European Commission

Mapping and Assessment of Ecosystems and their Services in transitional and marine environments

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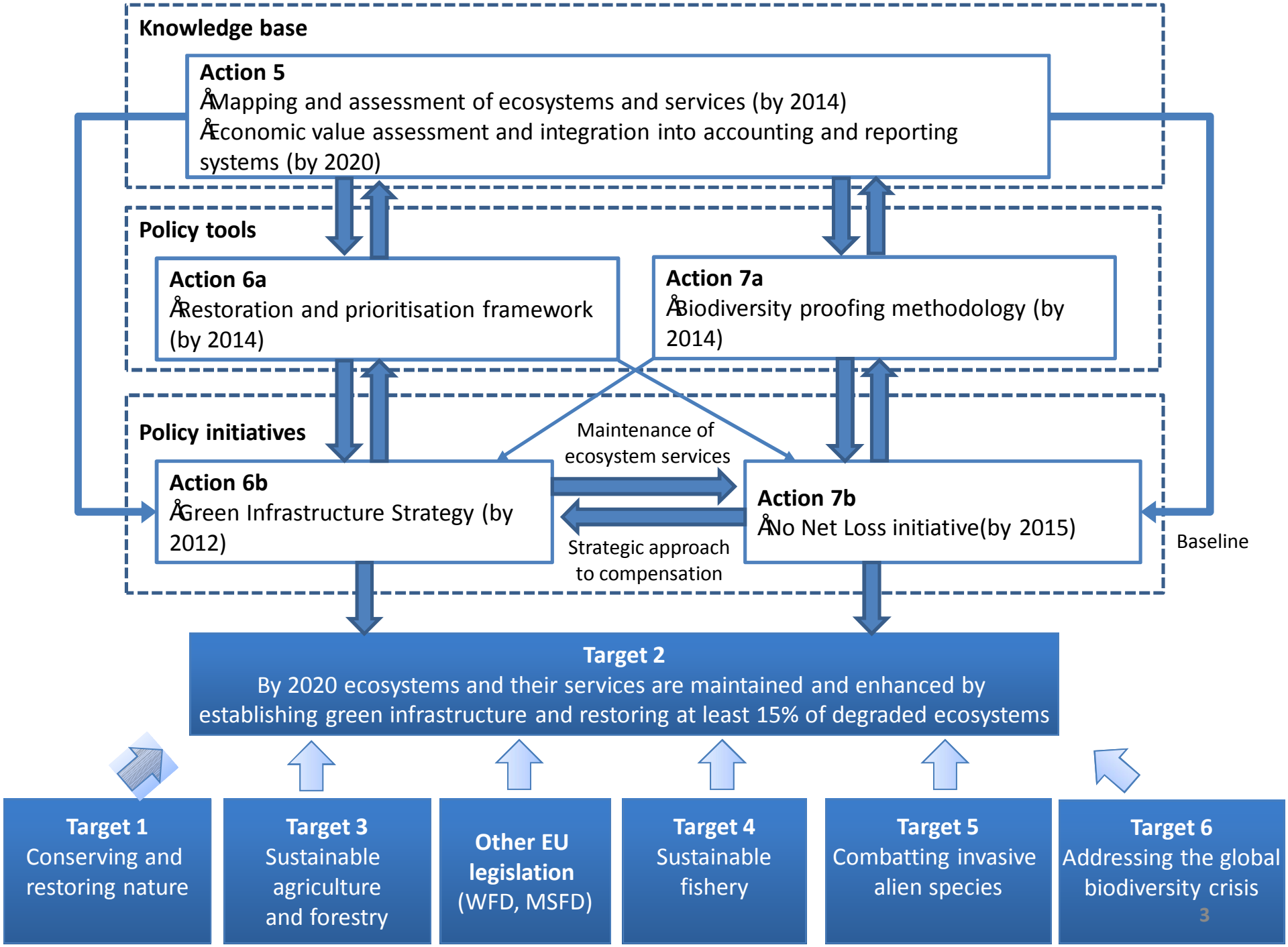
Serving society
Stimulating innovation
Supporting legislation

Action 5 of the Biodiversity Strategy

"*Member States, with the assistance of the Commission, to map and assess the state of ecosystems and their services in their national territory by 2014, assess the economic value of such services, and promote the integration of these values into accounting and reporting systems at EU and national level by 2020*"

Action 5 is one of the keystones of the strategy providing a knowledge base for Europe's green infrastructure, the restoration of 15% of degraded ecosystems and the no net loss of biodiversity and ecosystem services initiative.


Knowledge base
Action 5
ÅMapping and assessment of ecosystems and services (by 2014)
ÅEconomic value assessment and integration into accounting and reporting systems (by 2020)
Policy tools
Action 6a
ÅRestoration and prioritisation framework (by 2014)
Action 7a
ÅBiodiversity proofing methodology (by 2014)
Policy initiatives
Maintenance of ecosystem services
Action 6b
ÅGreen Infrastructure Strategy (by 2012)
Action 7b
ÅNo Net Loss initiative(by 2015)
Strategic approach to compensation
Baseline
Target 2
By 2020 ecosystems and their services are maintained and enhanced by establishing green infrastructure and restoring at least 15% of degraded ecosystems
Target 1
Conserving and restoring nature
Target 3
Sustainable agriculture and forestry
Other EU legislation
(WFD, MSFD)
Target 4
Sustainable fishery
Target 5
Combatting invasive alien species
Target 6
Addressing the global biodiversity crisis

Action 5 of the Biodiversity Strategy

Action 5 is linked to global initiatives to protect biodiversity.

IPBES: the International Platform of Biodiversity and Ecosystem Services is expected to deliver regional assessments of biodiversity and ecosystem services.

Natural Capital Accounting: the UN statistics division is developing ecosystem capital accounts which will complement national economic accounts.

Mapping and assessment of Ecosystems and their Services (MAES)

The Working Group on Mapping and Assessment on Ecosystems and their Services (MAES) was set up under the Common Implementation Framework (CIF) and supports the implementation of Action 5.

It consists of Member State representatives, scientific experts, EEA and EU staff members.

Mapping and assessment of Ecosystems and their Services (MAES)

3 Working Group meetings in 2012 to prepare the scope, mandate and analytical framework for assessments.

Successful stakeholder workshop in November 2012 to to discuss how this process could be supported and strengthened at EU and national level

3 Working Group meetings in 2013 to establish and implement the pilots

MAES Marine workshop in June 2013

Outcomes of the stakeholder workshop

There is a clear need for the MAES process to:

1) Highlight and broadly promote the added values of ecosystem assessment

➔ Role for the nature directors

2) To provide clear guidance to facilitate its implementation

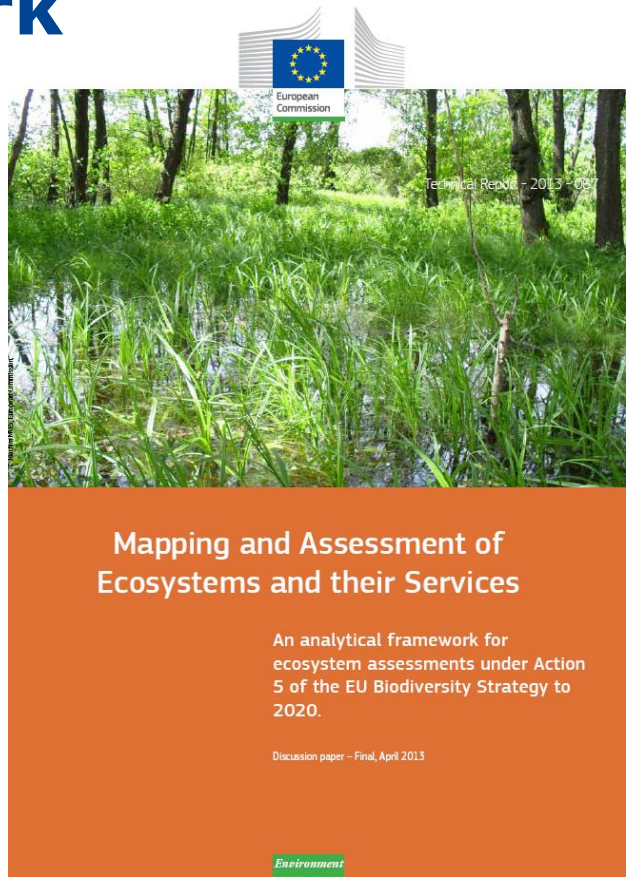
➔ MAES prepared an ***analytical framework*** and launched ***6 pilot studies***

MAES analytical framework

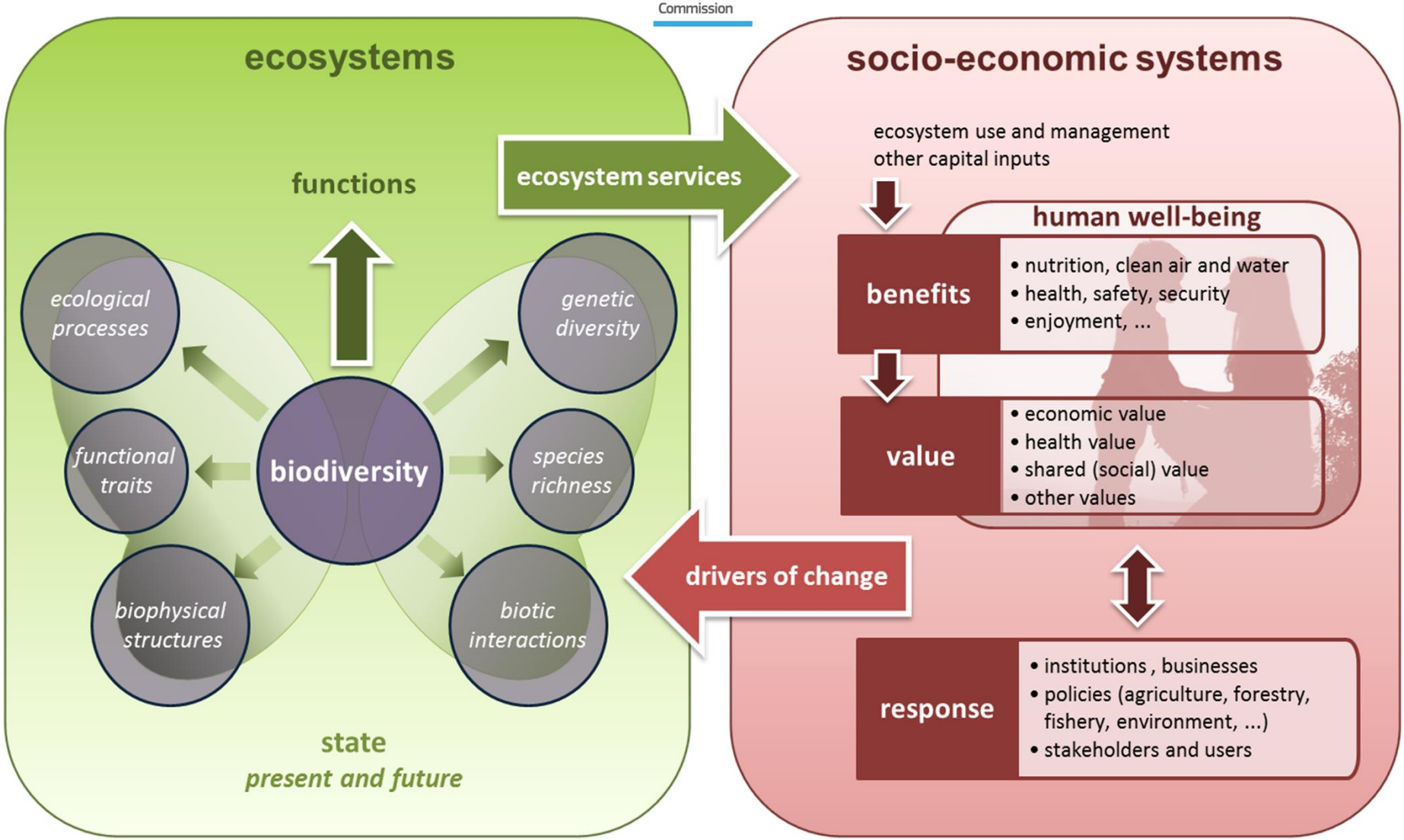
First output of the MAES working group.

Sets a conceptual framework for mapping and assessment linking human well-being to biodiversity.

Makes proposals for a typology of ecosystems and ecosystem services



http://ec.europa.eu/environment/nature/knowledge/ecosystem_assessment/pdf/MAESWorkingPaper2013.pdf


ecosystems
functions
ecological processes
genetic diversity
functional traits
biodiversity
species richness
biophysical structures
biotic interactions
state
present and future
ecosystem services
drivers of change
socio-economic systems
ecosystem use and management
other capital inputs
human well-being
benefits
• nutrition, clean air and water
• health, safety, security
• enjoyment, ...
value
• economic value
• health value
• shared (social) value
• other values
response
• institutions , businesses
• policies (agriculture, forestry, fishery, environment, ...)
• stakeholders and users

Typology of ecosystems.
Refinement of the EU 2010 Biodiversity Baseline (EEA 2012)

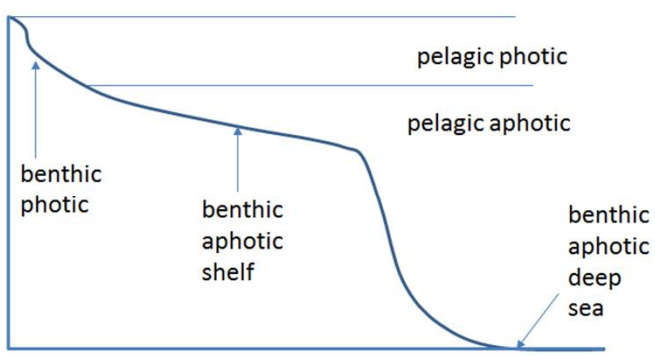


Figure 1: **Proposal 1**

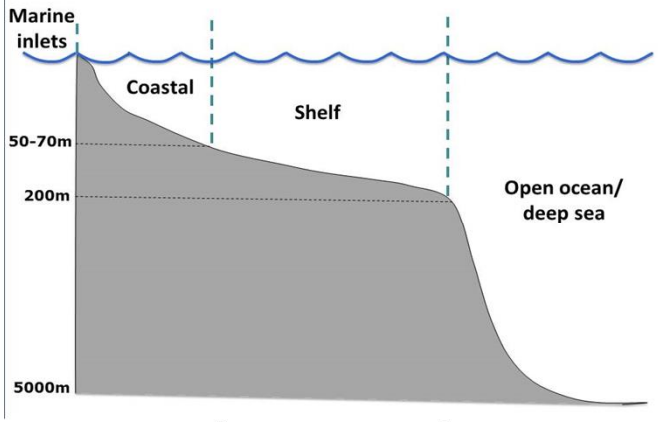
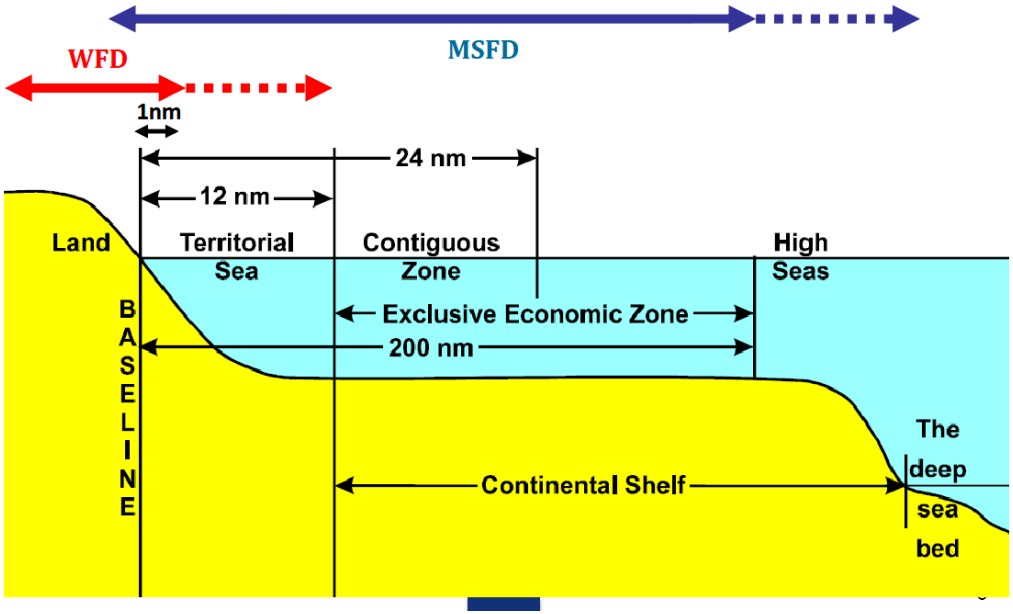


Figure 2: **Proposal 2**

Geographic scope



Testing the framework

The WG-MAES is testing the analytical framework using 6 pilots:

1) The use of nature reporting data for ecosystem assessment

2) Agro-ecosystems

3) Forest ecosystems

4) Freshwater ecosystems

5) Marine ecosystems

6) Natural capital accounting

	1 Nature	2 Agriculture	3 Forest	4 Freshwater	5 Marine	6 Natural Capital Accounting
EU Lead	**ENV**	**JRC**	**JRC**	**JRC**	**JRC**	**EEA**
MS Lead	**LT**	**BE**	**SE** **PT**	**FR**	**FR**	**BG**
EU members	EEA JRC	EEA ENV AGRI	EEA ENV AGRI ESTAT	EEA ENV	EEA ENV MARE RTD	ENV ESTAT RTD AGRI
MS members	BG EE FI HU	AT BE DE FR HU SK UK	AT BE BG FI FR LT	AT EE UK	PT EE BE UK LAGOONS ARCH	DE EE FR PT SK UK
Stakeholders	CEEweb	ELO FACE	ELO FACE Forest Europe WWF	WWF	Coastwatch Oceana	WWF

Thematic pilots to test the framework

SCOPE: The objective of the pilots is to **identify available knowledge that can be used to map marine ecosystems and assess their condition and the services they provide**.

WHAT: Each pilot will examine and report data needs to complete the ecosystem assessments

WHO: Each pilot is led by a Member State and an EC service and draws on the active contributions of EU and MS working together.

WHEN: Final delivery by December 2013

COMMON FRAMEWORK:

1. Map the concerned ecosystem;

2. Assess the condition of the ecosystem;

3. Quantify the ecosystem services provided by the ecosystem;

4. Integrated ecosystem assessment

Current status and future prospects for the assessment of marine and coastal ecosystem services: a systematic review

Liquete, Piroddi, Drakou, Gurney, Katsanevakis, Charef, Egoh (PlosOne, 2013)

European Commission, Joint Research Centre

MCES	Marine/Coastal specific component	General ES definition
Water purification	Treatment of human wastes (e.g. nitrogen retention); dilution; sedimentation, trapping or sequestration (e.g. of pesticide residues or industrial pollution); bioremediation (e.g. bioaugmentation after marine oil spills); oxygenation of "dead zones"; filtration and absorption; remineralisation; decomposition.	Biochemical and physicochemical processes involved in the removal of wastes and pollutants from the aquatic environment.
Air quality regulation	Vegetation (e.g. in mangroves), soil (e.g. in wetlands) and water bodies (e.g. open ocean), due to their physical structure and microbiological composition, absorb air pollutants like particulate matter, ozone or sulphur dioxide.	Regulation of air pollutants concentration in the lower atmosphere.
Coastal protection	Natural defense of the coastal zone against inundation and erosion from waves, storms or sea level rise. Biogenic and geologic structures that form the coastal habitats can disrupt the water movement and, thus, stabilize sediments or create buffering protective zones.	Protection against floods, droughts, hurricanes and other extreme events. Also, erosion prevention in the coast.
Climate regulation	The ocean acts as a sink (and only a very marginal source) for greenhouse and climate active gases. Inorganic carbon is dissolved into the seawater, organic carbon is formed through primary producers, a percentage of which is stored, and a percentage of which is sequestered.	Regulation of greenhouse and climate active gases. The most common proxies are the uptake, storage and sequestration of carbon dioxide.
Weather regulation	For example, the influence of coastal vegetation and wetlands on air moisture and, eventually, on the saturation point and the formation of clouds.	Influence of ecosystems and habitats on the local weather conditions such as thermoregulation and relative humidity.
Ocean nourishment	Natural cycling processes leading to the availability of nutrients in the seawater for the production of organic matter. Pedogenesis could be observed at the margin of certain wetlands and mangroves, depending on hydrodynamic conditions.	In the terrestrial realm it refers to pedogenesis and soil quality regulation.
Life cycle maintenance	The maintenance of key habitats that act as nurseries, spawning areas or migratory routes (e.g. seagrasses, coastal wetlands, coral reefs, mangroves). These habitats and the connectivity among them are crucial for the successful life cycle of species. This also includes pollination (e.g. mangrove pollination), and seed and gamete dispersal by organisms. This service guarantees the maintenance of genetic diversity or gene pool protection.	Biological and physical support to facilitate the healthy and diverse reproduction of species.
Biological regulation	Control of fish pathogens especially in aquaculture installations; role of cleaner fishes in coral reefs; biological control on the spread of vector borne human diseases; control of potentially invasive species.	Biological control of pests mostly linked to the protection of crops and animal production that may affect commercial activities and human health.

ANALYTICAL FRAMEWORK:

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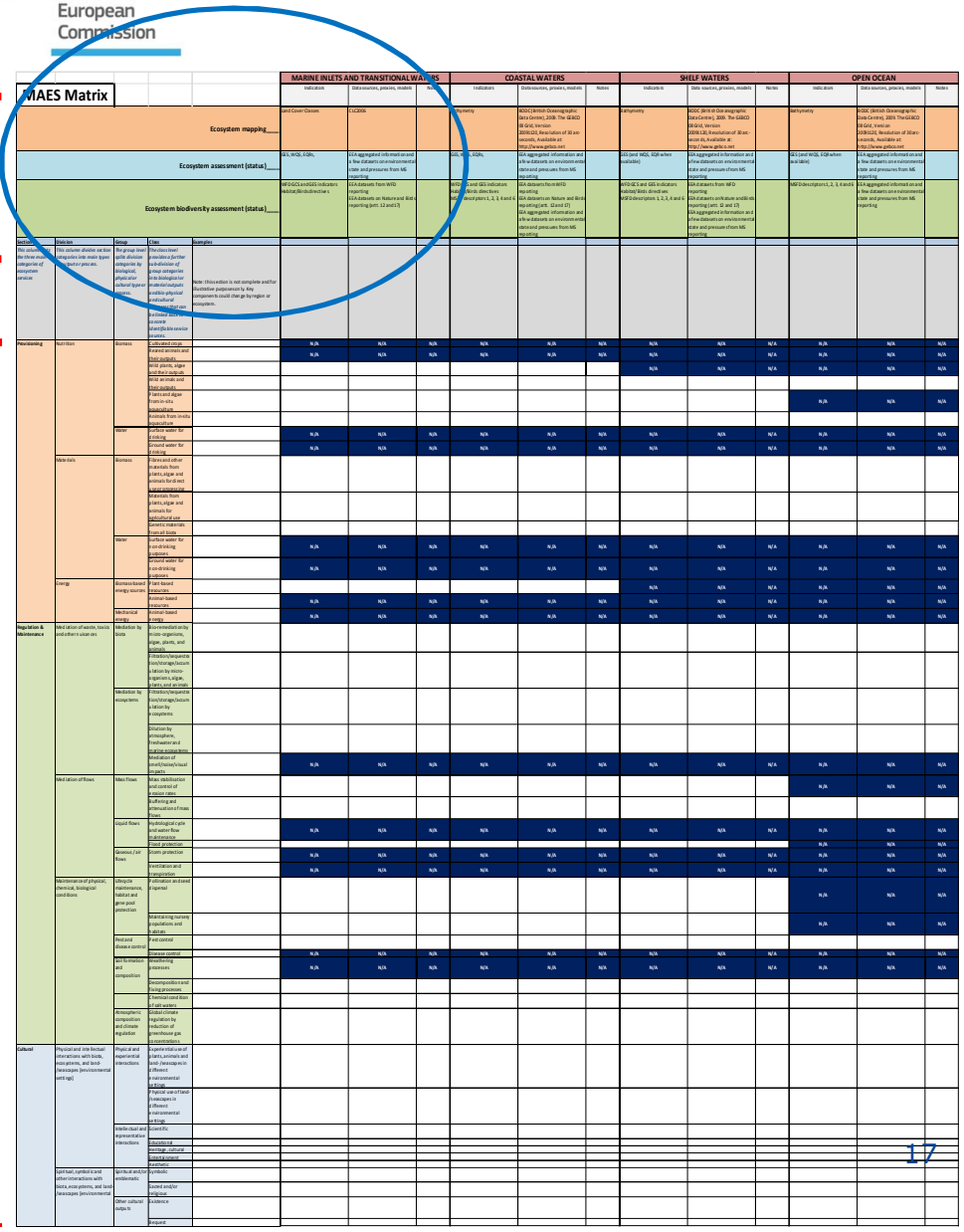
Theme	Class	Group
Provisioning	Nutrition	Terrestrial plant and animal foodstuffs
		Freshwater plant and animal foodstuffs
		Marine plant and animal foodstuffs
		Potable water
	Materials	Biotic materials
		Abiotic materials
	Energy	Renewable biofuels
		Renewable abiotic energy sources
Regulation and Maintenance	Regulation of wastes	Bioremediation
		Dilution and sequestration
	Flow regulation	Air flow regulation
		Water flow regulation
		Mass flow regulation
	Regulation of physical environment	Atmospheric regulation
		Water quality regulation
		Pedogenesis and soil quality regulation
	Regulation of biotic environment	Lifecycle maintenance & habitat protection
		Pest and disease control
		Gene pool protection
Cultural	Symbolic	Aesthetic, Heritage
		Religious and spiritual
	Intellectual and Experiential	Recreation and community activities
		Information & knowledge

Common International Classification of Ecosystem Goods and Services (CICES)
(Haines-Young and Potschin, EEA, 2010)

THE MAES MATRIX

Ecosystem mapping and assessment

Service assessment



COMMON FRAME ➔ MAES MATRIX

1. Map the concerned ecosystem

2. Assess the status

MAES Matrix	MARINE INLETS AND TRANSITIONAL WATERS		
	Indicators	Data sources, proxies, models	Notes
Ecosystem mapping	Land Cover Classes	CLC2006	
Ecosystem assessment (status)	GES, WQS, EQRs,	EEA aggregated information and a few datasets on environmental state and pressures from MS reporting	
Ecosystem biodiversity assessment (status)	WFD GCS and GES indicators Habitat/Birds directives	EEA datasets from WFD reporting EEA datasets on Nature and Birds reporting (art. 12 and art. 17)	

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MAES Matrix

				[C] = CAPACITY [F] = FLOW [B] = BENEFIT	MARINE INLETS AND TRANSITIONAL WATERS: Indicators	Data sources, proxies, models	Notes
Provisioning	Nutrition	Biomass	Cultivated crops	Cereals (e.g. wheat, rye, barely), vegetables, fruits etc.	N/A	N/A	N/A
			Reared animals and their outputs	Meat, dairy products (milk, cheese, yoghurt), honey etc.	N/A	N/A	N/A
			Wild plants, algae and their outputs	Wild berries, fruits, mushrooms, water cress, salicornia (saltwort or samphire); **seagrass (e.g. Palmaria palmata = dulse, dillisk), seaweed for food**	1) Wild seaweed abundance [C] 2) Harversted wild seaweed (t/a) [F] 3) Wild seaweed sales (€/a) [B]		This is a very small production in Europe. (a)
			Wild animals and their outputs	Game, freshwater fish (trout, eel etc.), **marine fish (plaice, sea bass etc.)** and **shellfish (i.e. crustaceans, molluscs)**, as well as **echinoderms** or honey harvested from wild populations; **Includes commercial and subsistence fishing** and hunting **for food**	1) Fish abundance [C] 2) Commercial and artisanal fish and shellfish landing (t/a) [F] 3) Fish and shellfish sales (€/a) [B]	1) GBIF, OBIS, SEALIFEBASE, DG MARE Medits surveys (Mediterranean), EASIN-JRC 2) FAO, EUROSTAT, JRC-DCF 3) FAO, EUROSTAT, JRC-DCF	(b)

MAIN ISSUES

1. Harmonization of ecosystem/habitat type (EUNIS, MSFD, EUSeaMap, also EMODNET1) (JRC /EEA)

2. Harmonization of typologies and definitions across relevant sectorial policies (Habitat, MSFD, etc.)

3. Take into account the data availability from MSFD reporting

4. Adapt CICES classification 4.3 to marine case (to discuss within pilot)

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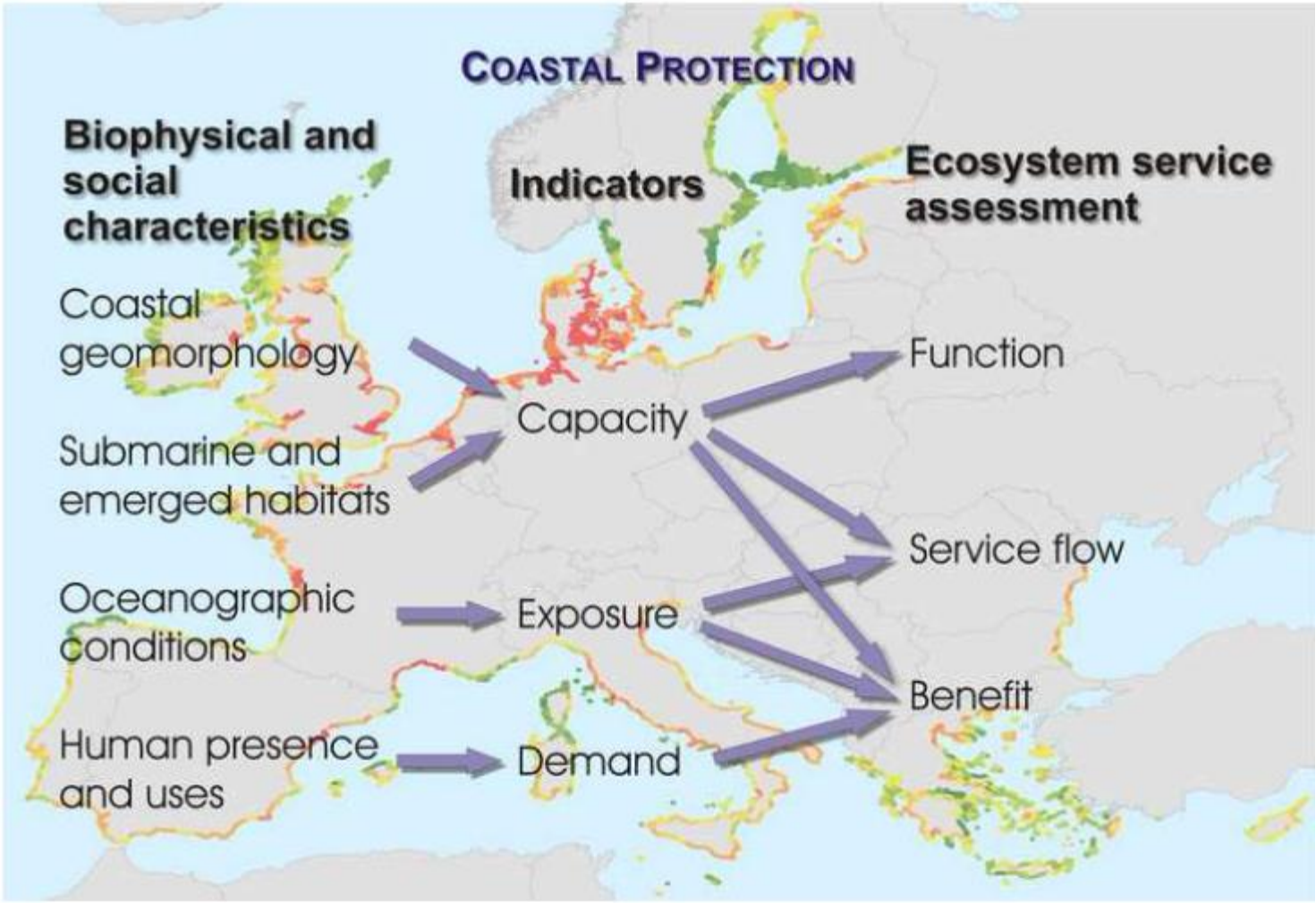
NEXT STEPS (Completion by Dec 2013)

1. Review the material of the MAES matrices and conclude on 1) data used for mapping ecosystems; 2) indicators for assessment of condition, biodiversity and services using a template which contains key information that MS can use for MAES.

2. Prepare a collection of 1 page "guidance card" on mapping, condition, biodiversity and service per ecosystem.

3. Emphasis should be on practical solutions based on current (though incomplete) ecosystem data.

COASTAL PROTECTION SERVICES (COMPLETED)

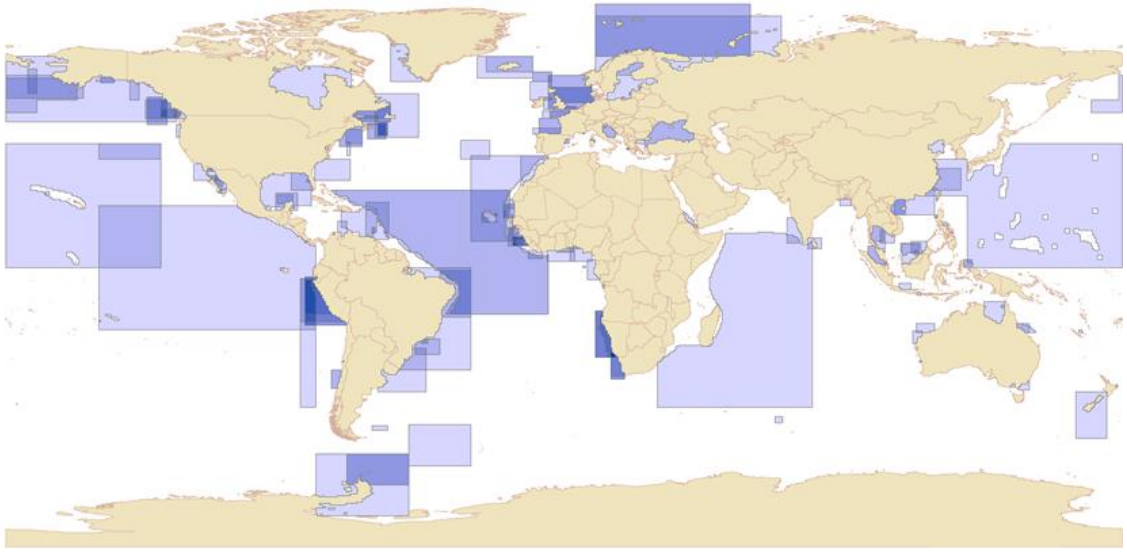


Joint Research Centre

Liquete et al. (2013)

1st case study: MCES in the Mediterranean Sea using EwE (an ecosystem modelling approach)

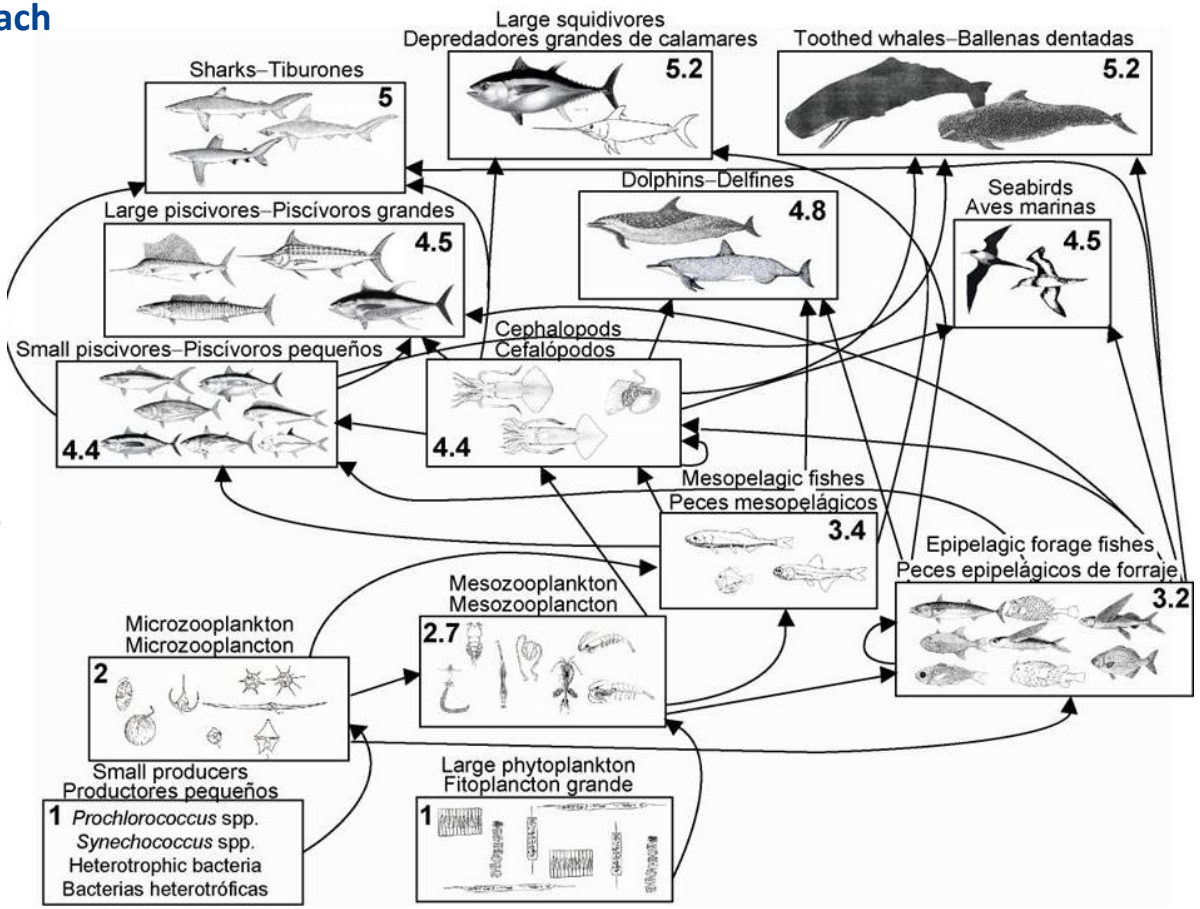
- Describes ecosystem resources and their interactions;
- Evaluates ecosystem effects of fishing (incl. indirect effects, e.g., - through habitat modifications);
- Evaluates effects of environmental change;
- Predicts bioaccumulation of persistent pollutants;
- Evaluates impact and placement of marine protected areas;
- Evaluates uncertainty in the management process (MSE);
- Explores management policy options incorporating economic, social, and ecological considerations



1. Ecopath provides a static description of an ecosystem at a precise period in time. It describes all the principal species of an ecosystem either individually or by aggregating them into groups.

Its major basic input parameters are per each species/groups of species :

- Biomass
- Production / Biomass
- Consumption / Biomass
- Diet
- Migration: Immigration and emigration



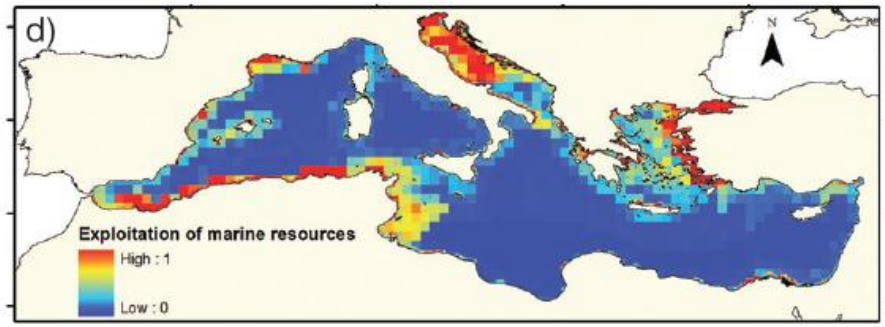
It could also include fishing fleets with the following parameters:

- Landings
- Discards
- Costs
- Market prices
- Non market price ('Existence' values e.g., the value for tourism of having, e.g., marine mammals in a system)

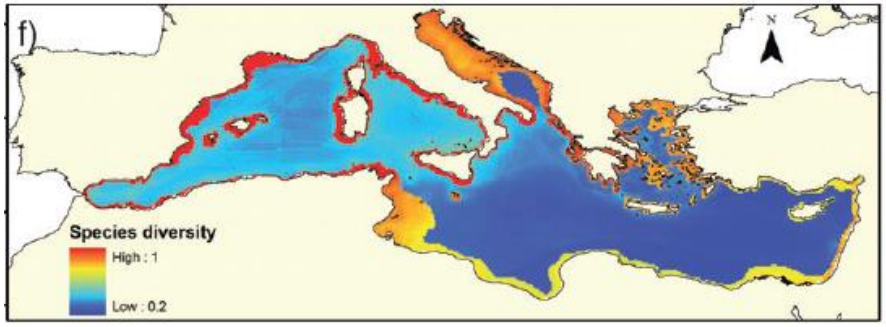
Examples on the outcomes

Category	MCES	Indicators
		Spatial distribution and trend
Provision	1. Food provision	a) Biomass by species
		b) Species diversity
		c) Trophic level of catch
		d) Catch of marine resources
Regulating	1. Water purification	a) Biomass of jellyfish
	2. Life cycle maintenance	a) Seagrass extent
		b) Trophic levels of community
		c) Species diversity
	3. Climate regulation	a) Seagrass biomass as proxy for organic C stock and primary production as proxy for organic C uptake
Cultural	1. Recreation and tourism	a) Recreational Fishing (both species biomass and catch)
		b) whale watching (biomass of marine mammals)
		c) MPAs (area size)
	2. Spiritual and aesthetic value	a) Existence of whales (B)

Food provision: catch of marine resources



Life cycle maintenance: Biodiversity

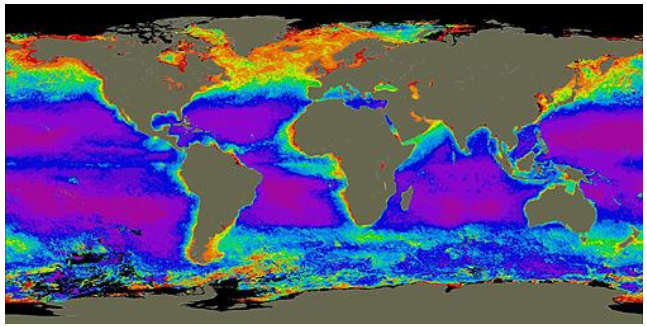


2nd case study: modelling Blue C concentration and sequestration

Variables included:

1. **Chlorophyll a concentration and distribution**
2. **Seagrass density and distribution**
3. **Salt Marshes density and distribution**
4. **Mangroves density and distribution**

1.



2.

3.

4.

Sediment loads in freshwaters: EuroSWAT

- **The goal**: develop a model (SWAT) to predict surface water flow, sediment, and nutrient loads at pan European scale
- To support assessment of ecosystem services in water quality (e.g. sediment load delivery to estuaries)
- Current status
  - 9 major eco-hydrological zones
  - Advanced water quantity calibration (Pagliero et al., JEQ 2012)
  - Sediment modelling 2013-2016

The Danube case study

834000 km^2 area, 19 Countries, 14 of which have >2000 km^2 of catchment area

In collaboration with International Commission for the Protection of Danube River; to provide scientific input for developing the Basin plan in 2015

For further information contact
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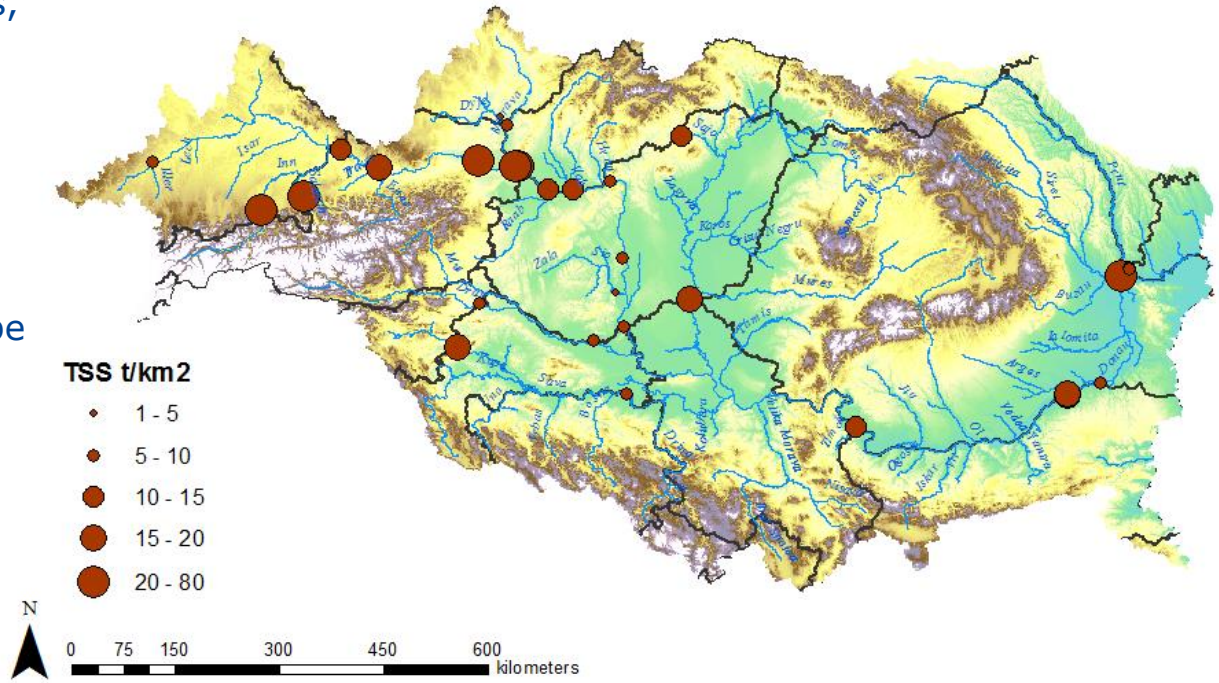

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THANK YOU

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