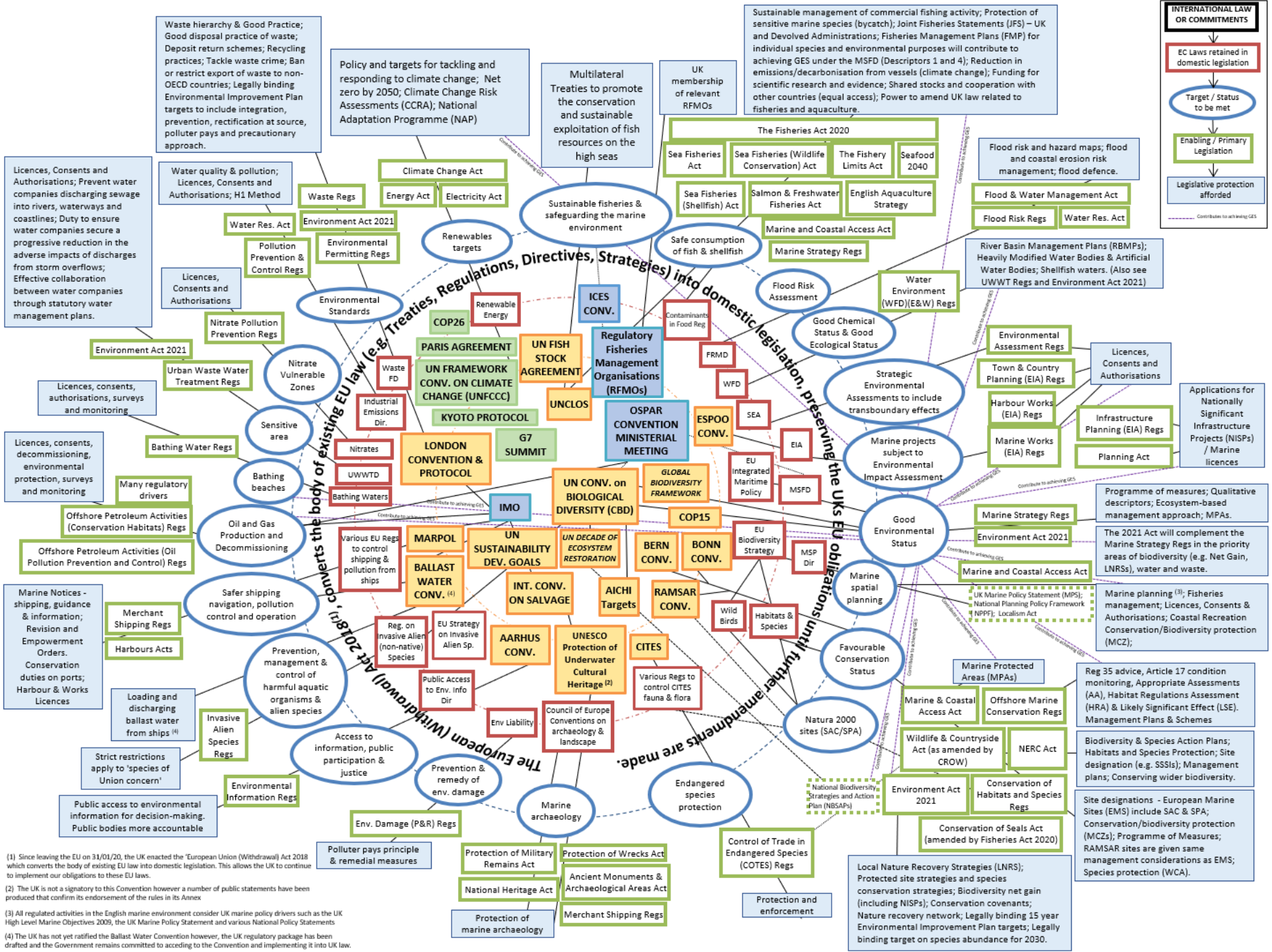
How are we managing it/them?

- By management action
- By developing programmes of measures
- By developing monitoring schemes
- By linking monitors to SMART indicators
- By feedback to check if management is working
- By implementing laws
- By having lots of managing bodies
- By making industry get their house in order
- By realizing the management footprint
- By having visions, objectives, policies
- By using good and fit for purpose science

Governance in management

incorporating internationally recognised policies, politics, legislation and administration by horizontal and vertical integration of the management organogram to accomplish the vision of The Ecosystem Approach.

- ecologically sustainable development
- inter-generational equity
- the precautionary principle
- conservation of biological diversity and ecological integrity
- ecological valuation
- economic valuation of environmental factors
- the ‘damager debt’ / ‘polluter pays’ principle
- waste minimisation, and
- public participation - the role of individuals and ethics.



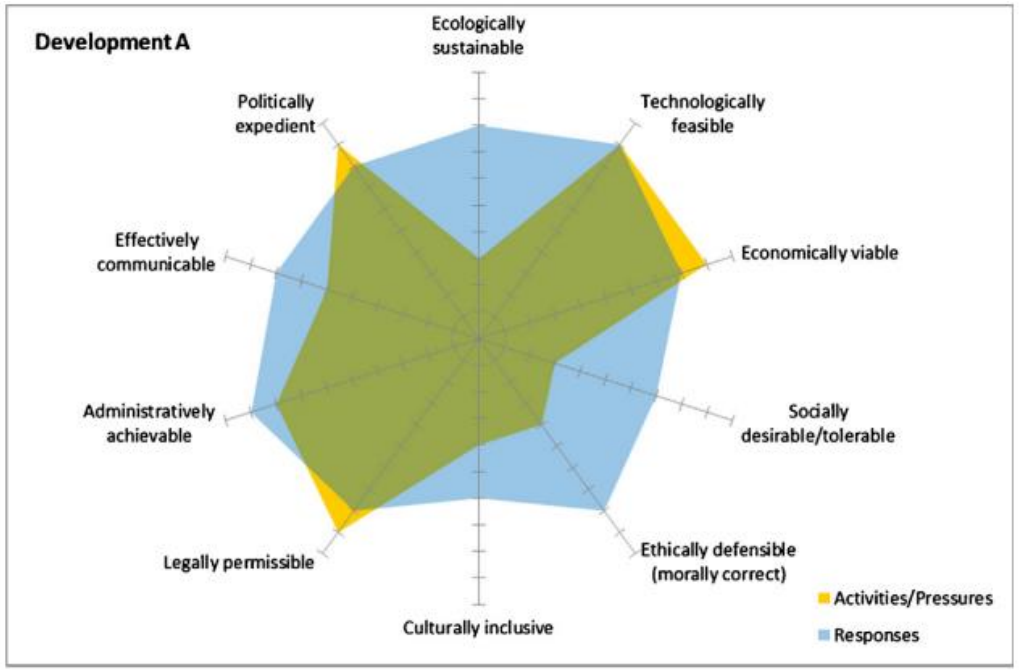
The increasingly-horrendous horrendogram – the estuarine & marine policy landscape (post-Brexit)

(from Elliott & Boyes, 2022, Unpubl. Rept. To Natural England)

Solutions - The 10-tenets:

To be successful, management measures or responses to changes resulting from human activities should be:

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




Marine Pollution Bulletin 74 (2013) 1–5

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Editorial

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


ENVIRONMENTAL SCIENCE & POLICY 51 (2015) 181–191

Available online at www.sciencedirect.com

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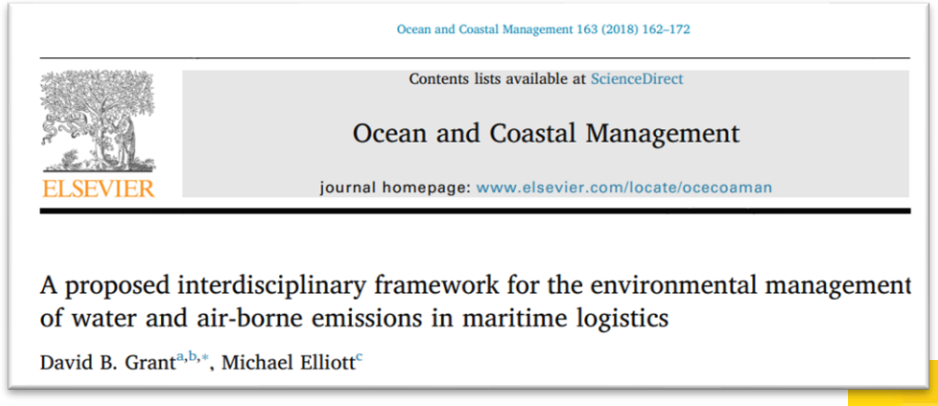
journal homepage: www.elsevier.com/locate/envsci

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

*Steve Barnard *, Michael Elliott*


Ocean and Coastal Management 163 (2018) 162–172

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Ocean and Coastal Management

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A proposed interdisciplinary framework for the environmental management of water and air-borne emissions in maritime logistics

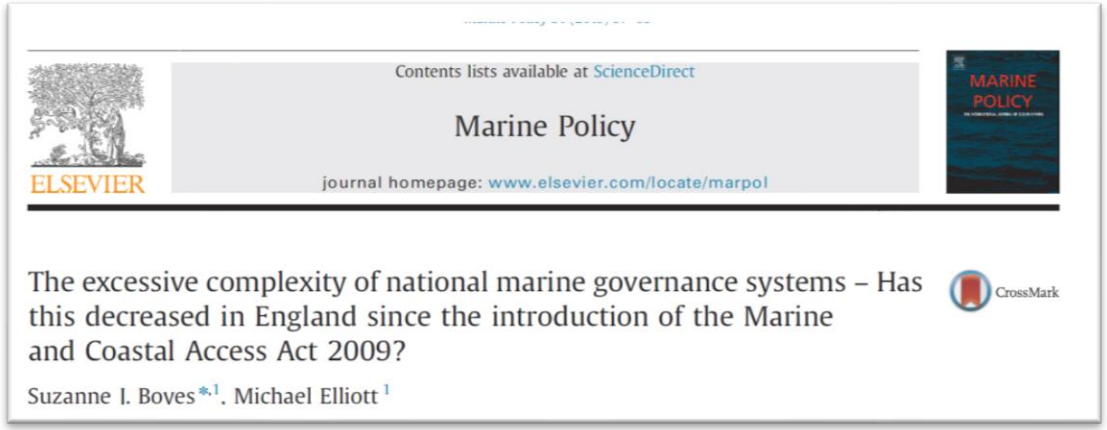
David B. Grant[a,b,*], Michael Elliott[c]

(NB spellcheck - not "10 Tennents – that's a good night in Scotland"!)

Tenet	Examples for climate change responses (Elliott for GESAMP WG41 unpubl.)
Ecologically sustainable	Use of Nature-based solutions, use of ecoengineering Types A & B, endpoint of ecological structure and functioning protection, diversity maintenance as all levels of biological organization, assimilative capacity
Technologically feasible	Environmental design of products, waste minimization, re-use and recycle, ecoengineering types A & B, geoengineering techniques
Economically viable	Environmental taxes, penalties, benefits and incentives, carbon pricing, carbon credits, good-for-business
Socially desirable/tolerable	Human (personal & societal) behaviour, acceptance of controls,
Legally permissible	Defending areas, moving back, planning blight, climate change blight, control regulations, laws, court action, global agreements
Administratively achievable	EPA, nature ministries, municipalities, etc.
Politically expedient	Guidelines and ethos from the top (COP26), political actions required by society, responding to public, 'Greta effect'
Ethically defensible (morally correct)	Desires for sustainability for now and future, willingness to pay, good neighbourliness, duty of care
Culturally inclusive	Custodianship, recognizing heritage, societal behavior and protection
Effectively communicable	Ensure the message is out, getting everyone on board

Who is doing the managing?

- Environmental protection agencies
- Nature conservation bodies
- Fisheries departments
- Developers
- Municipal authorities
- Environmental health departments
- Port authorities
- Industries
- NGOs



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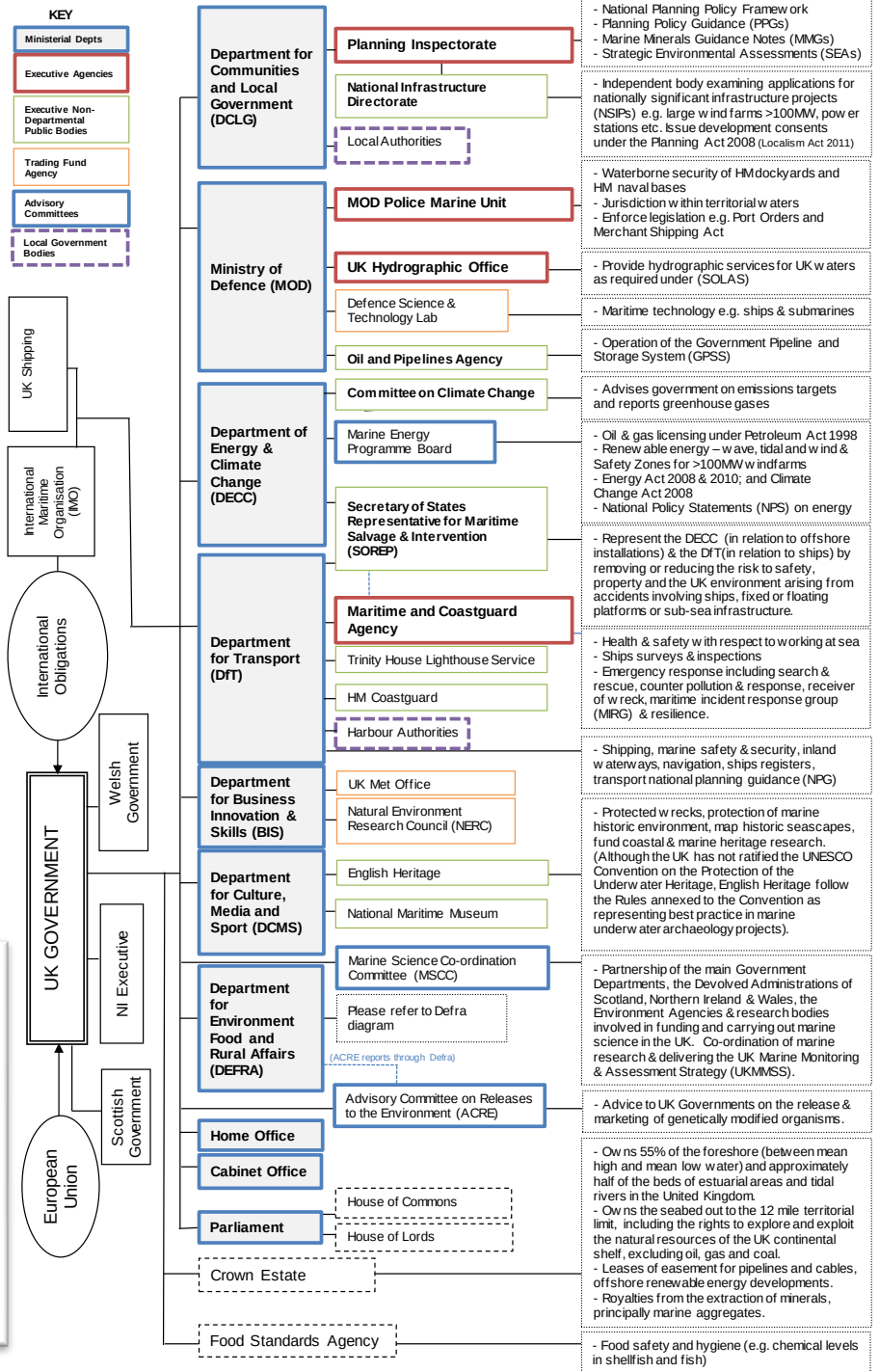
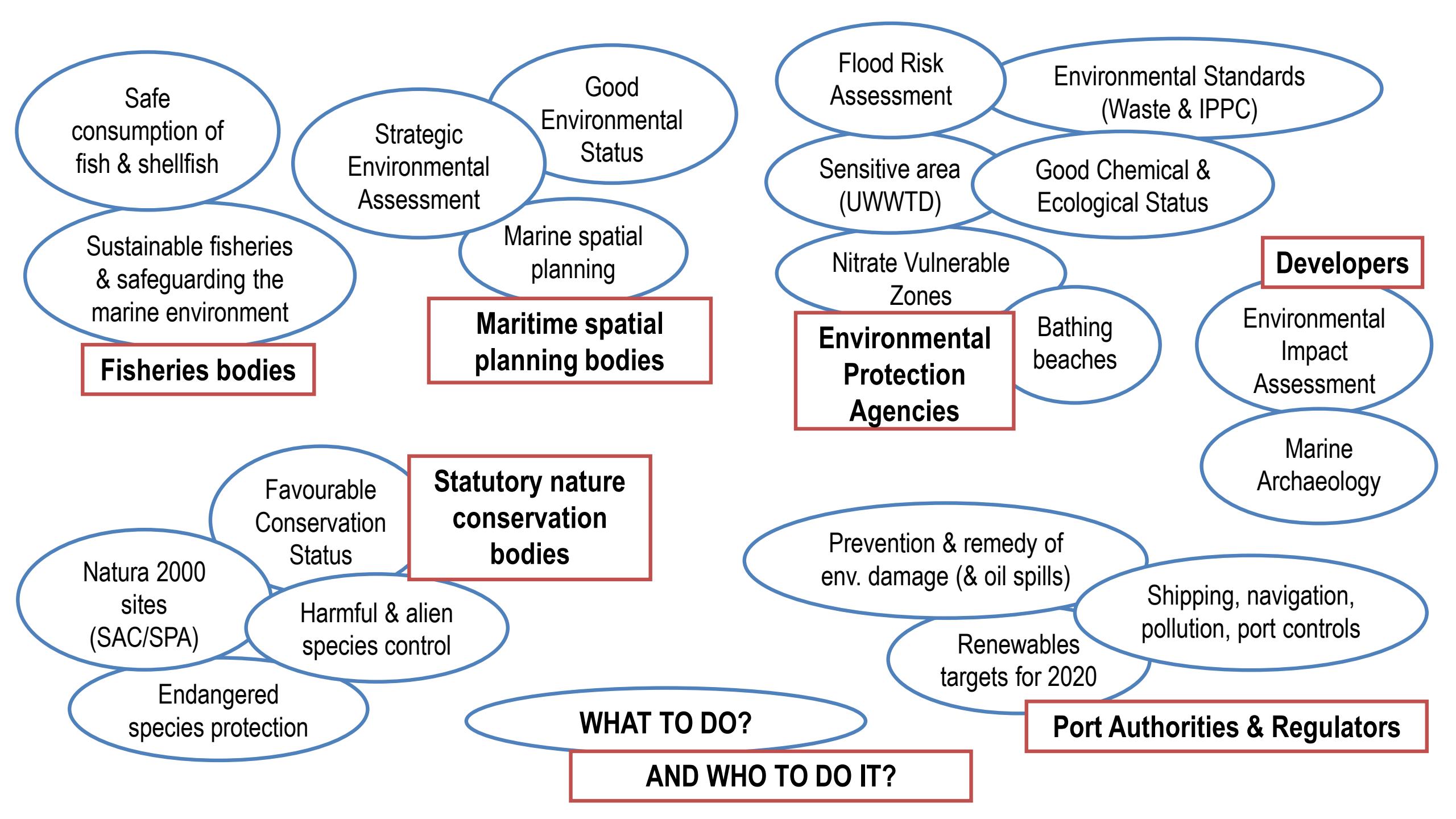
Marine Policy

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

The excessive complexity of national marine governance systems – Has this decreased in England since the introduction of the Marine and Coastal Access Act 2009?

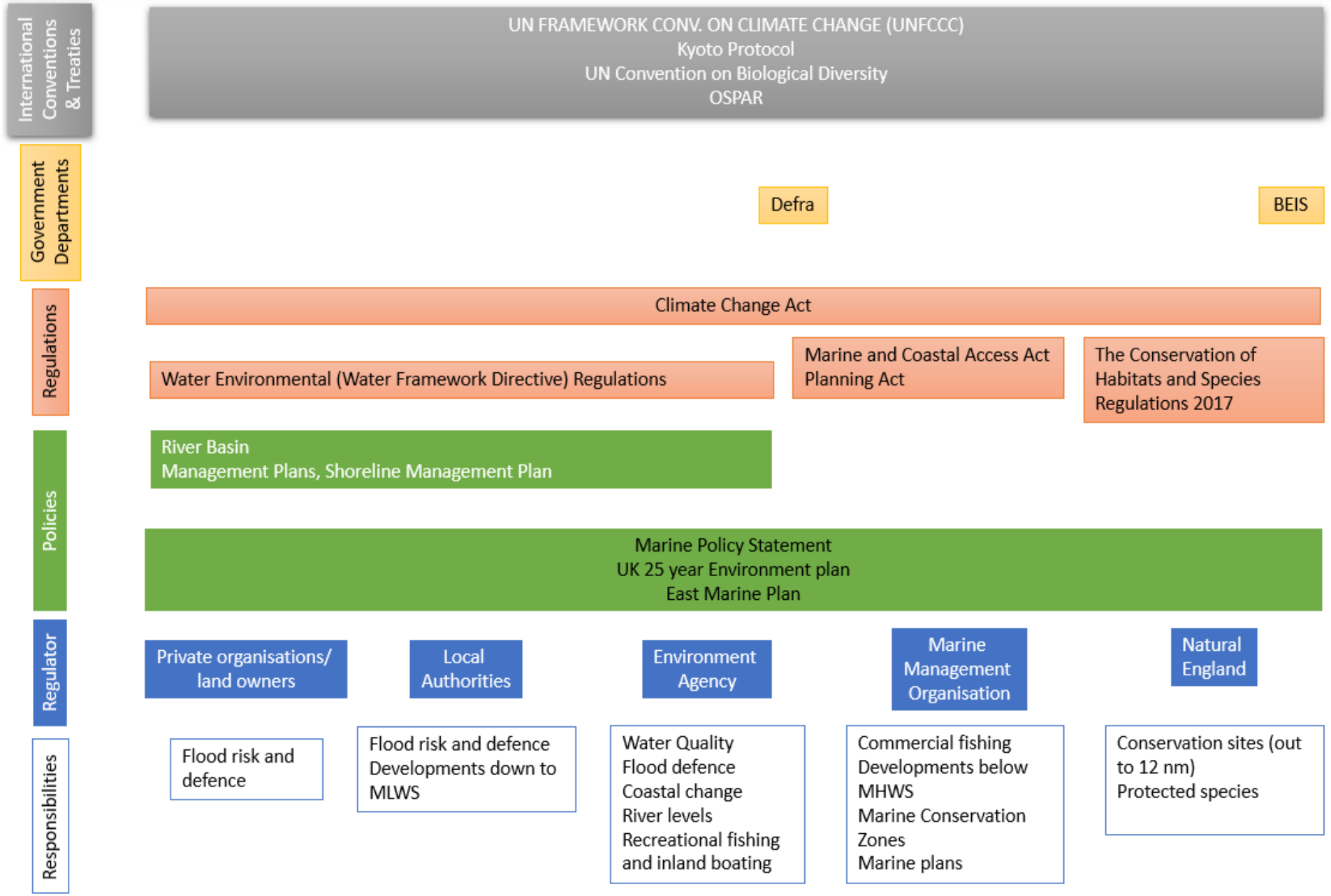
Suzanne I. Boyes *[1], Michael Elliott [1]




Safe consumption of fish & shellfish
Sustainable fisheries & safeguarding the marine environment
Fisheries bodies
Strategic Environmental Assessment
Good Environmental Status
Marine spatial planning
Maritime spatial planning bodies
Flood Risk Assessment
Environmental Standards (Waste & IPPC)
Sensitive area (UWWTD)
Good Chemical & Ecological Status
Nitrate Vulnerable Zones
Bathing beaches
Environmental Protection Agencies
Developers
Environmental Impact Assessment
Marine Archaeology
Favourable Conservation Status
Statutory nature conservation bodies
Natura 2000 sites (SAC/SPA)
Harmful & alien species control
Endangered species protection
Prevention & remedy of env. damage (& oil spills)
Shipping, navigation, pollution, port controls
Renewables targets for 2020
Port Authorities & Regulators
WHAT TO DO?
AND WHO TO DO IT?

Types of Government departments with a marine competency (with their agencies):

- Environment, food and rural affairs
- Fisheries and conservation
- Business, skills, innovation, energy and climate change
- Foreign office
- International development office
- Defence
- Transport
- Communities and local government
- Culture, media and sport
- Home office
- Cabinet office



The horizontal and vertical governance of the Humber Estuary specific to estuarine climate change adaptation management

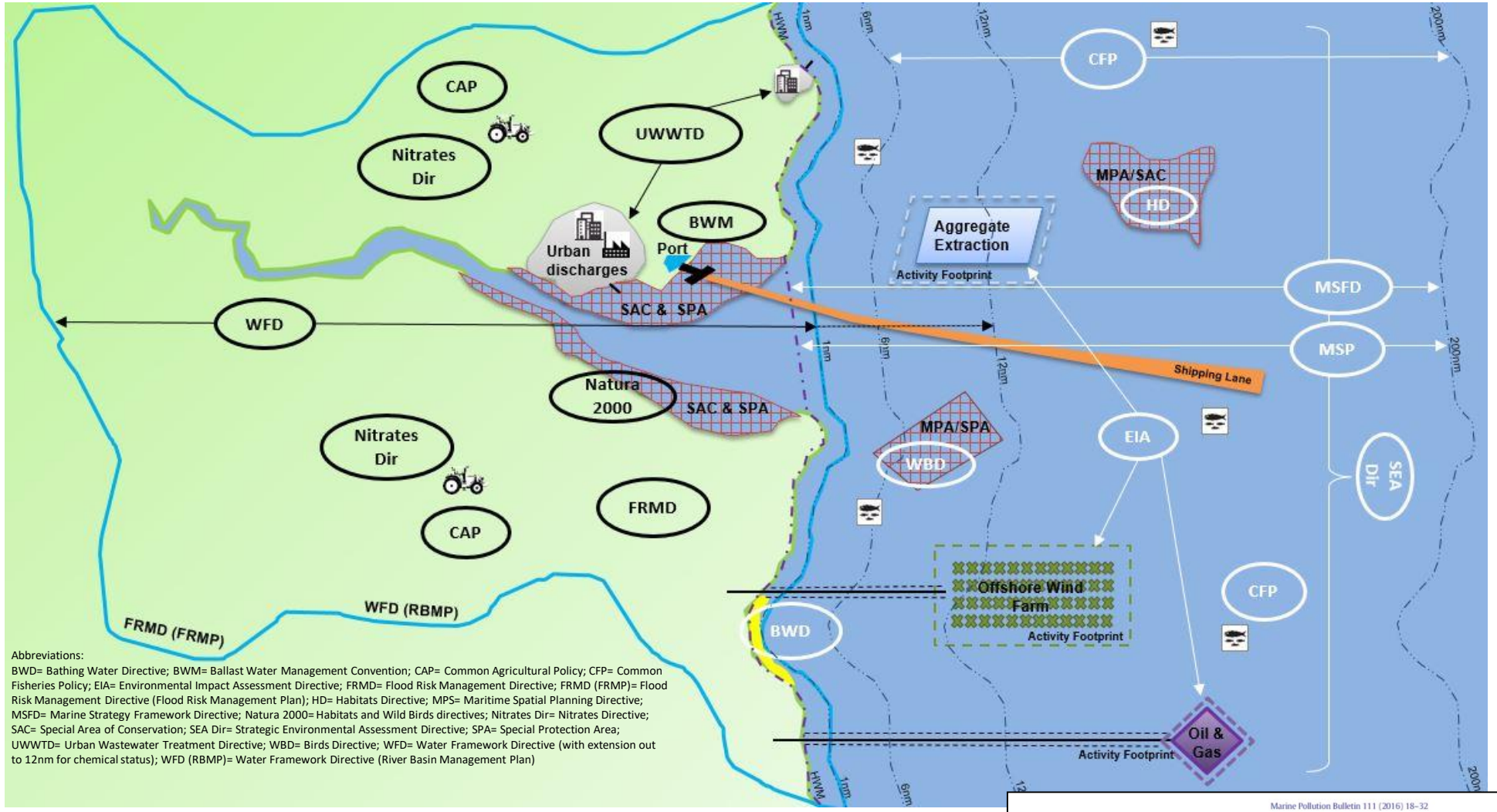
(from Lonsdale, Leach, Elliott & Parsons, in revision)

	Effect	What is(are) the policy (or policies) addressing the climate change effects	What is(are) the agency (or agencies) implementing the policy (policies)?
Physical	Changes in coastal hydrodynamics	River Basin Management Plans, Shoreline Management Plan, Water Environmental (Water Framework Directive) Regulations,	Environment Agency. Local Authorities. Private landowners
	Coastal squeeze	River Basin Management Plans, Shoreline Management Plan, Water Environmental (Water Framework Directive) Regulations,	Environment Agency. Natural England (for compensation sites under Habitats Regulations Assessment)
Chemical	Ocean Acidification	Water Environmental (Water Framework Directive) Regulations,	Environment Agency
	Changes in salinity	Water Environmental (Water Framework Directive) Regulations,	Environment Agency
	Increase in contamination release	Water Environmental (Water Framework Directive) Regulations, Marine and Coastal Access Act	Environment Agency Sediment contamination is also considered by the Marine Management Organization.
Biological	Changes in reproduction	Water Environmental (Water Framework Directive) Regulations	Environment Agency
	Changes in primary and secondary production	Water Environmental (Water Framework Directive) Regulations	Environment Agency
	Changes in species distribution	Water Environmental (Water Framework Directive) Regulations	Environment Agency.
	Changes in physiological responses	Water Environmental (Water Framework Directive) Regulations	Environment Agency

The policies and their competent authority for addressing climate change effects in estuaries (from Lonsdale, Leach, Elliott & Parsons, in revision).

Where are we managing?

- A small area (the activity footprint)
- A middle sized area (pressures footprints)
- Middle to large areas (effects footprints)
- Whole estuaries
- Whole catchments/river basins
- Catchment-estuary-coastal areas
- Seas and sea regions
- Regional seas
- Areas Beyond National Jurisdictions
- The globe

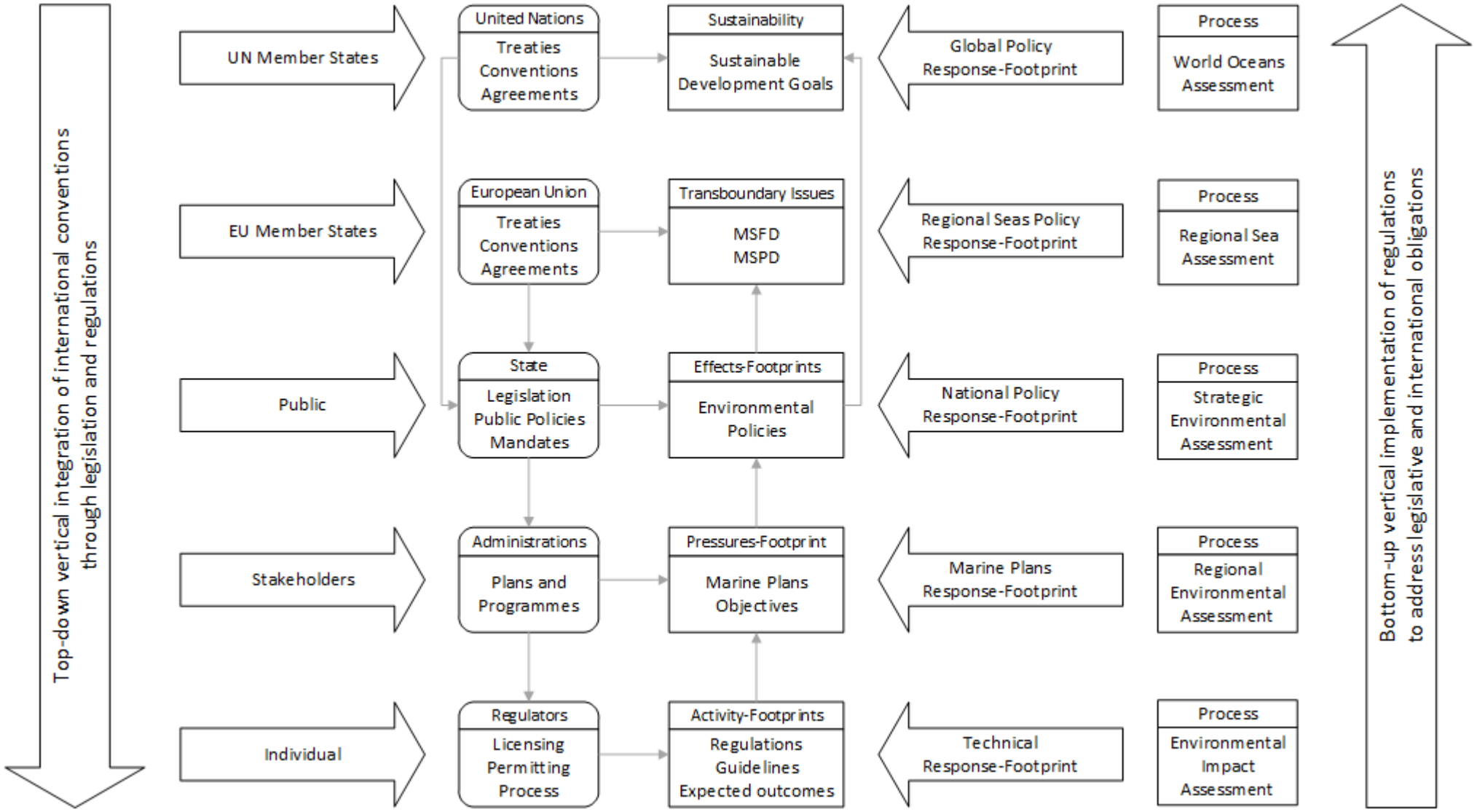


An example of Management response-footprints – the geographical scope and competencies of EU legislation


Marine Pollution Bulletin 111 (2016) 18–32
Contents lists available at ScienceDirect
Marine Pollution Bulletin
journal homepage: www.elsevier.com/locate/marpolbul
ELSEVIER
Review

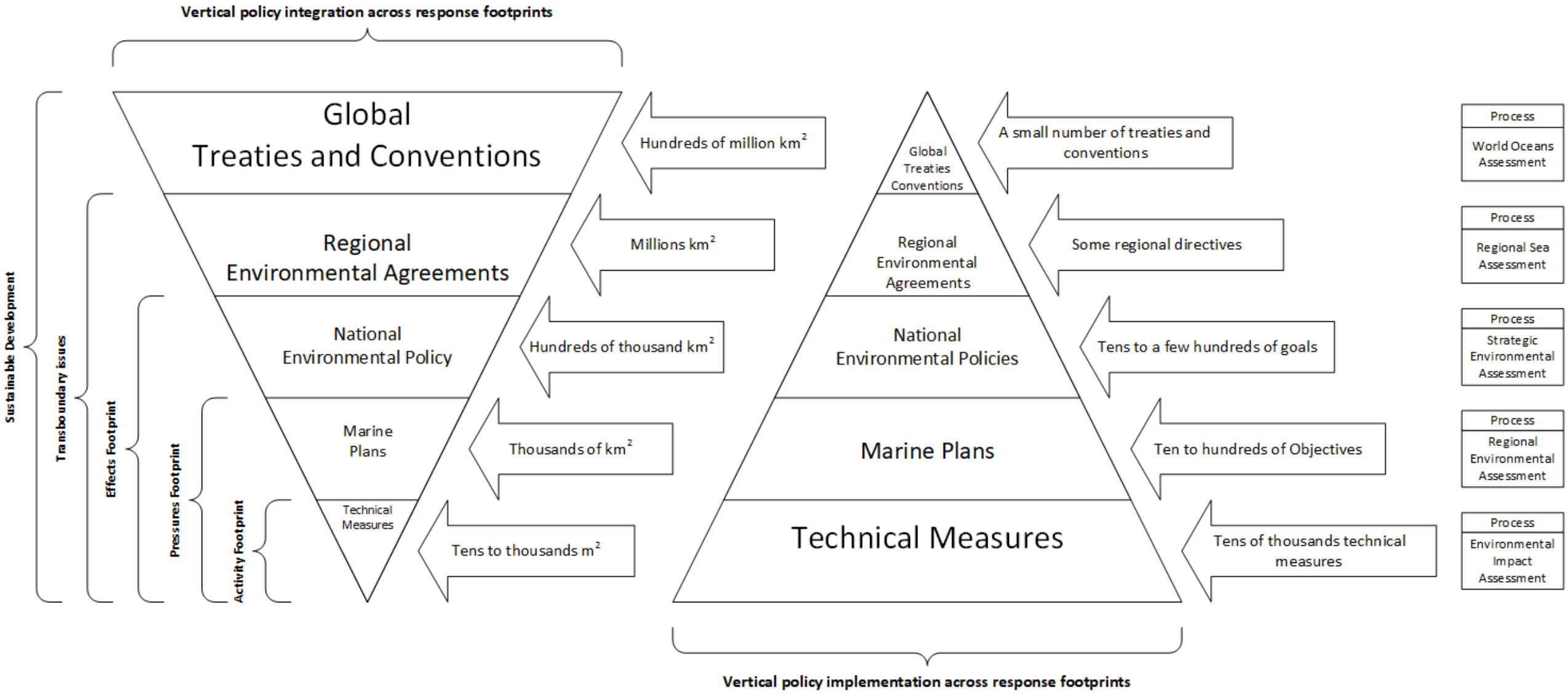
Is existing legislation fit-for-purpose to achieve Good Environmental Status in European seas?

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



Top -down and bottom-up integration of regional and national policies, plans and programmes, regulatory and non-regulatory frameworks for implementation, and footprints (Cormier, Elliott & Borja, submitted)

The '*management response-footprint pyramid*'



(From Cormier, Elliott & Borja – submitted)

Management of:	Examples of management to give response footprints
Activity (covering the immediate area where the activity takes place)	Fisheries bylaws, fish and shellfish extraction Pipeline discharge consents and permits Authorisations for industrial processes Agricultural guidelines for nutrient run-off Ballast water discharge Port operations Planning permissions EIA and ES coverage Seabed extraction and dredged-material disposal licences Habitat regulations assessments Sea bed occupancy permissions
Pressures (the area and time where the pressures may be detected)	Embedded and implicit in the above permissions but the area is not delimited
Effects (the area and time where the effects on nature and society may be detected)	Embedded and implicit in the above permissions but the area is not delimited

Management of:	Examples of management to give response footprints
Whole sea region (within and between national jurisdictions, territorial waters (to 12 nm) and EEZ)	Strategic Environmental Assessments Habitats regulations assessments Maritime Spatial Planning guidelines Marine Protected Area designation Marine Strategy Framework Directive and Water Framework Directive assessments Regional Seas Conventions – Quality Status Reports Particularly Sensitive Sea Areas (PSSA) Ecologically or Biologically Sensitive Areas (EBSA) National obligations transposed from international agreements
ABNJ (Areas Beyond National Jurisdictions) (the high seas, beyond 200 nm)	Vessel regulations in registered state Seabed Mining Authority (SMA) International Maritime Organisation regulations (IMO) UN Convention of Law of the Sea (UNCLOS) Internationally Legally Binding Instrument (ILBI) UNESCO World Heritage sites London Protocol (sea deposits)
Global	Paris COP SDG14 Implementation

Global Ocean Initiatives

Initiative	Date	Release
Convention on Biological Diversity – Ecosystem Approach	2000, 2004	CoP agreed
Sustainable Development Goals (SDG)	2015	Adopted
World Oceans Assessment I	2015	Published
G7 Future of the Seas & Oceans Initiative	2016	Adopted
World Oceans Assessment II	2021	Published
UN Decade of Ocean Science for Sustainability	2021-2030	
UN Decade of Ecological Restoration	2021-2030	
G7 Ocean Decade Navigation Plan, Climate and Environmental Ministerial Ocean Action	2021	Adopted
Paris Climate Change Agreement CoP26 (Glasgow)	2021	

Hence 2021 is called 'a super year for the oceans!'

Convention/Agreement	Domain
UN Sustainable Development Goals	High level, e.g. SDG14 Life Below Water
UN Convention on Biological Diversity	Conservation, sustainability, Ecosystem Approach, Aichi targets
Bern / Bonn (Convention on Migratory Species)/RAMSAR/CITES	Endangered species, migratory species, trade in protected species and products
UN Framework on Climate Change Convention	e.g. Paris COP/Kyoto, emission and temperature targets
Fisheries (e.g. ICES, London Convention on Fisheries, UN Fish Stock Agreement)	Quotas, science advice, straddling stocks
IMO London (Dumping) Convention	Waste and other matter disposal
UNCLOS	International ocean law, (boundary disputes?)
UNESCO (Heritage convention)	cultural aspects, archaeology, underwater heritage
International Salvage Convention/IMO/MARPOL	Salvage, oil spills, non-indigenous species, ballast water, garbage
OSPAR	Regional seas management, de facto implementation of MSFD
UNECE – ESPOO convention; SEA Protocol (Kyiv 2003)	Strategic environmental assessment, transboundary environmental damage
UNECE – Aarhus convention	Public access to environmental information

International conventions

IMO

CITES

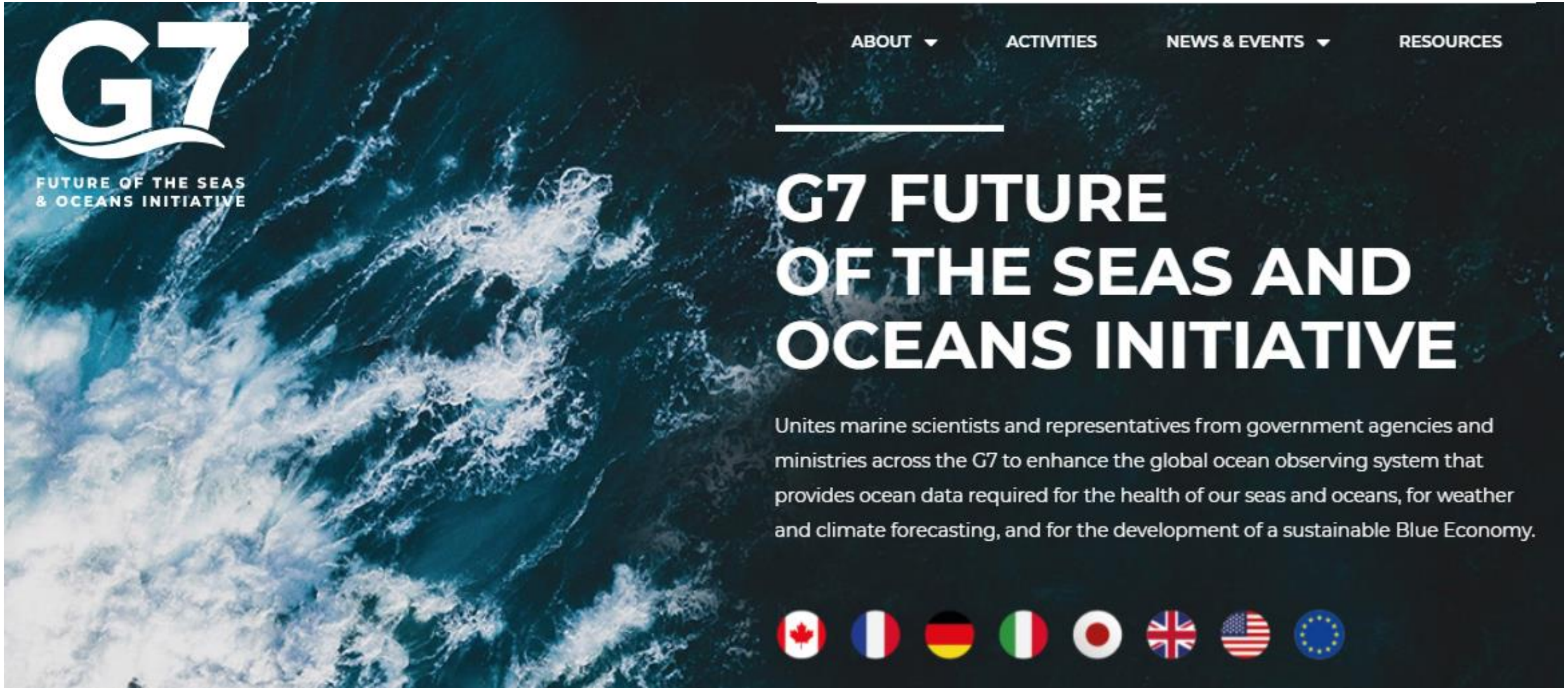
LC&P LONDON CONVENTION AND PROTOCOL

OSPAR COMMISSION

Ramsar CONVENTION ON WETLANDS CONVENTION SUR LES ZONES HUMIDES CONVENCIÓN SOBRE LOS HUMEDALES (Ramsar, Iran, 1971)

SUSTAINABLE DEVELOPMENT GOALS

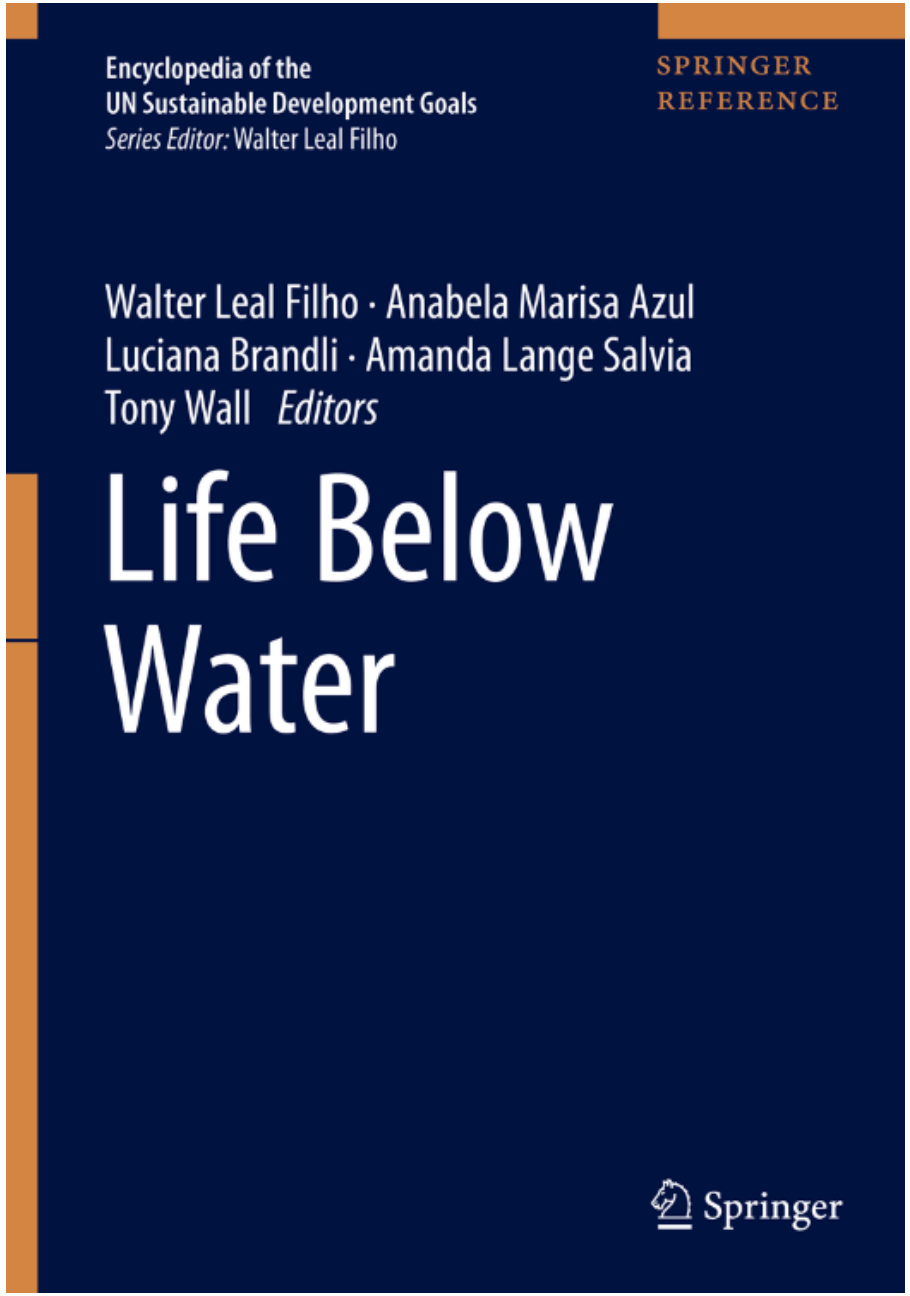
ICES CIEM

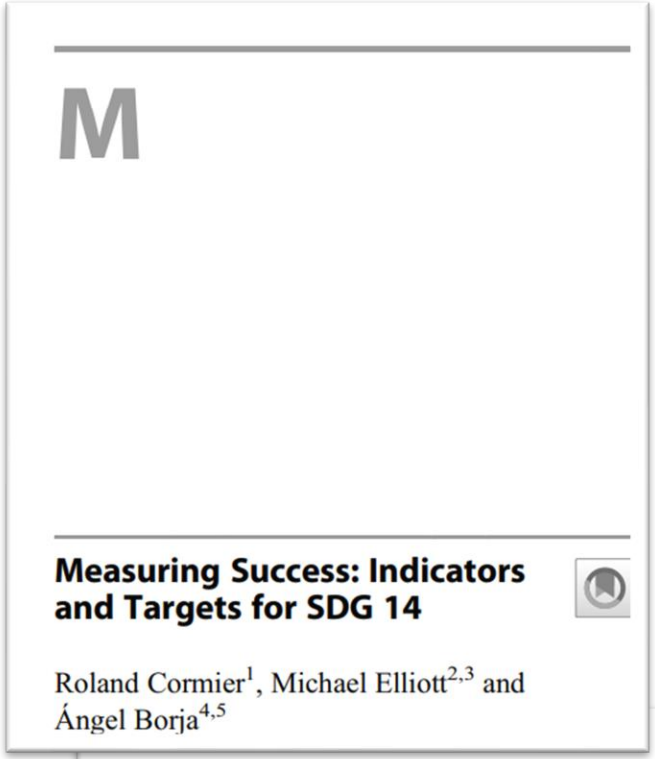

G7
FUTURE OF THE SEAS
& OCEANS INITIATIVE
ABOUT
ACTIVITIES
NEWS & EVENTS
RESOURCES
G7 FUTURE OF THE SEAS AND OCEANS INITIATIVE
Unites marine scientists and representatives from government agencies and ministries across the G7 to enhance the global ocean observing system that provides ocean data required for the health of our seas and oceans, for weather and climate forecasting, and for the development of a sustainable Blue Economy.

Global Marine Initiatives – Agreements rather than binding law:

(ICES-UNECE Working Group on Risk Assessment and Management for SDG14)

The 17 SDG were adopted by the UN to be achieved by 2030 – SDG14 (*Life Below Water*) cover the marine with 10 targets and 10 indicators adopted by the UN



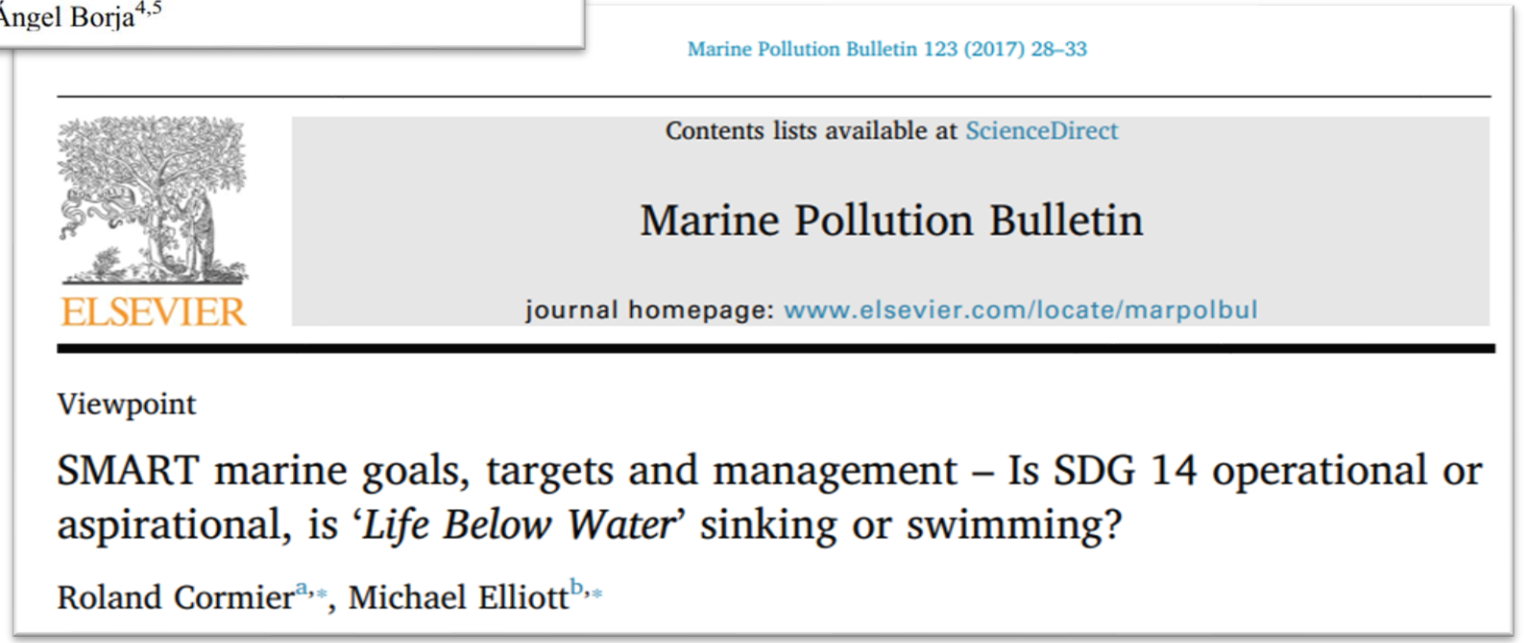


M

Measuring Success: Indicators and Targets for SDG 14

Roland Cormier[1], Michael Elliott[2,3] and Ángel Borja[4,5]

For further details see:



Marine Pollution Bulletin 123 (2017) 28–33

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Marine Pollution Bulletin

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

Viewpoint

SMART marine goals, targets and management – Is SDG 14 operational or aspirational, is '*Life Below Water*' sinking or swimming?

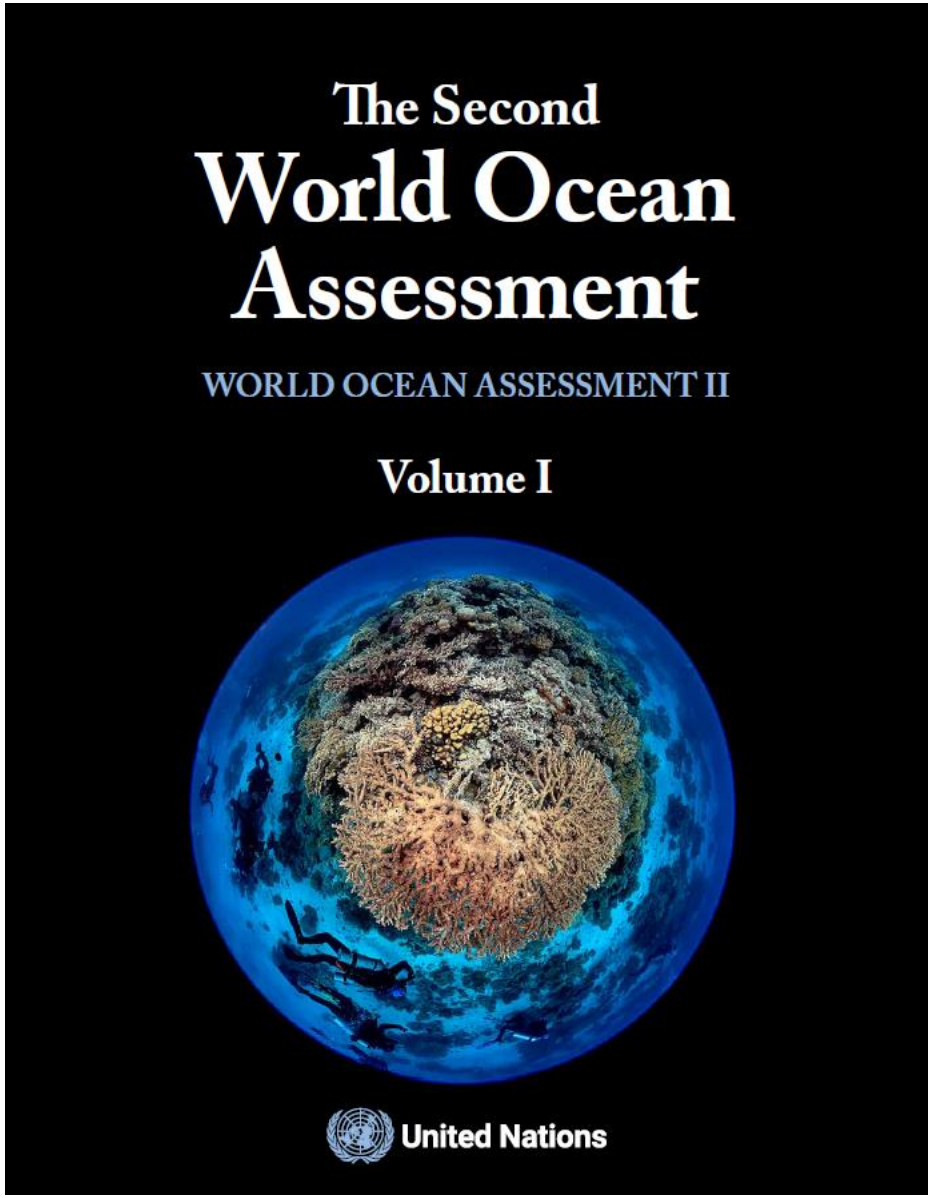
Roland Cormier[a,*], Michael Elliott[b,*]

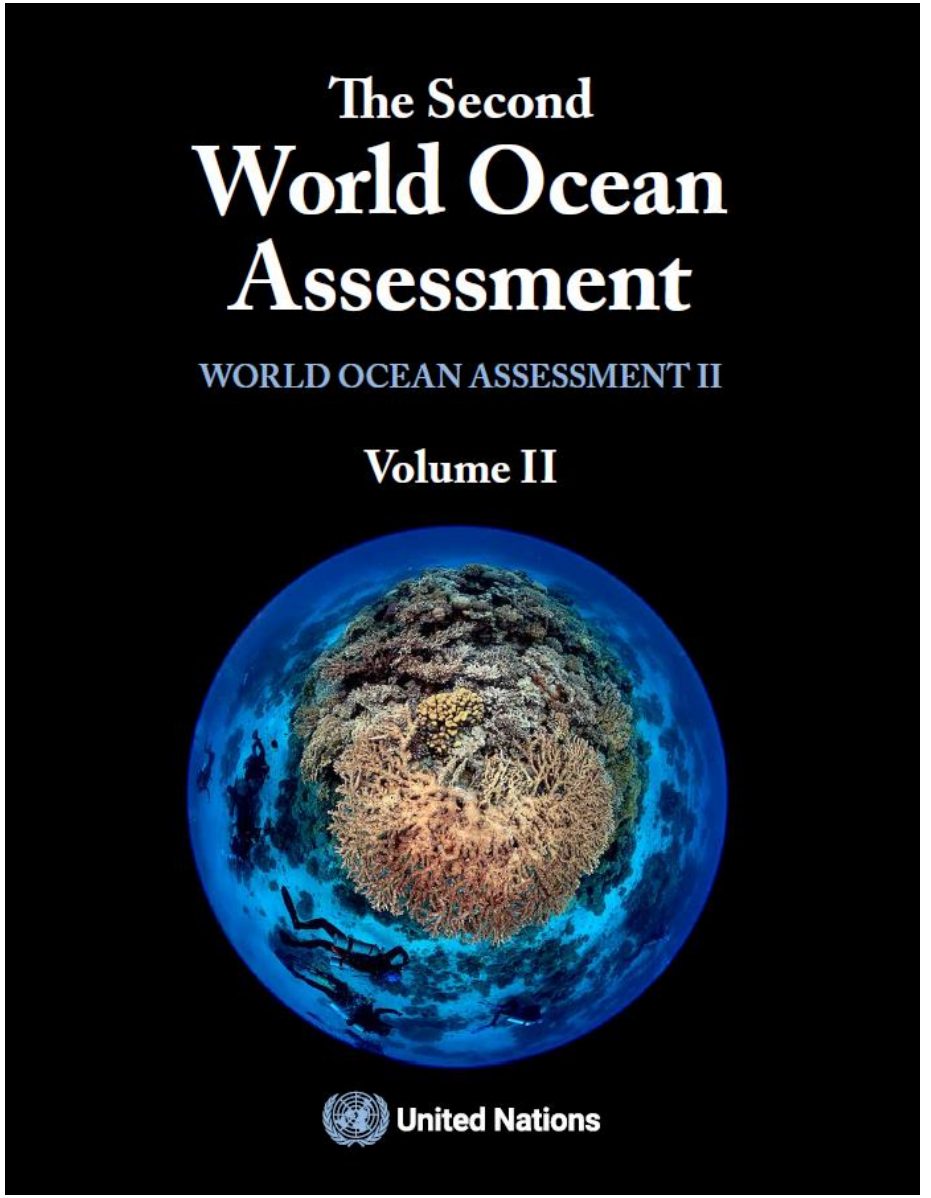
United Nations Decade of Ocean Science for Sustainable Development (2021-2030)

- Aim: to support efforts to reverse the cycle of decline in ocean health and gather ocean stakeholders worldwide behind a common framework
- To ensure ocean science can fully support countries in creating improved conditions for sustainable development of the Ocean.
- To give scientific understanding of the responses to pressures and management action, to underpin the SDG.
- Observations and research are essential to predict the consequences of change, design mitigation and guide adaptation.
- Coordinated by the Intergovernmental Oceanographic Commission (IOC) of UNESCO and implemented in UK by NOC and MSCC.

2021 2030 United Nations Decade of Ocean Science for Sustainable Development

Seven Decade Outcomes from 10 Decade Challenges and 9 Actions!

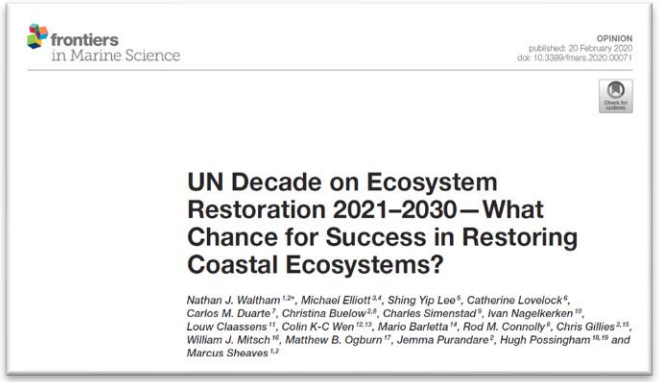




- WOAII - 28 Chapters, 1050 pages, including Recent Advances in Marine Management
- To help implement the 2030 Agenda for Sustainable Development, particularly its ocean related goals.
- Released April 21st 2021!

Current state of modified and impacted coastal ecosystems and expected state following the Decade of Eco. Res.

(NB. the uncertainty in the success of past restoration efforts, current state of altered systems, climate variability and restoration actions now in in the future – this may mean that the benefits of the Decade take longer than a decade!)


frontiers in Marine Science

OPINION

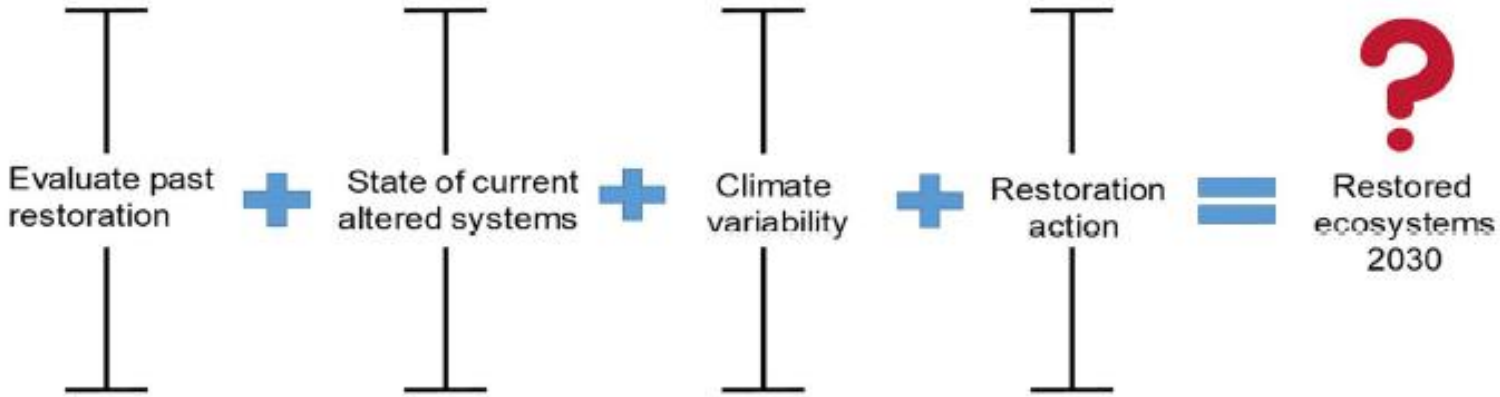
published: 20 February 2020

doi: 10.3389/fmars.2020.00071

UN Decade on Ecosystem Restoration 2021–2030—What Chance for Success in Restoring Coastal Ecosystems?

Nathan J. Waltham [1,2*], Michael Elliott [3,4], Shing Yip Lee [5], Catherine Lovelock [6], Carlos M. Duarte [7], Christina Buelow [2,8], Charles Simenstad [9], Ivan Nagelkerken [10], Louw Claassens [11], Colin K-C Wen [12,13], Mario Barletta [14], Rod M. Connolly [5], Chris Gillies [2,15], William J. Mitsch [16], Matthew B. Ogburn [17], Jemma Purandare [2], Hugh Possingham [18,19] and Marcus Sheaves [1,2]

Waltham et al. 2020 Frontiers in Marine Science – also see table in Supplementary Material https://www.frontiersin.org/articles/10.3389/fmars.2020.00071/full#supplementary-material



And still others:

UNEP GEMS (Global Environmental Monitoring Systems) Oceans – now being planned – aim to create a Community of Practice – register on https://forms.gle/nMvQoS3HNVZA1qN17

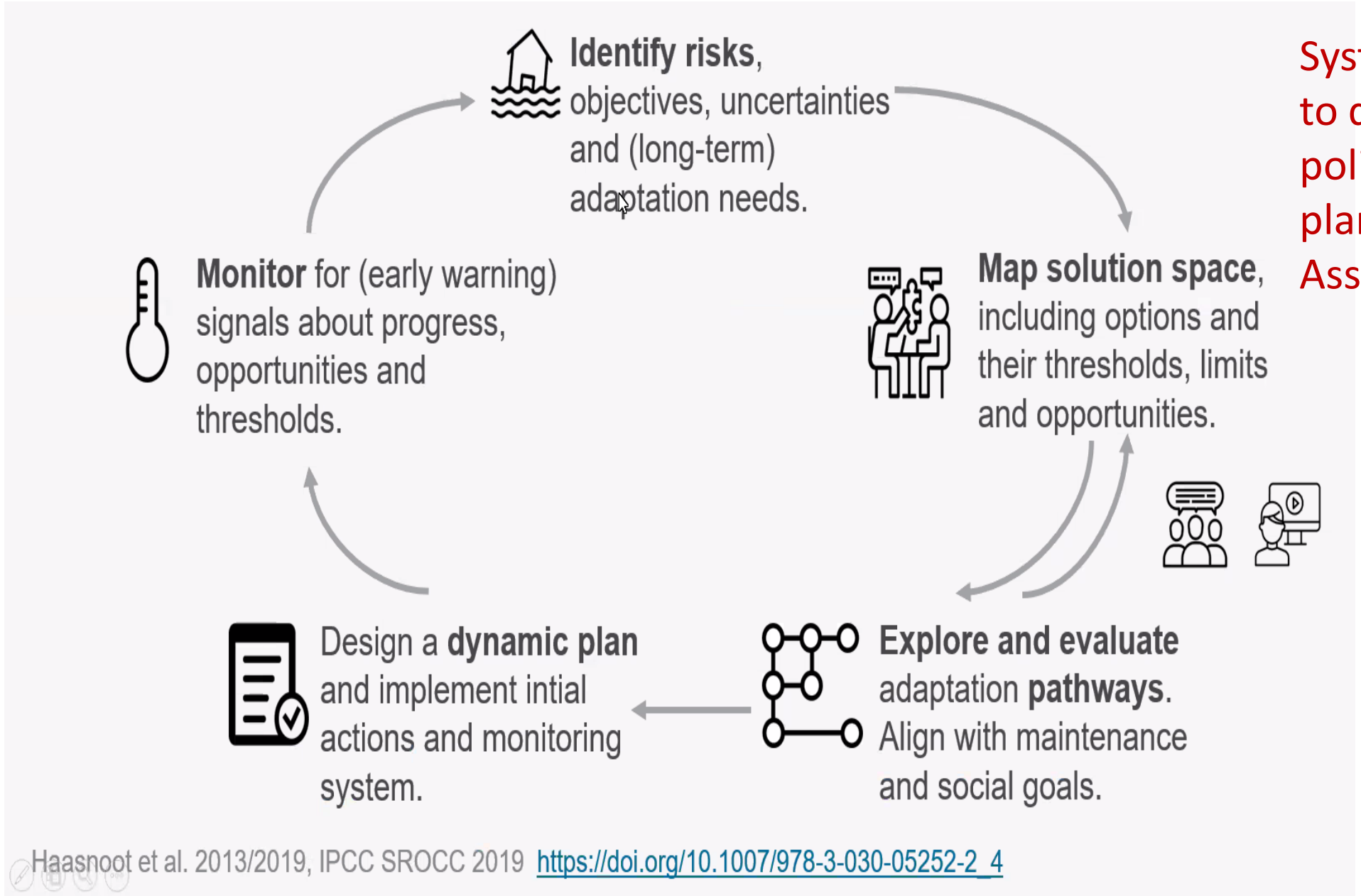
IGU (International Geographical Union) – Oceans Commission – being created now, suggestions of names to be sent to Prof. Elliott

Future Earth Coasts – e.g. Coastal Assessment – contact Prof. Elliott

GESAMP WG41 etc – climate change mitigation ocean techniques – contact Prof. Elliott

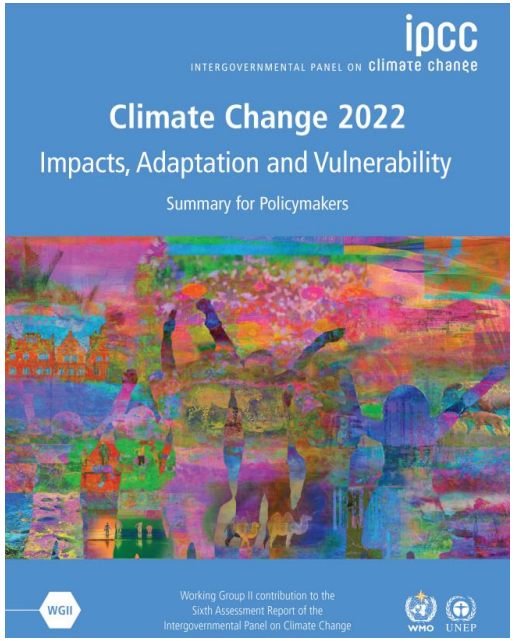
Bringing it all together – Systems Analysis Approaches, Decision Support Systems, Estuarine Planning Support Systems

- A Systems Analysis Approach (SAA) is needed to bring all the elements together for a logical and structured approach to study, assessment and management
- A Decision Support System (DSS) is needed to enable managers to cost-effectively decide solutions and to check if solutions are effective
- An Estuarine Planning Support System (EPSS) is a framework that defines a clear planning or management process and the tools available to support the process
- These all take into account the different disciplines to ensure the management of a system is holistic, have feedback-loops and encompass all the relevant stakeholders views
- The approaches and tools should be applicable to all environmental systems



Haasnoot et al. 2013/2019, IPCC SROCC 2019 https://doi.org/10.1007/978-3-030-05252-2_4

Systematic approach to dynamic adaptive policy pathways planning (from IPCC 6th Assessment Report)



Managing marine resources sustainably: a proposed integrated systems analysis approach

A. Setting priorities, visions and issues: need for information for and from habitats, species, human activities ….

B. Getting and ensuring the provenance of the information: natural and social scientists need to obtain environmental information, using monitoring and laboratory methods

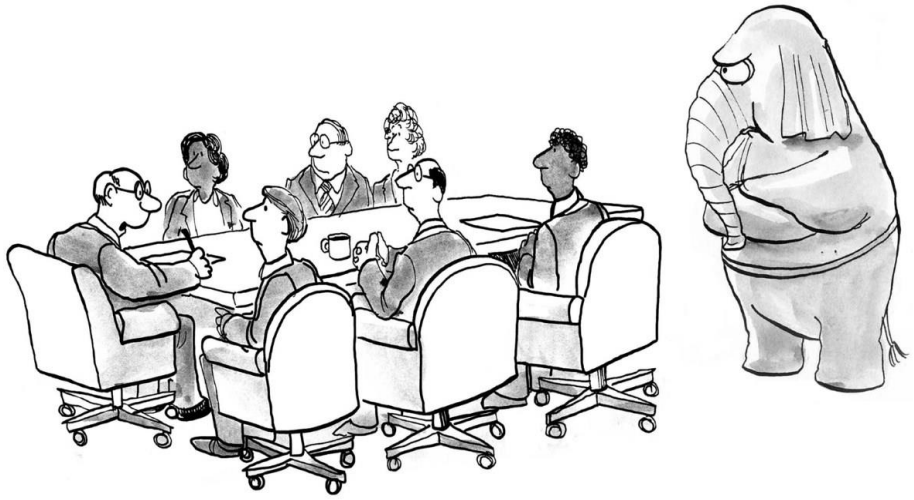
C. Using the information: governance and management imperatives, stakeholder meetings and consultation

(Icons are from https://smashicons.com/)

(Elliott, Borja & Cormier 2020 Ocean & Coastal Management)

Challenges – needs for measuring and managing change:

- Start off with SMART objectives
- Base management on good science
- Quantify the four footprints
- Emphasise that the system functions because of connectivity across all fields
- Collect data to use and use data collected
- Determine if management is working
- Have solid underpinning concepts
- Harmonise the governance (policies, politics, administration and legislation)
- ***Focus on the global primary activity footprint for causes to climate change and the response activity footprint for the consequences***



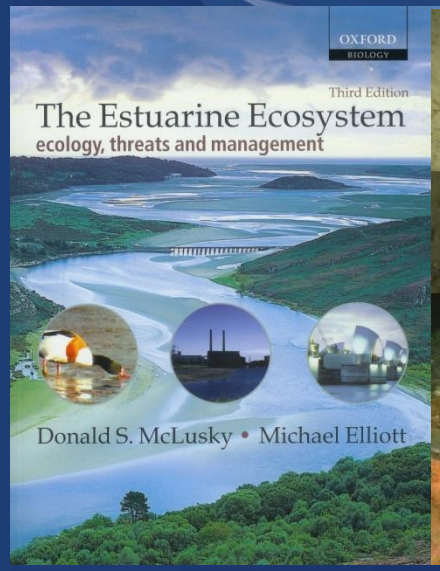
"I suppose I'll be the one to mention the elephant in the room."

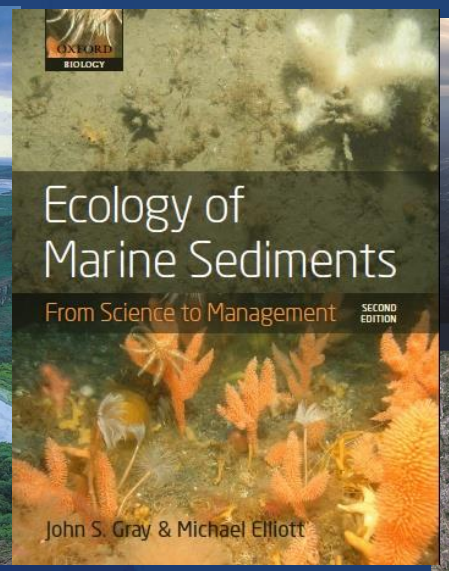
"How come it's always the old, bald-headed guy with glasses in cartoons?"

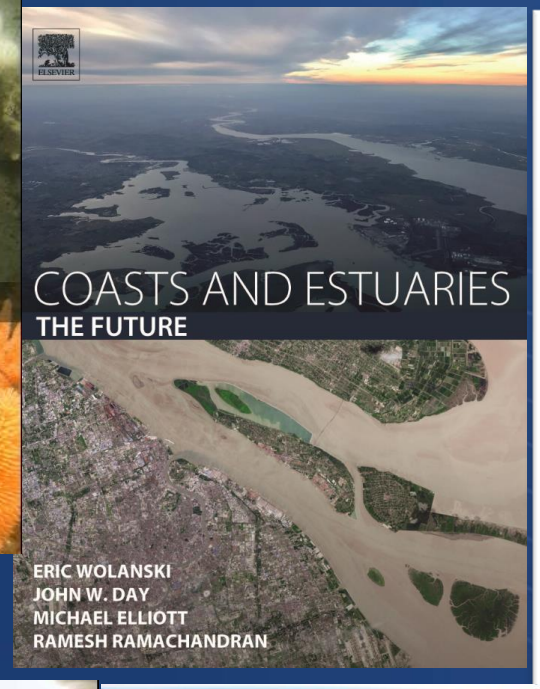
UNIVERSITY OF HULL

International Estuarine and Coastal Specialists

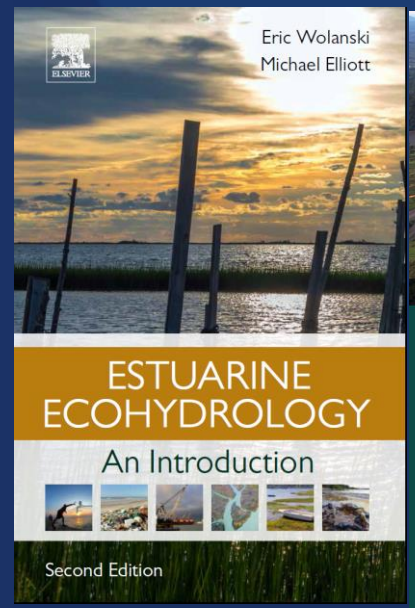
https://www.iecs.ltd

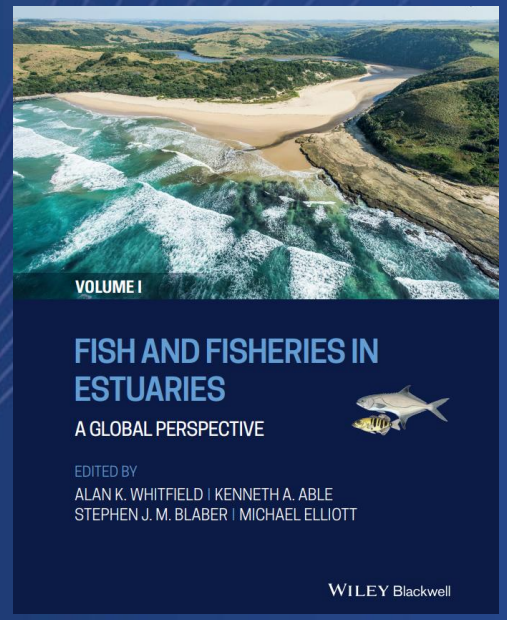






Thanks for listening!





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