



Marine biophysical accounts in France

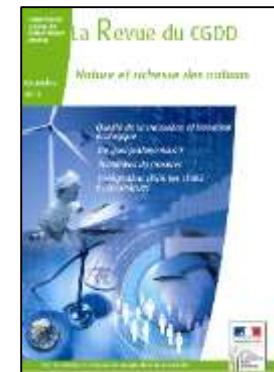
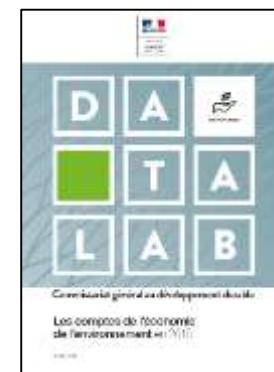
Adrien Comte, Solène Legrand, Frédéric Quemmerais-Amice, Yann Kervinio, Harold Levrel

MAIA webinar on marine accounts. 19/05/2021

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 817527

Environmental accounting in France

- No official ecosystem account to date
- Report by Stiglitz, Sen, Fitoussi (2009) & new indicators of wealth
 - Not appropriate to adjust macro-aggregates
 - Advise for a dashboard of selected indicators
- Economy of the environment accounts (2005-2015), SDES
 - Expenses, Added value, Green jobs, Environmental taxes, flow of materials, energy, air
- Forestry accounts
- Natural patrimony account (Weber, 1983)
- Unpaid ecological costs (Vanoli 1995; 2017), Experimentations on Unpaid Ecological costs on carbon, air, and water (Devaux 2015)



Resources mobilized for marine ecosystem accounts

- Marine Strategy Framework Directive (MSFD): Levrel et al., 2014, scientific reports on good ecological status and cost of degradation
- CarpeDiem (Quemmerais-Amice et al., 2020)
- French assessment of ecosystems and ecosystem services (EFESE)
- Not mobilized but interesting : ES recreation (Martin et al., 2018); input-output model and restoration (Cordier et al., 2011)

The maintenance costs of marine natural capital: A case study from the initial assessment of the Marine Strategy Framework Directive in France

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ABSTRACT

This article aims at estimating the costs of environmental degradation, i.e. the costs associated with the loss of benefits resulting from the degradation of natural capital, and at the maintenance costs required to compensate for the actual or potential degradation of natural capital. The first of these methods is based on the Total Economic Value (TEV) of benefits lost due to the depletions of ecosystem services driven by human activities. The second method is based on the costs required to maintain a given level of ecosystem maintenance, i.e. one which meets 4 priorities in terms of ecosystem services.

This paper gives an illustration of this second approach. It details how these maintenance costs have been calculated in the initial assessment of the Marine Strategy Framework Directive (MSFD) in France. It addresses three problems areas: – corresponding to the sources of environmental degradation – those areas where no specific TEV can be applied; – given that the costs of maintenance are not necessarily constant over time; – given that the costs of maintenance are not necessarily constant over space. The results are compared with those of other Methods. The main conclusion is that it is not really possible to make meaningful comparisons at this stage, since the methods of data collection and the nature of the costs are very different. The need to develop such accounting in a standardised way is noted.

Integrating Cultural Ecosystem Services in an Ecosystem Satellite Account: A Case Study in the Gulf of Saint-Malo (France)

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ARTICLE INFO

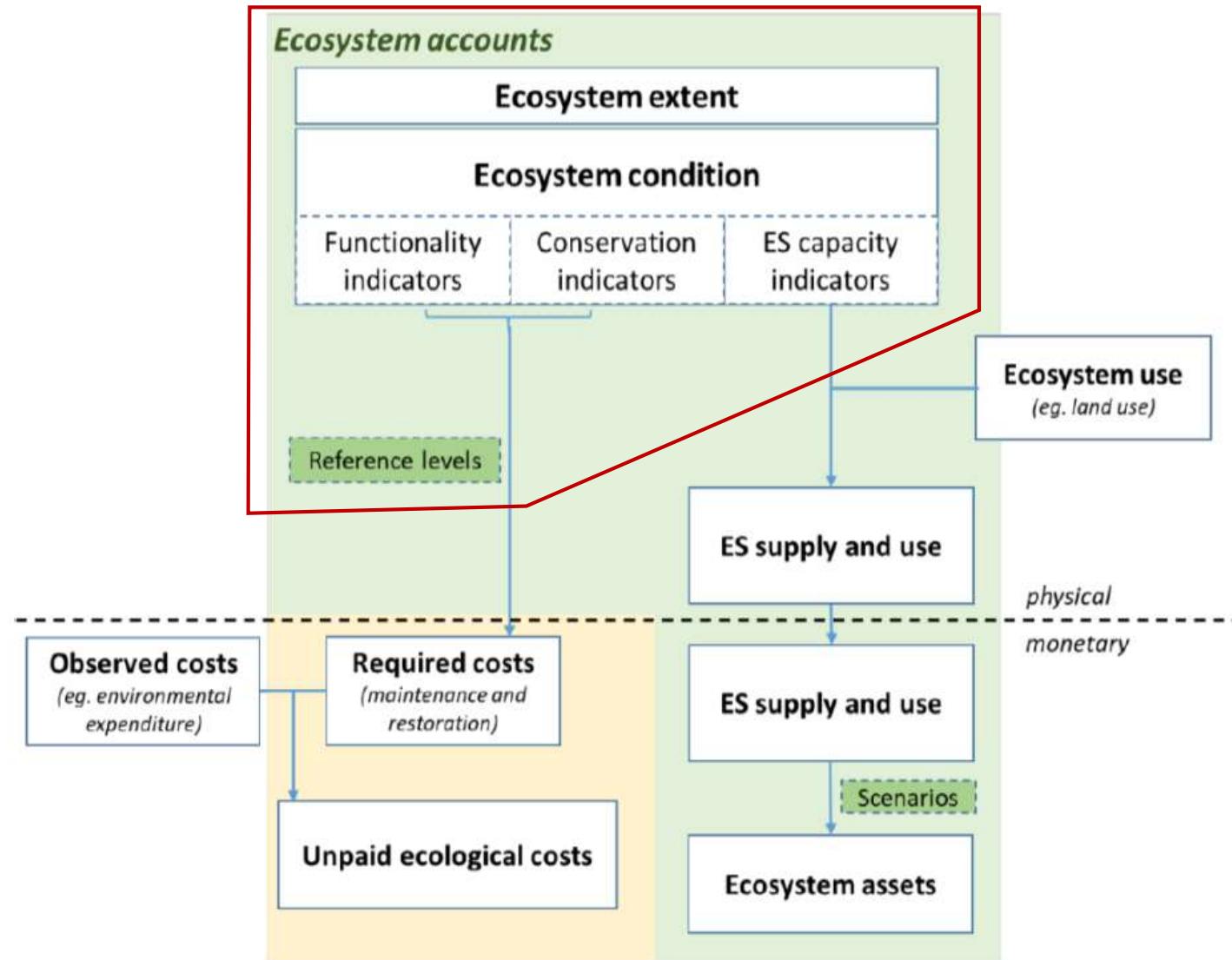
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Keywords: Ecosystem satellite account
Household production function
Cultural ecosystem services
Recreational services

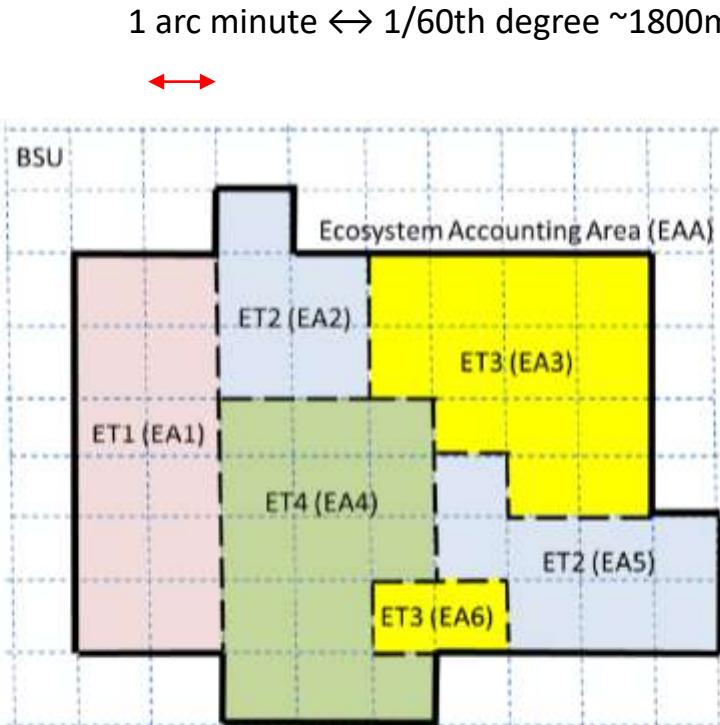
ABSTRACT

This paper develops an accounting approach for estimating cultural ecosystem services. Ecosystem satellite accounts should be able to include cultural ecosystem services, which are numerous and often difficult to assess. A new assessment method is proposed, which uses the production for own use of households who carry out recreational activities depending on cultural ecosystem services. An application is carried out in the Gulf of Saint-Malo (France). A survey was implemented in order to collect the accounting data. Six recreational activities among the coastal population were considered: beach sunbathing, swimming, windsurfing, kite-surfing, sea-watching and offshore fishing; canoeing and kayaking; light sailing; scuba-diving and underwater fishing. The results show that the householded production value for these six marine cultural ecosystem services in the Gulf of Saint-Malo is about 276 M€, which corresponds to 3.7% of the total output of recreational services. It means that the current national accounting system captures only 3% of the output of marine recreational activities. This means that the current national accounting system allocates most of the production value for these six marine cultural ecosystem services to services for other non-recreational activities. The remaining part of the production value is assigned to the consumption of sportive services, while the remaining part of the production value is assigned to the consumption of sportive services. This is probably due to the fact that the survey did not consider all the activities that could be estimated at home (72 and 225 with recursive equivalents of 105 M€ and 154 M€). These results definitely point out the necessity of distinguishing recreational services which depend only on human activities from cultural ecosystem services which depend on outputs from ecosystem processes, in order to avoid over-estimating or under-estimating estimates of marine cultural ecosystem services.

Conceptual framework of ecosystem accounts with maintenance costs



Spatial model of ecosystem assets



Source: Adapted from SEEA EEA Figure 2.4 (UN et al., 2014b). Note that Ecosystem Assets (EA) represent individual, contiguous ecosystems. Ecosystem Types (ET) are EA of the same type.



Overview of French experimentation on marine ecosystem accounts

Benthic

Compte de condition			MED	Code EUNIS niveau 4	
Compte de condition		MMN	Code EUNIS niveau 4		
Compte de condition		CEL	Code EUNIS niveau 4		
Compte de condition		GDG	Code EUNIS niveau 4		
Compte de condition	ZEE	Code EUNIS niveau 4			
Dimension	Indicateur	...			
Patrimoine	Zones protégées	Surface total par habitat			
Capacité	-	-			
Fonctionnalité	Risque physique	Indice			

Pelagic

Compte de condition			MED	Code EUNIS niveau 2	
Compte de condition		MMN	Code EUNIS niveau 2		
Compte de condition		CEL	Code EUNIS niveau 2		
Compte de condition		GDG	Code EUNIS niveau 2		
Compte de condition	ZEE	Code EUNIS niveau 2			
Dimension	Indicateur	A7, colonne d'eau			
Patrimoine	Abondance	Quantité d'individus			
Capacité	SSB / F	Stocks au BEE			
Fonctionnalité	NO3-PO4 / Chlorophylle-A / Turbidité / Dioxygène	Surfaces au BEE			

Compte d'étendue	Code EUNIS niveau 4
GDG	Surface total par habitat
CEL	Surface total par habitat
MMN	Surface total par habitat
MED	Surface total par habitat
ZEE	Surface total par habitat

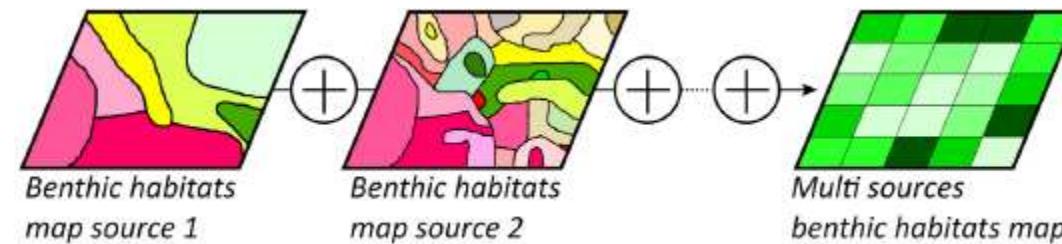
Compte de référence

- Bon Etat Ecologique DCSMM
- Objectifs Environnementaux DCSMM
- Autres sources ?

Extent

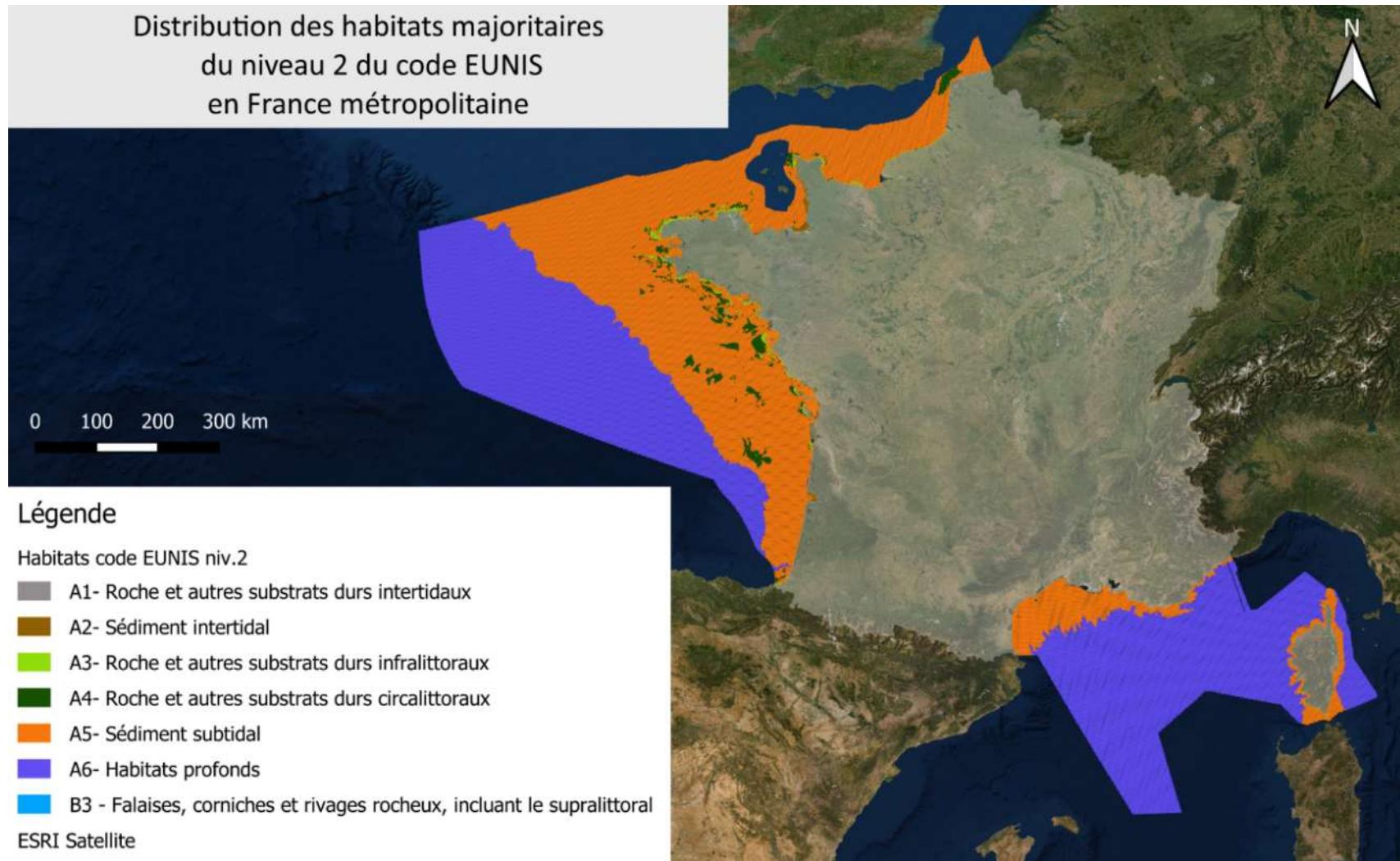
Availability of time series for the datasets used

Account	Data name	Years of data collection
Extent	Marine habitats	2010-2018



Source: Quemmerais-Amice et al., 2020

Extent account : benthic habitat map



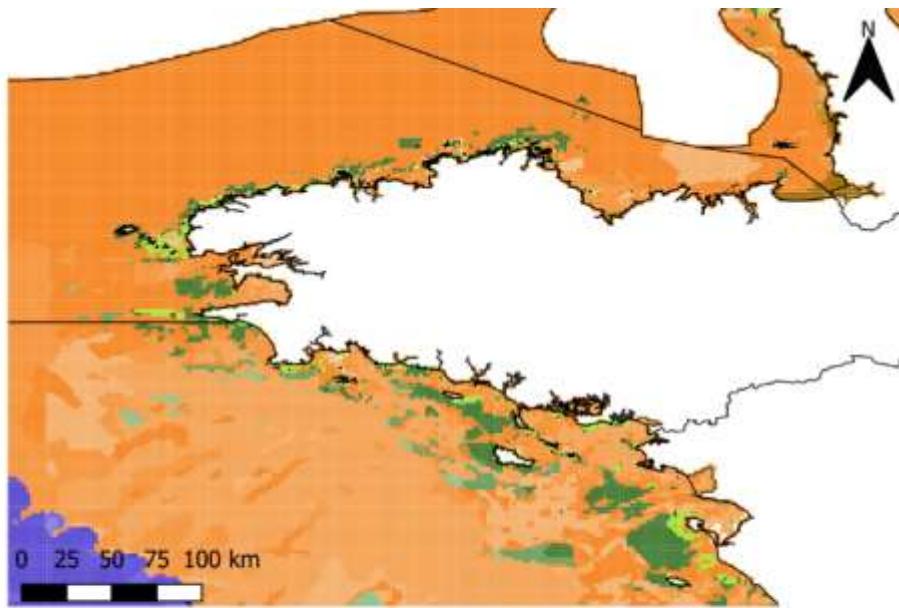
Source: datasets adapted from the CarpeDiem project; Quemmerais-Amice et al. (2020)

Extent account tables

Comptes d'étendue		Code EUNIS de niveau 2										Unité
		A1	A2	A3	A4	A5	A6	B1	B2	B3		
Sous-Régions Marines	Manche-Mer du Nord	49,433794	195,557415	253,384366	997,775713	27379,60543		0,08306	0,004954	0,272876	km ²	
	Mers Celtiques	24,43044	158,554414	599,04111	868,226821	39603,79612	2995,866326	0,095116		1,024297		
	Golfe de Gascogne	72,801343	188,49549	730,017343	5099,928326	77176,94754	105020,0218	0,170867	0,005716	0,465983		
	Méditerranée occidentale	0,419335	7,828731	99,388097	119,811903	17845,40933	94894,65769	0,489435	0,26309	0,007482		
Espace maritime français	Zone Economique Exclusive	147,084912	550,43605	1681,830915	7085,742763	162005,7584	202910,5459	0,838479	0,27376	1,770639		
Sous-Régions Marines	Manche-Mer du Nord	0,17	0,65	0,85	3,34	91,68		0,00	0,00	0,00	%	
	Mers Celtiques	0,05	0,35	1,32	1,92	87,47	6,62	0,00		0,00		
	Golfe de Gascogne	0,04	0,10	0,38	2,68	40,61	55,26	0,00	0,00	0,00		
	Méditerranée occidentale	0,00	0,01	0,08	0,10	15,02	79,89	0,00	0,00	0,00		
Espace maritime français	Zone Economique Exclusive	0,04	0,14	0,44	1,85	42,19	52,84	0,00	0,00	0,00		

Map of the extent of marine habitats : EUNIS lvl 3

Cartographie de l'étendue des habitats marins
dans la région de Bretagne
après fixation de l'habitat majoritaire
dans chaque BSU.



DCSMM_SOUS_REGIONS_MARINES_REPORT_P

region

habitatA_et_B_niv2eunis_cell_v2

A1- Roche et autres substrats durs intertidaux

A1.1 - Roche intertidale sous fort hydrodynamisme

A1.2 - Roche intertidale sous hydrodynamisme modéré

A1.3 - Roche intertidale sous faible hydrodynamisme

A2.1 - Sédiments grossiers intertidaux

A2.2 - Sable et sable vaseux

A2.4 - Sédiments hétérogènes intertidaux

A2.5 - Marais salés côtiers et roselières salines

A2.6 - Sédiments intertidaux dominés par des Angiospermes aquatiques

A2.7 - Récifs biogénés intertidaux

A2.8 - ??

A3.1 - Roche infralittorale de l'Atlantique et de la Méditerranée sous fort hydrodynamisme

A3.2 - Roche infralittorale de l'Atlantique et de la Méditerranée sous hydrodynamisme modéré

A3.3 - Roche infralittorale de l'Atlantique et de la Méditerranée sous faible hydrodynamisme

A4.1 - Roche circalittorale de l'Atlantique et de la Méditerranée sous fort hydrodynamisme

A4.2 - Roche circalittorale de l'Atlantique et de la Méditerranée sous hydrodynamisme modéré

A4.3 - Roche circalittorale de l'Atlantique et de la Méditerranée sous faible hydrodynamisme

A5.1 - Sédiment grossier intertidal

A5.2 - Sable subtidal

A5.3 - Vase subtidale

A5.4 - Sédiments hétérogènes subtidaux

A5.5 - Sédiment subtidal dominé par des macrophytes

A6 - Habitats profonds

A6.2 - Substrats hétérogènes profonds

A6.3 - Sable profond

A6.4 - Sable vaseux profond

A6.5 - Vase profonde

Overview of French experimentation on marine ecosystem accounts

Condition

Compte de condition			MED	Code EUNIS niveau 4		
Compte de condition			MMN	Code EUNIS niveau 4		
Compte de condition			CEL	Code EUNIS niveau 4		
Compte de condition			GDG	Code EUNIS niveau 4		
Compte de condition	ZEE	Code EUNIS niveau 4				
Dimension	Indicateur	...				
Patrimoine	Zones protégées	Surface total par habitat				
Capacité	-	-				
Fonctionnalité	Risque physique	Indice				

Compte de condition			MED	Code EUNIS niveau 2		
Compte de condition			MMN	Code EUNIS niveau 2		
Compte de condition			CEL	Code EUNIS niveau 2		
Compte de condition			GDG	Code EUNIS niveau 2		
Compte de condition	ZEE	Code EUNIS niveau 2				
Dimension	Indicateur	A7, colonne d'eau				
Patrimoine	Abondance	Quantité d'individus				
Capacité	SSB / F	Stocks au BEE				
Fonctionnalité	NO3-PO4 / Chlorophylle-A / Turbidité / Dioxygène	Surfaces au BEE				

Compte d'étendue	Code EUNIS niveau 4
GDG	Surface total par habitat
CEL	Surface total par habitat
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MED	Surface total par habitat
ZEE	Surface total par habitat

Compte de référence
Bon Etat Ecologique DCSMM
Objectifs Environnementaux DCSMM
Autres sources ?

Categories of ecosystem condition used in the French experimentation

Category of condition	Objective	Current condition	Reference condition
Heritage	conservation status of habitat and species , but also, and more generally, in terms of no-net-loss on a set of dimensions.	conservation status of targeted habitats and species, detailing the trends of the targeted populations	All dimensions on which conservation objectives are specified shall be listed
Capacity	maintaining the capacity of ecosystems to sustainably provide goods and services	A list of ecosystem goods and services of interest from a sectoral perspective and biophysical indicators that reflect the capacity of ecosystems to sustainably provide these goods and services	Legal norms for many ecosystem services like the quality of water for bathing, the level of fisheries exploitation, etc. mentioned in the MSFD. They reflect political trade-offs on environmental targets.
Functionality	maintaining ecosystem functioning . Includes the complexity and the dynamic character of the systems considered; can be expressed in terms of thresholds on a set of indicators	selection of relevant indicators could result from the study of the risk of an irreversible degradation of the ecosystems considered (or resilience) and their determinants	based on ecological diagnosis regarding cumulative risks for various components of marine ecosystems, as mentioned in the MSFD. Resilience metrics of ecosystems could complement such metrics (connectivity, diversity of species or of genetic material)

Links between the categories of ecosystem condition and the MSFD descriptors

MSFD descriptor	Short name	Abbreviation
Biological diversity is maintained. The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climatic conditions.	Biodiversity	D1
Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystems	Non-indigenous species	D2
Commercially exploited fish and shellfish	Commercially exploited fish and shellfish	D3
All elements of the marine food webs, to the extent that they are known, occur at normal abundance and diversity and levels capable of ensuring the long-term abundance of the species and the retention of their full reproductive capacity.	Marine food webs	D4
Human-induced eutrophication is minimised, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algae blooms and oxygen deficiency in bottom waters.	Human-induced eutrophication	D5
Sea-floor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected.	Sea floor integrity	D6
Permanent alteration of hydrographical conditions does not adversely affect marine ecosystems.	Hydrographical conditions	D7
Concentrations of contaminants are at levels not giving rise to pollution effects.	Concentrations of contaminants	D8
Contaminants in fish and other seafood for human consumption do not exceed levels established by Community legislation or other relevant standards.	Contaminants in fish and other seafood	D9
Properties and quantities of marine litter do not cause harm to the coastal and marine environment	Marine litter	D10
Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment.	Energy, including underwater noise	D11

Source: Oinonen et al., 2016

Category of ecosystem condition	Descriptor MSFD
Heritage	D1, D6
Capacity	D3, D9
Functionality	D2, D4, D5, D6, D8, D10, D11



Potential indicators for the dimensions of marine ecosystem condition

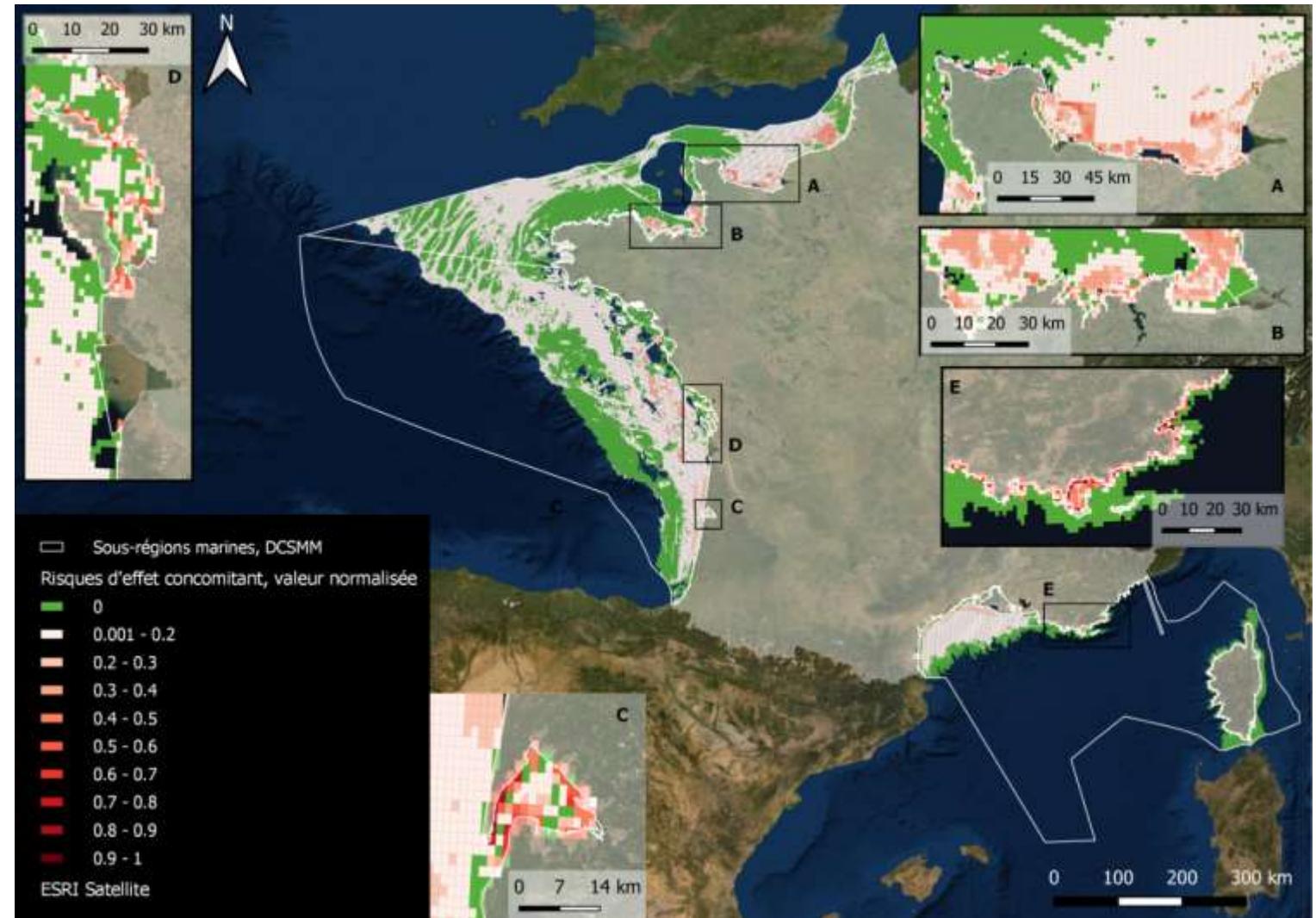
Dimension	Current condition	Descriptors of the MSFD	Link to policy documents
Heritage	<ul style="list-style-type: none"> -Abundance of species (marine mammals, birds) -Red list -State of protected areas 	<ul style="list-style-type: none"> -D1 (-D6) 	<ul style="list-style-type: none"> MSFD, Habitat Directive, OSPAR, Barcelona, Natura2000
Capacity	<ul style="list-style-type: none"> -Fish stocks -Water quality 	<ul style="list-style-type: none"> -D3 -D9 	<ul style="list-style-type: none"> MSFD, WFD
Functionality	<ul style="list-style-type: none"> -Non-indigenous species -Trophic levels -Physical integrity -Eutrophication -Marine debris -Nurseries & feeding grounds -Resilience metrics 	<ul style="list-style-type: none"> -D2 -D4 -D5 -D6 -D8 -D10 -D11 	<ul style="list-style-type: none"> MSFD, OSPAR, WFD

-Available
-Uncertain
-Not available

Temporal availability of datasets

Account	Data name	Years of data collection
Extent	Marine habitats	2010-2018
Condition (heritage)	Birds	2011-2012
Condition (heritage)	Marine Mammals	2011-2012
Condition (heritage)	Marine mammal strandings	2014, 2015, 2016, 2017, 2018
Condition (heritage)	Protected areas	2012 (SPAs), 2013 (NMP) , 2016(SIC)
Condition (function)	Floating waste	2011-2012
Condition (function)	Waste on the seabed	2012, 2013, 2014, 2015, 2016
Condition (function)	Risk of Cumulative Effects on Benthic Habitats	2005-2018
Condition (function)	Eutrophication	2010-2016
Condition (capacity)	Fish stock	2000, 2006, 2012, 2018

Condition account : integrity of the seafloor approximated as risk of concomitant effects of physical pressures

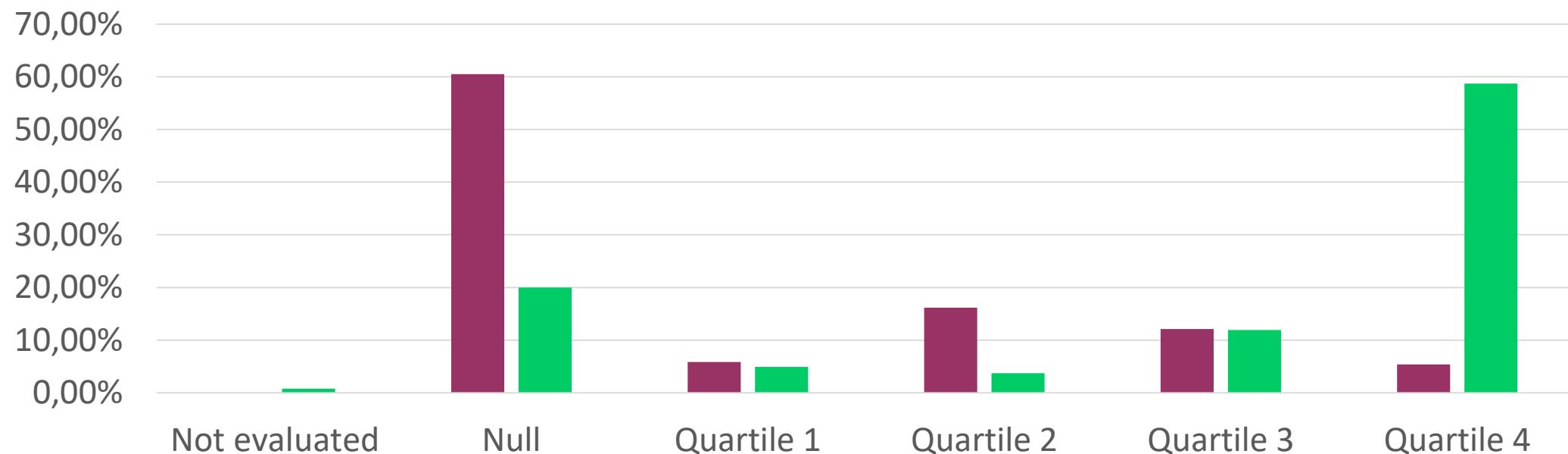




Condition of benthic habitats Distribution of the risk on physical integrity

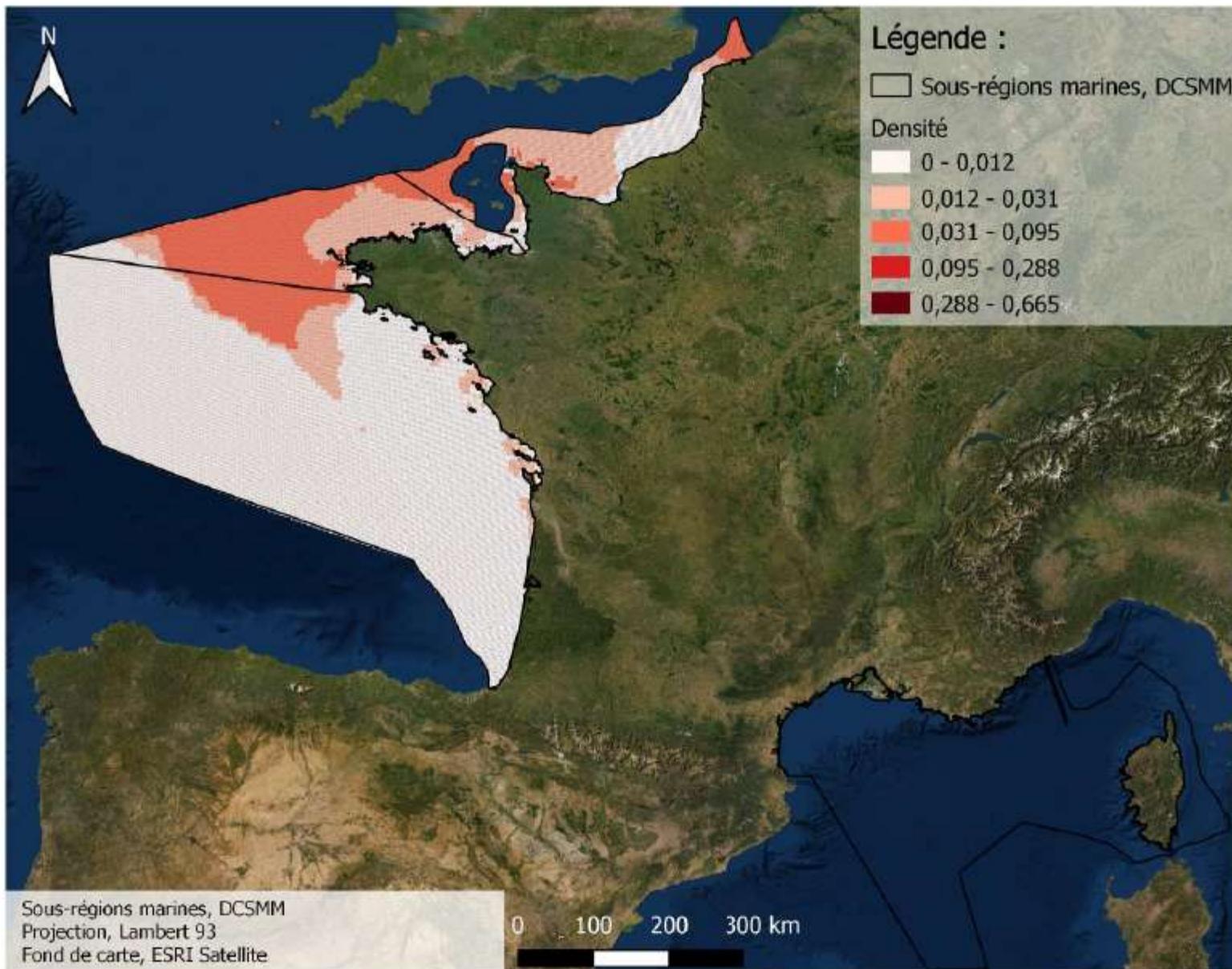


■ Maerl beds (A5.51) ■ Seagrass beds (A5.53)



Risk of Cumulative Effects on
Benthic Habitats

Prédiction de la densité des Marsouin en été 2012
en France Métropolitaine (unité : nombre d'individus par km²).



Overview of French experimentation on marine ecosystem accounts

Benthic

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Compte de condition		CEL	Code EUNIS niveau 4		
Compte de condition		GDG	Code EUNIS niveau 4		
Compte de condition	ZEE	Code EUNIS niveau 4			
Dimension	Indicateur	...			
Patrimoine	Zones protégées	Surface total par habitat			
Capacité	-	-			
Fonctionnalité	Risque physique	Indice			

Pelagic

Compte de condition			MED	Code EUNIS niveau 2	
Compte de condition		MMN	Code EUNIS niveau 2		
Compte de condition		CEL	Code EUNIS niveau 2		
Compte de condition		GDG	Code EUNIS niveau 2		
Compte de condition	ZEE	Code EUNIS niveau 2			
Dimension	Indicateur	A7, colonne d'eau			
Patrimoine	Abondance	Quantité d'individus			
Capacité	SSB / F	Stocks au BEE			
Fonctionnalité	NO3-PO4 / Chlorophylle-A / Turbidité / Dioxygène	Surfaces au BEE			

Compte d'étendue	Code EUNIS niveau 4
GDG	Surface total par habitat
CEL	Surface total par habitat
MMN	Surface total par habitat
MED	Surface total par habitat
ZEE	Surface total par habitat

Compte de référence

- Bon Etat Ecologique DCSMM
- Objectifs Environnementaux DCSMM
- Autres sources ?

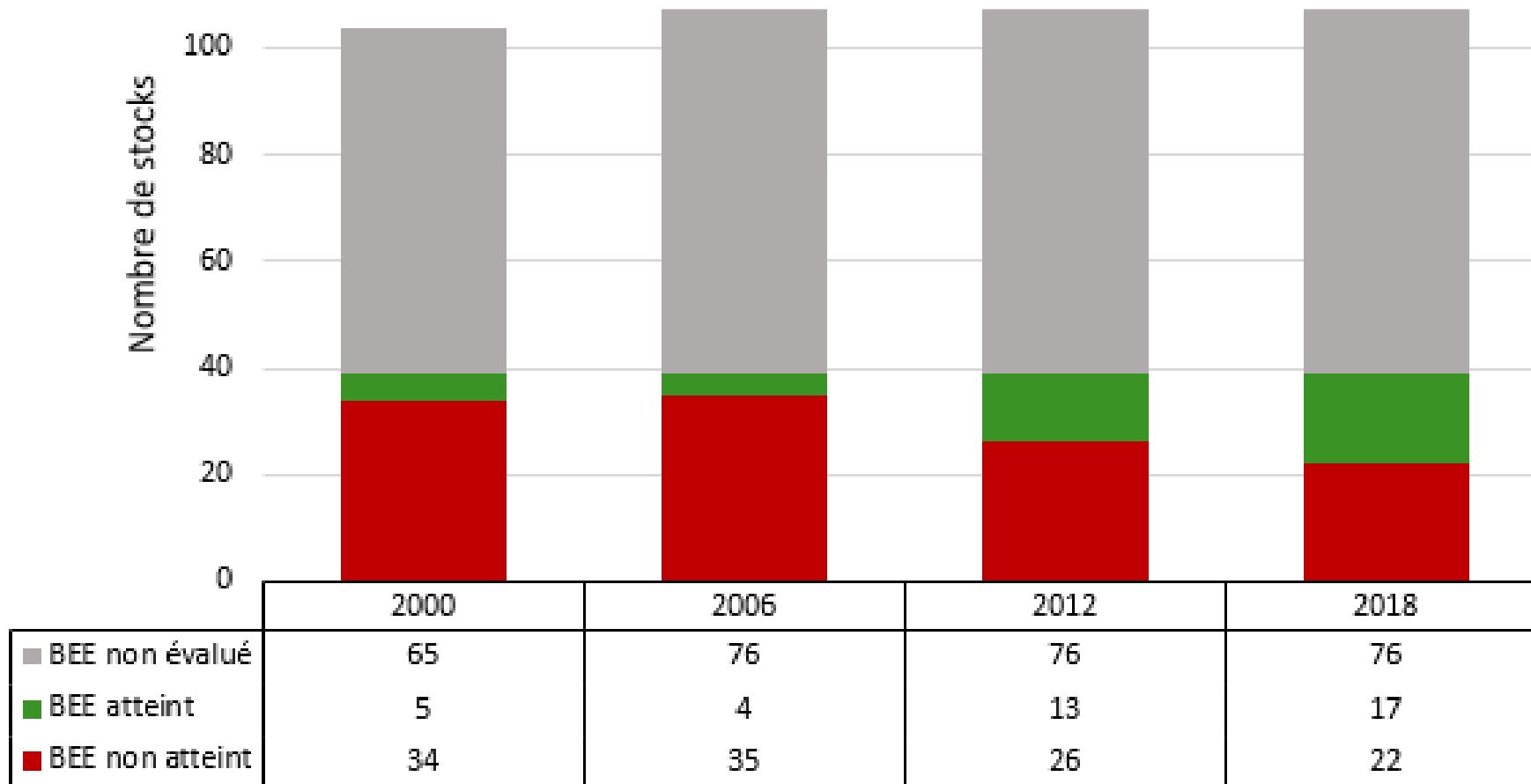
Reference/target condition

Potential indicators for reference/target conditions

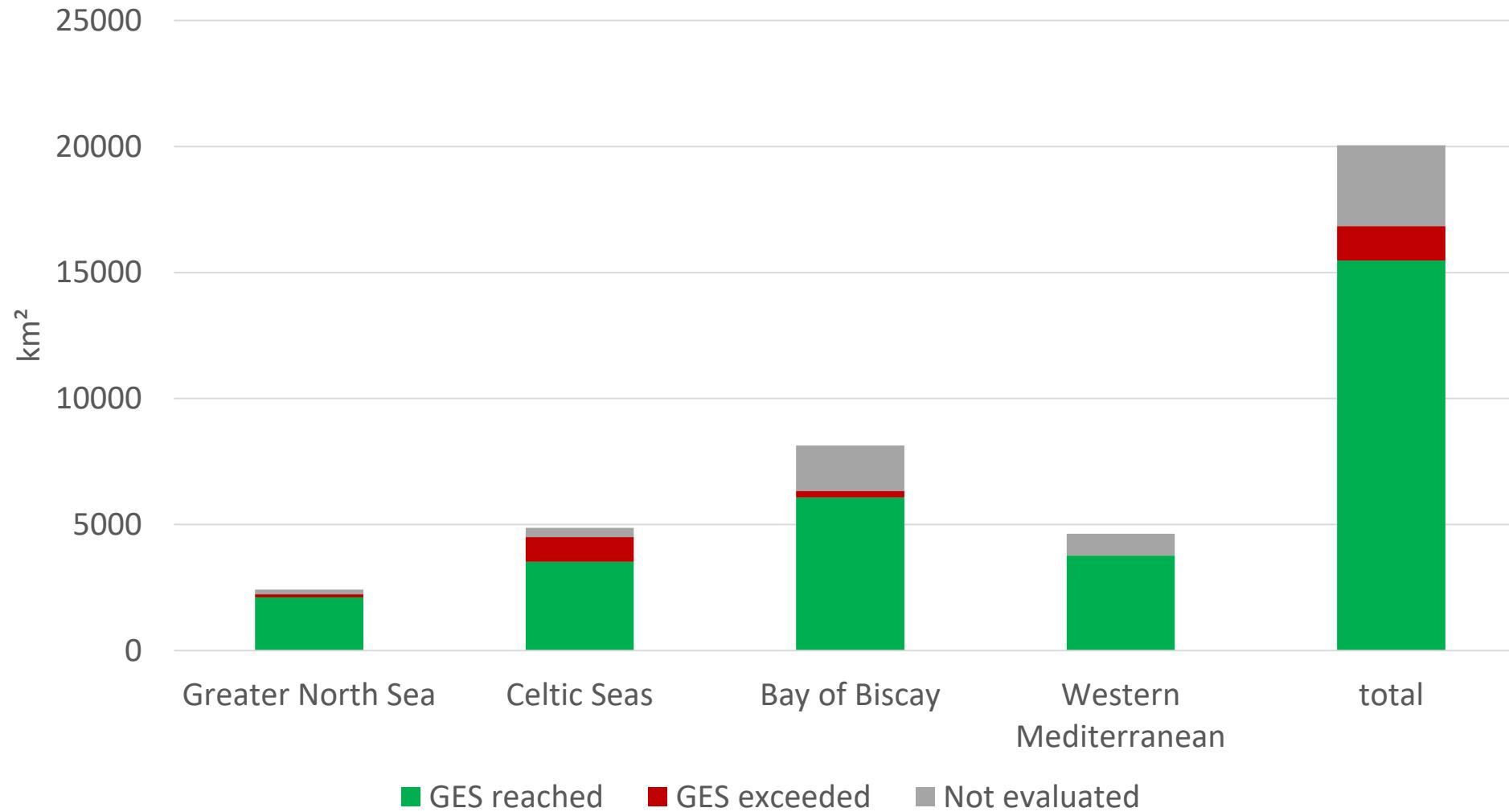
Dimension	Current condition	Reference condition	Link to policy documents
Heritage	<ul style="list-style-type: none"> -Abundance of species (marine mammals, birds) -Red list -State of protected areas 	<ul style="list-style-type: none"> -Non-declining abundances and surfaces -level of captures -No-net loss of biodiversity -Protection of species and habitats 	MSFD, Habitat Directive, OSPAR, Barcelona, Natura2000
Capacity	<ul style="list-style-type: none"> -Fish stocks -Water quality 	<ul style="list-style-type: none"> -MSY -Contaminants levels 	MSFD, WFD
Functionality	<ul style="list-style-type: none"> -Trophic levels -Physical integrity -Eutrophication -Marine debris -Nurseries & feeding grounds -Resilience metrics 	<ul style="list-style-type: none"> -Pollutants levels -Thresholds of chemical and biological variables -Trends in marine debris -Non-declining surfaces 	MSFD, OSPAR, WFD

-Available
-Uncertain
-Not available

Assessment of good ecological status for fish stocks in the French EEZ



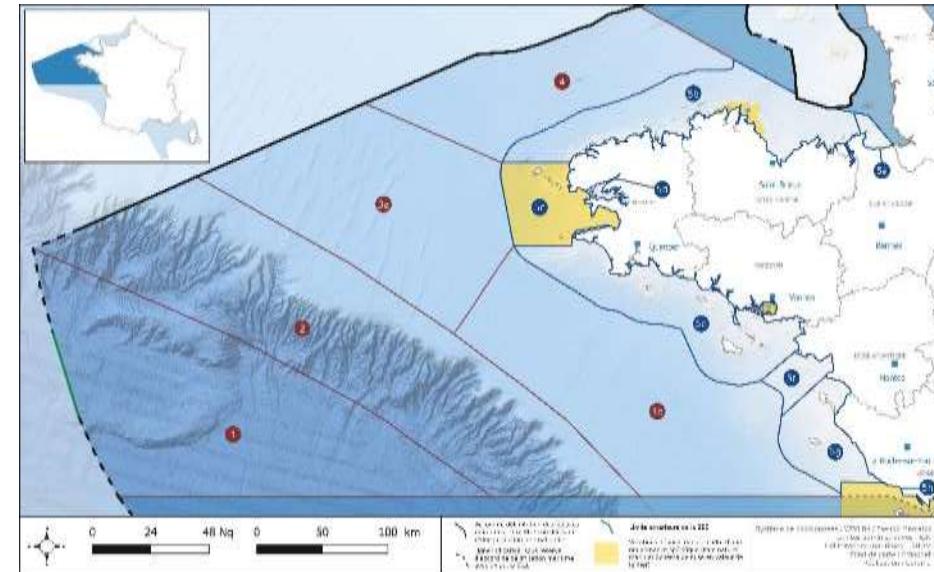
Assessment of good ecological status for eutrophication of coastal water masses (2010-2016 period)



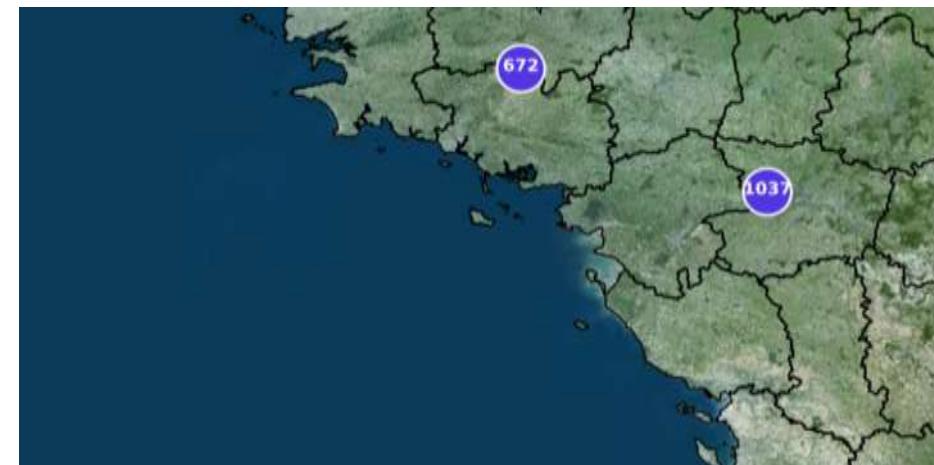
Policy use of marine ecosystem accounts

- Build standardized indicators to monitor the achievement of specific policy objectives, including spatially-explicit strategic objectives
- Monitor environmental degradation
- Assist in the identification of data gap
- Harmonize and integrate existing ecosystem monitoring processes
- Ease access to data
- Analyze trends over time and between countries
- Foster the development of more integrated policies
- Relate state of ecosystems to economic agents

Inform marine spatial planning



Coupled with compensation measures



Limits and issues

- Overseas territories: limited spatial information on marine ecosystems
- Frequency of update of the accounts
- Boundary between marine, coastal, and terrestrial ?
- Communicating uncertainty (linked to resolution, valuation methodologies, data sources) ?
- Articulation with existing databases and institutions (MTES, INSEE, OFB, IFREMER, EMODNET) ?
- Usefulness/effectiveness of constructing these accounts compared to current statistical systems?

MAIA country fact sheet



This project receives funding from
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research and innovation programme
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<https://maiaportal.eu/factsheets>

The MAIA country fact sheets summarize the state of affairs on natural capital accounting (NCA) in the countries connected to the MAIA project. They serve as an accessible overview and entry point for collaboration. The factsheets describe the needs from policy, society, science and business for the use of NCA, give an overview of the ongoing and published research -including knowledge gaps- in the country, include contact details and an overview of national partners and stakeholders involved in the accounts. Information in this document is based on MAIA Deliverables and exchanges, and the content is reviewed, co-authored and updated by MAIA-liaison persons in the participating country. This version was updated on 15 December 2020.

Country fact sheet:
France (FR)

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December 2020

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Thank you for your attention

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