

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



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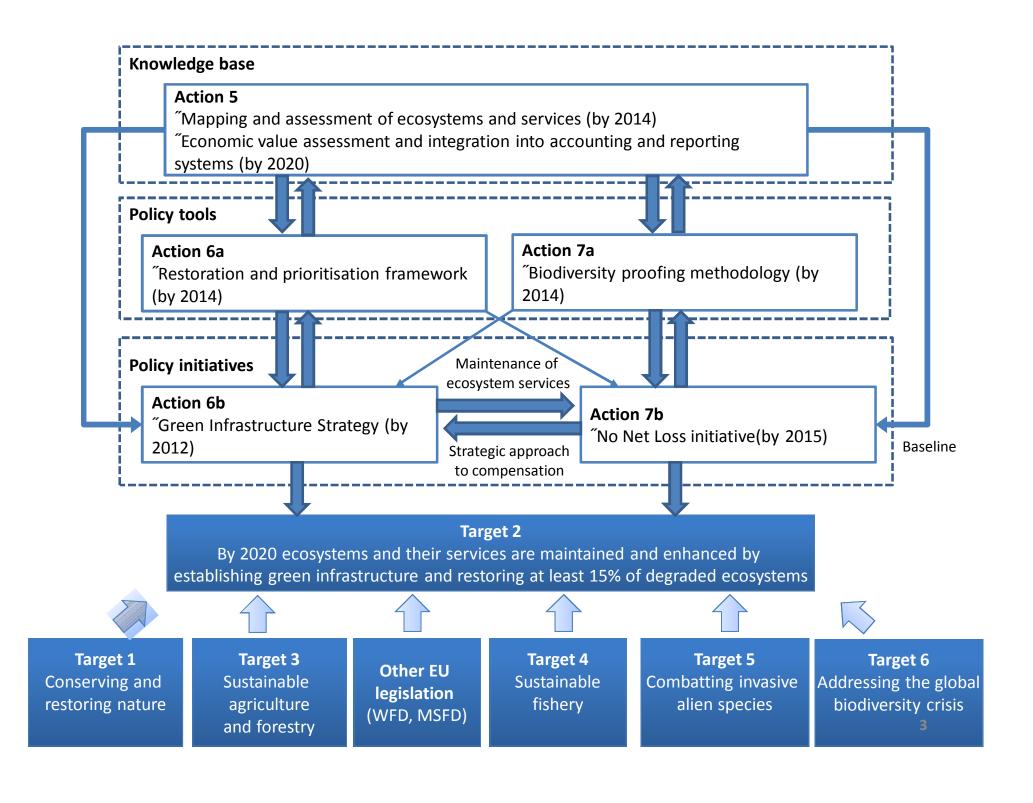


Action 5 of the Biodiversity Strategy

"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.







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 <u>analytical framework</u> and launched <u>6 pilot</u> <u>studies</u>



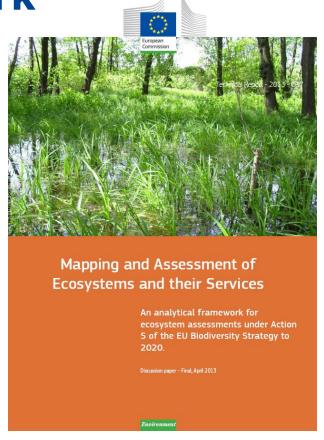


MAES analytical framework

First output of the MAES working group.

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

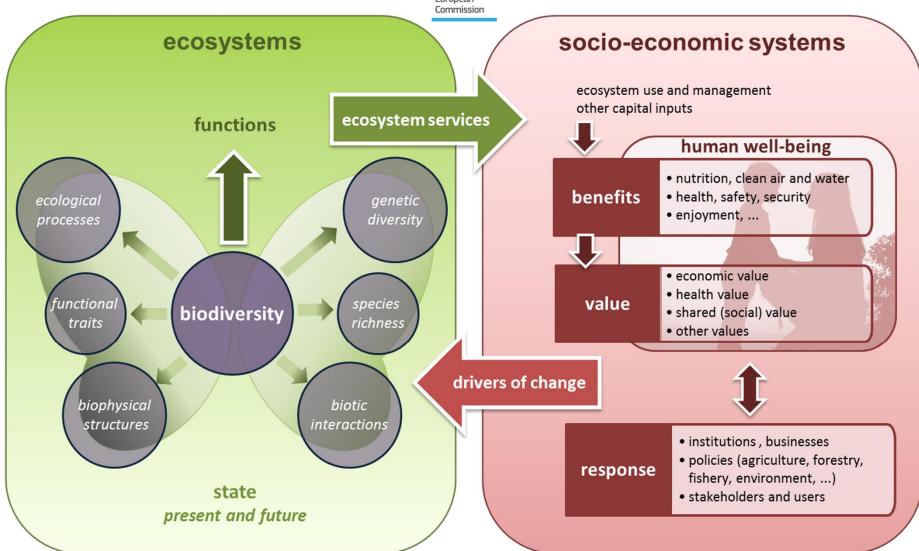
Makes proposals for a typology of ecosystems and ecosystem services



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

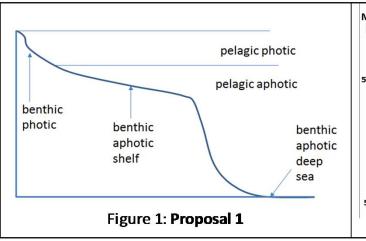


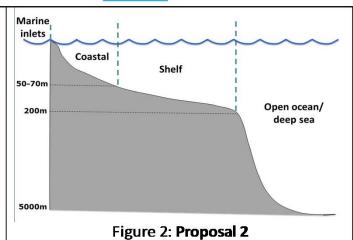




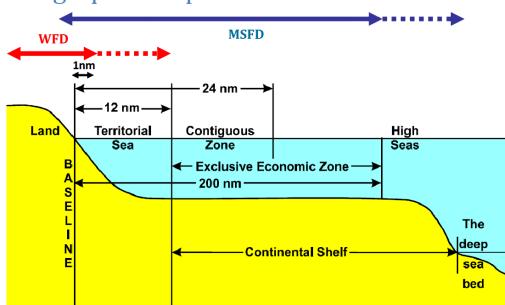
Typology of ecosystems. Refinement of the EU 2010 Biodiversity Baseline (EEA 2012)







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 <u>identify available</u>
<u>knowledge</u> 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.



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

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





Ecosystem mapping and assessment

Service assessment

		***	^*; **														
		Europe Comm	an														
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_	This column or the others mani- cotingories of acceptions arrices	This column divides out time cot signifies into main types in purt or process.	the group leve- splitt division extragaries by biological, physicalor cultural type or spores.	The class level a sovides a further to believision of a soup categories in an abolicajou har moterial outputs a editio-physical and cultural meshipat can be linked accessored.	Note: this sedion is not complete and/or illustrative purpose only. Key component could dran ge by-region or scooystem.												
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		Maintenance of physical, chemical, biological conditions	flows Lifequile maintenance, habitat and gene pool protection	Ventilation and transpiration Politication and seed dispensal		N (A	MCW	N/A	N/A	N/A	N/A	N/A	N/GA	N/A			
			Pestand disease control Soil formation and	Mishtaining nursely propulations and hishitats Fest control Downess control streathering processes		N jh N jh	n(ca n(ca	N/A N/A	N/A N/A	N/A N/A	Ma Ma	nja nja	N/GA N/GA	n/a n/a	N/A N/A	N/A N/A N/A	M/A M/A
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		/seascapes Jenvironmental	Other cultural outputs	seligious Existence		 											
				Reques		 											



COMMON FRAME → **MAES MATRIX**

1. Map the concerned ecosystem

2. Assess the status

		MARINE IN	LETS AND TRANSITIONAL WATER	RS
MAES Matrix		Indicators	Data sources, proxies, models	Notes
	Ecosystom manning	Land Cover	CLC2006	
	Ecosystem mapping	-Classes		
		GES, WQS,	EEA aggregated	
		EQRs,	information and a few	
Ecosys	stem assessment (status)		datasets on environmental	
			state and pressures from	
			MS reporting	
		WFD GCS and	EEA datasets from WFD	
		GES indicators	reporting	
Ecosystem biodive	rsity assessment (status)	Habitat/Birds	EEA datasets on Nature and	
		directives	Birds reporting (art. 12 and	
			art. 17)	18

Centre



				European Commission	MARINE INLETS A	ND TRANSITIONAL	WATERS
MAES Matrix				[C] = CAPACITY [F] = FLOW [B] = BENEFIT	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	mushrooms, water cress, salicornia (saltwort or samphire); seagrass (e.g. Palmaria palmata =	2) Harversted wild		This is a very small production in Europe.
				(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;	[C] 2) Commercial and artisanal fish and shellfish landing (t/a) [F] 3) Fish and shellfish sales (€/a) [B]	surveys (Mediterranean), EASIN-JRC 2) FAO, EUROSTAT, JRC-DCF	(b)
				Includes commercial and subsistence, fishing and hunting for food		3) FAO, EUROSTAT, JRC-DCF	19





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)







NEXT STEPS (Completion by Dec 2013)

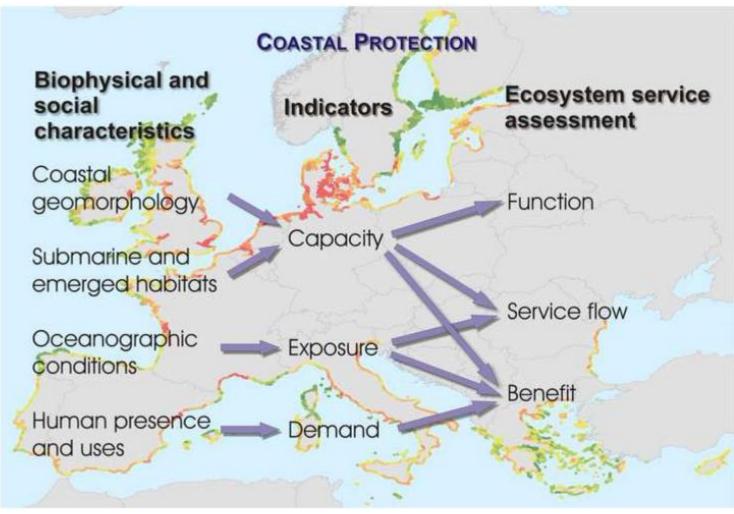
- 1. Review the material of the MAES matrices and conclude on 1) data used for mapping ecosystems; 2) indicators for assessment of condition, biodiversity and services using a template which contains key information that MS can use for MAES.
- 2. Prepare a collection of 1 page "guidance card" on mapping, condition, biodiversity and service per ecosystem.
- 3. Emphasis should be on practical solutions based on current (though incomplete) ecosystem data.



COASTAL PROTECTION SERVICES

(COMPLETED)



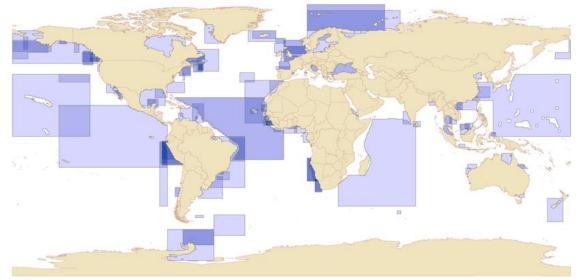






1st case study: MCES in the Mediterranean Sea using EwE (an ecosystem modelling approach)

- 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

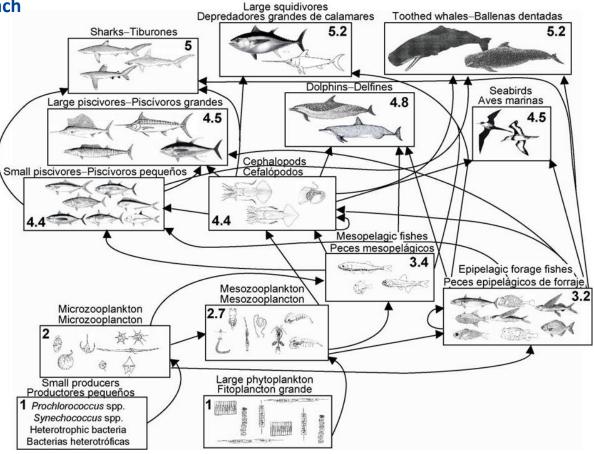
It could also include fishing fleets with the following parameters:

"Landings

"Discards

"Costs

"Market prices



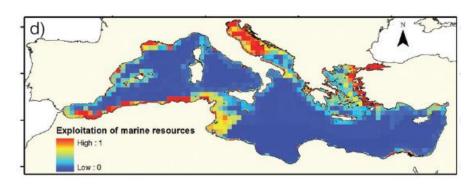
Non market price ('Existence' values e.g., the value for tourism of having, e.g., marine mammals in a system)

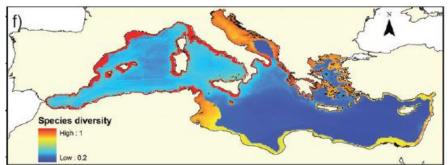


Examples on the outcomes

<u></u>	AACEC.	Indicators			
Category	MCES	Spatial distribution and trend			
		a) Biomass by species			
Provision	1. Food provision	b) Species diversity			
PTOVISION	1. Food provision	c) Trophic level of catch			
		d) Catch of marine resources			
	1. Water purification	a) Biomass of jellyfish			
		a) Seagrass extent			
Regulating	2. Life cycle maintenance	b) Trophic levels of community			
gailain.g		c) Species diversity			
	3. Climate regulation	a) Seagrass biomass as proxy for organic C stock and			
		primary production as proxy for organic C uptake			
		a) Recreational Fishing (both species biomass and			
	1. Recreation and tourism	catch)			
Cultural		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



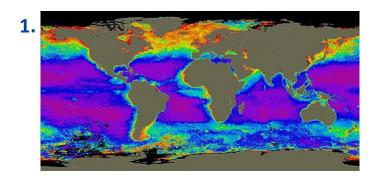






2nd case study: modelling Blue C concentration and Variables included: sequestration

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













Sediment loads in freshwaters: EuroSWAT



- The goal: develop a model (SWAT) to predict surface water flow, <u>sediment</u>, 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



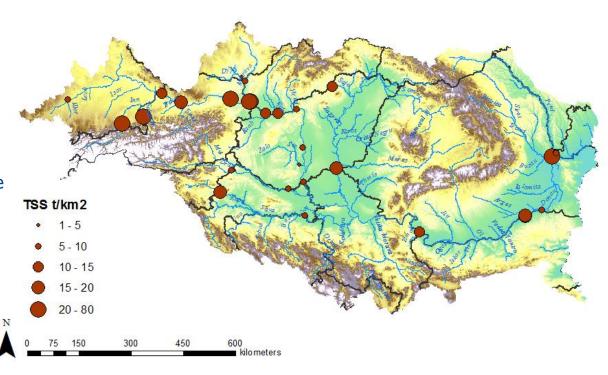


The Danube case study

834000 km² area, 19 Countries, 14 of which have >2000 km² 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 NOlga.Vigiak@jrc.ec.europa.eu



THEMATIC PILOT 5



THANK YOU

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