Marine biophysical accounts in France

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MAIA webinar on marine accounts. 19/05/2021

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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)

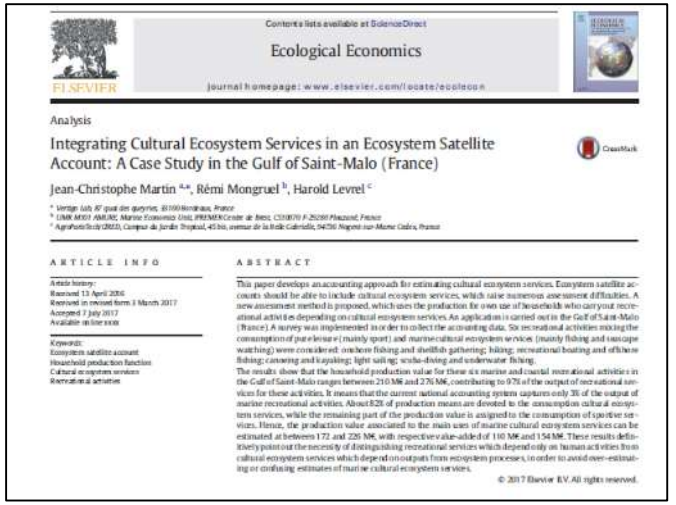
- Unpaid ecological costs (Vanoli 1995; 2017), Experimentations on Unpaid Ecological costs on carbon, air, and water (Devaux 2015)

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)


Marine Policy

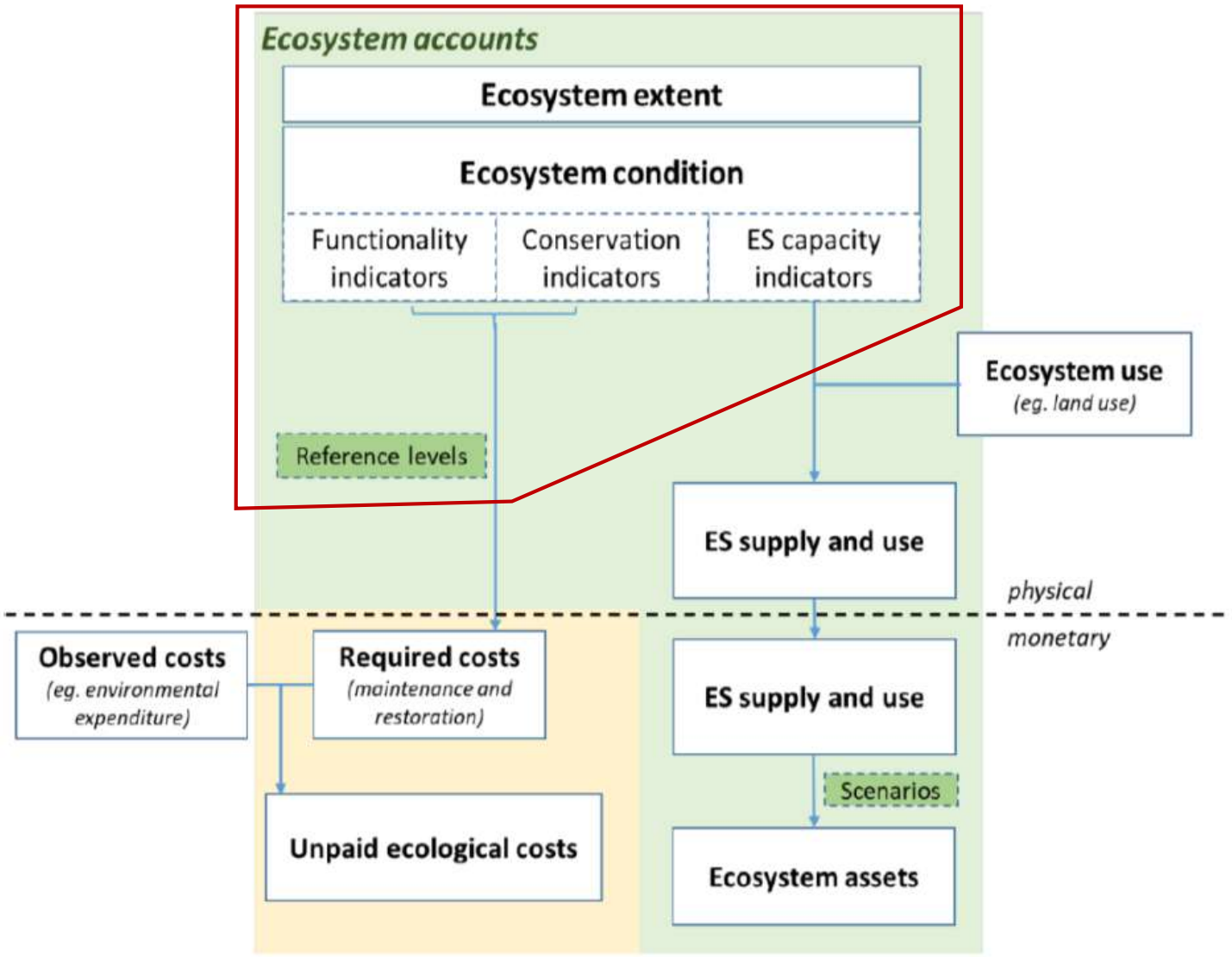
The maintenance costs of marine natural capital: A case study from the initial assessment of the Marine Strategy Framework Directive in France


Ecological Economics

Analysis

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

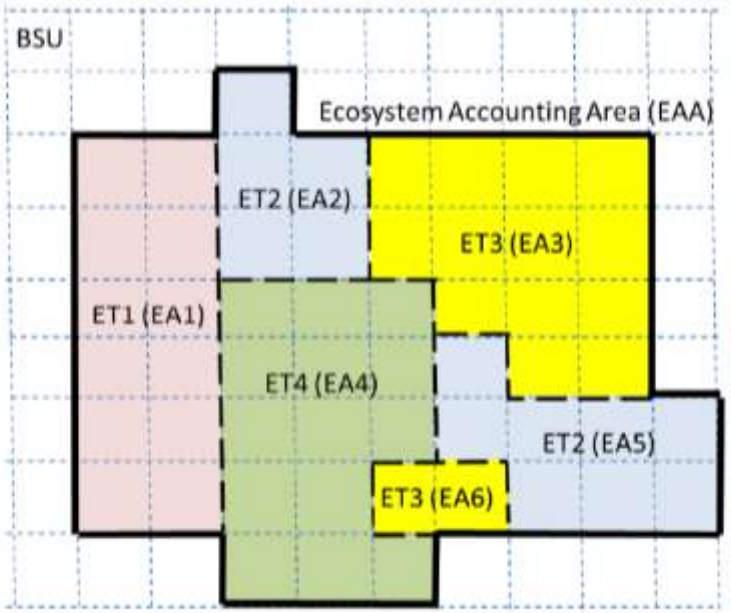
Conceptual framework of ecosystem accounts with maintenance costs



Comte, Kervinio, Levrel. 2020. CIRED Working Paper 2020-76

Spatial model of ecosystem assets

1 arc minute ↔ 1/60th degree ~1800m



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	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 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

Pelagic

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 de condition | MED | Code EUNIS niveau 2

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Compte d'étendue	Code EUNIS niveau 4
GDG	Surface total par habitat
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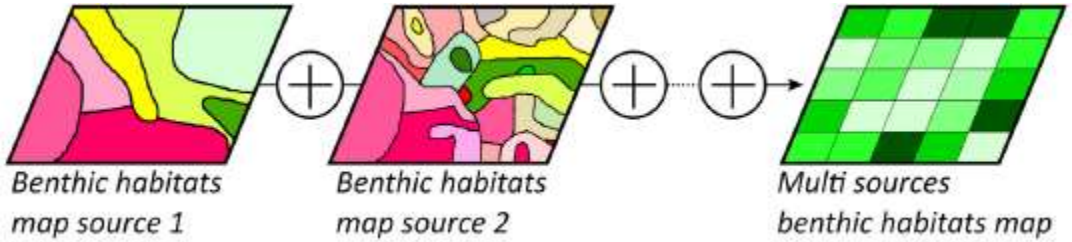
Extent

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

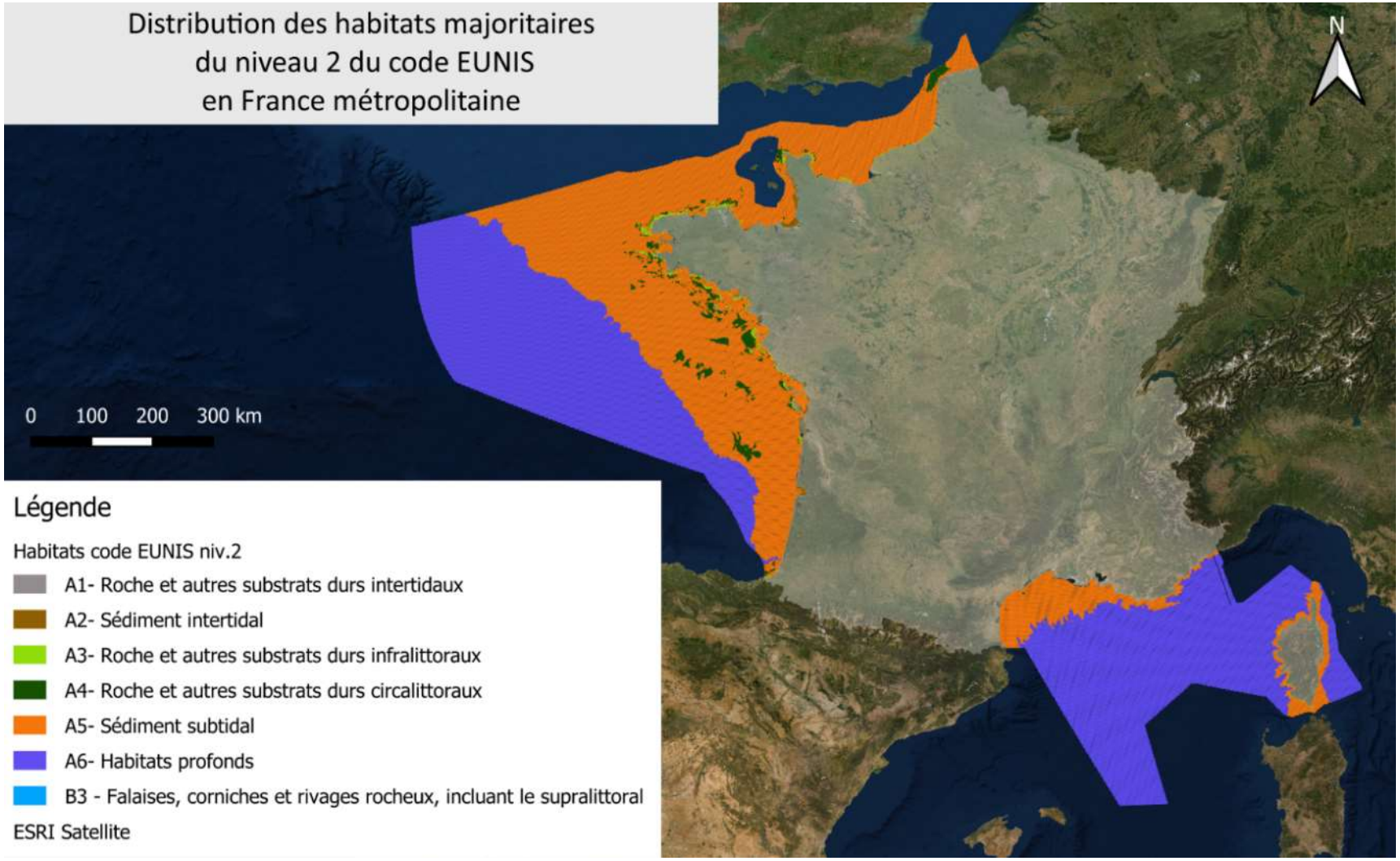
Availability of time series for the datasets used

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



Source: Quemmerais-Amice et al., 2020

Extent account : benthic habitat map



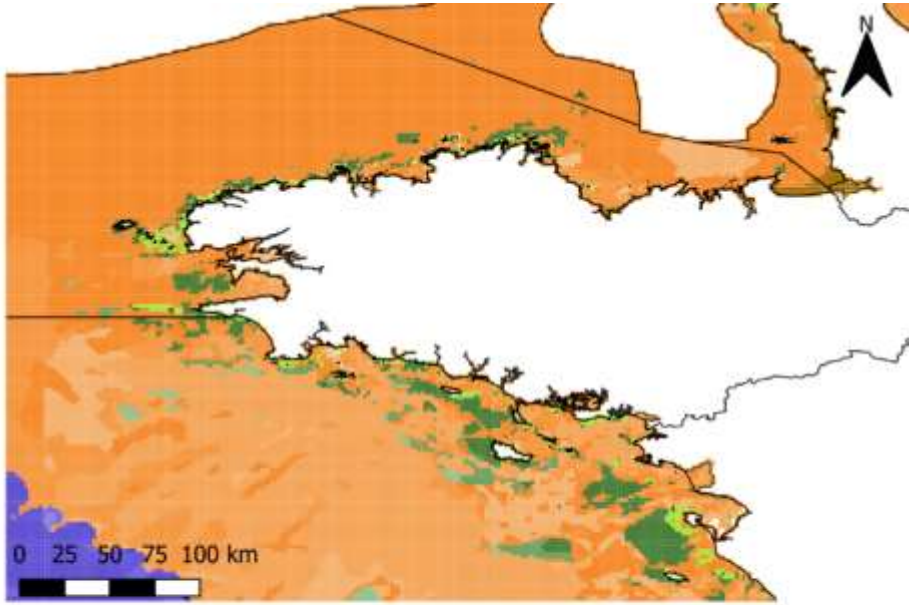
Source: datasets adapted from the CarpeDiem project; Quemmerais-Amice et al. (2020)

Extent account tables

Comptes d'étendue		Code EUNIS de niveau 2									
		A1	A2	A3	A4	A5	A6	B1	B2	B3	Unité
Sous-Régions Marines	Manche-Mer du Nord	49,433794	195,557415	253,384366	997,775713	27379,60543		0,08306	0,004954	0,272876	km²
	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 biogènes 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

Benthic

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 | GDG | Code EUNIS niveau 4

Compte de condition | CEL | Code EUNIS niveau 4

Compte de condition | MMN | Code EUNIS niveau 4

Compte de condition | MED | Code EUNIS niveau 4

Pelagic

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 de condition | GDG | Code EUNIS niveau 2

Compte de condition | CEL | Code EUNIS niveau 2

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Compte d'étendue	Code EUNIS niveau 4
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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 descrpitors

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

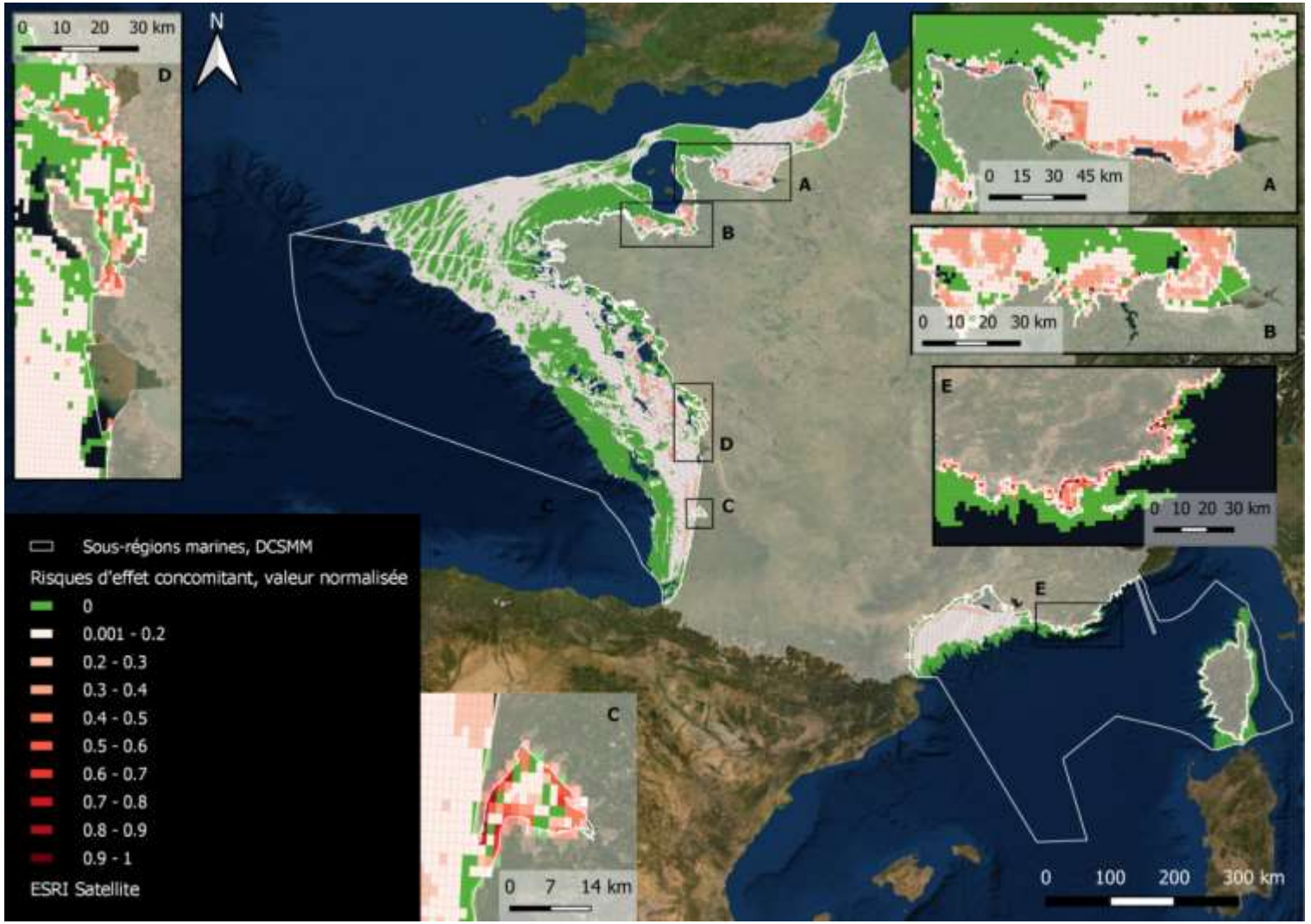
Dimension	Current condition	Descriptors of the MSFD	Link to policy documents
Heritage	-Abundance of species (marine mammals, birds) -Red list -State of protected areas	-D1 (-D6)	MSFD, Habitat Directive, OSPAR, Barcelona, Natura2000
Capacity	-Fish stocks -Water quality	-D3 -D9	MSFD, WFD
Functionality	-Non-indigeneous species -Trophic levels -Physical integrity -Eutrophication -Marine debris -Nurseries & feeding grounds -Resilience metrics	-D2 -D4 -D5 -D6 -D8 -D10 -D11	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

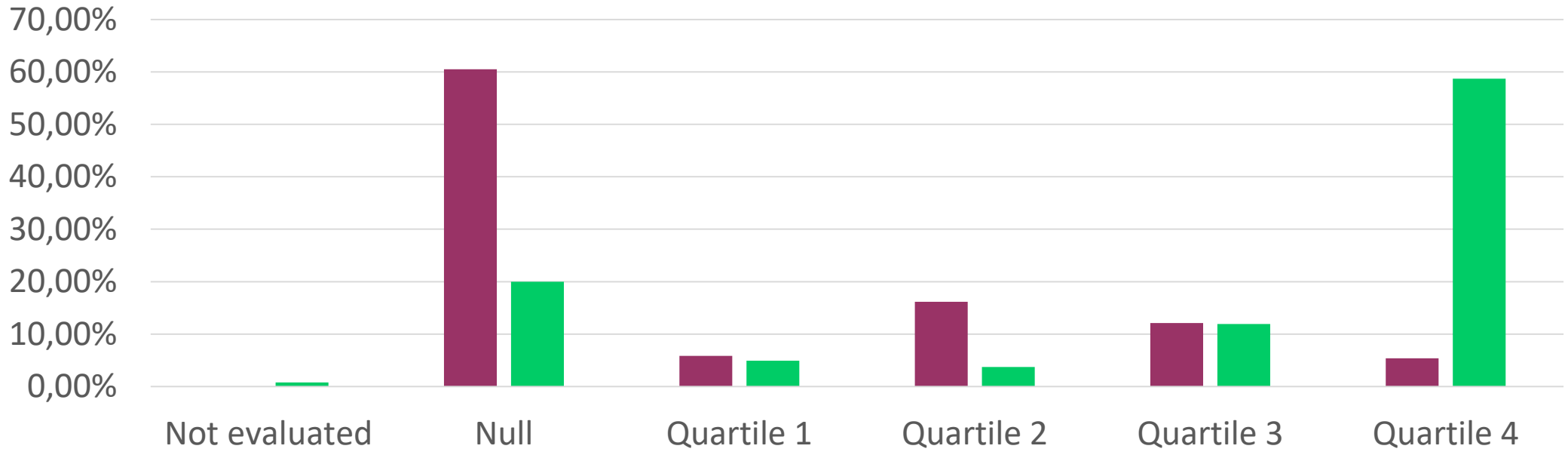


Projection carte : Lambert 93 / EPSG : 2154

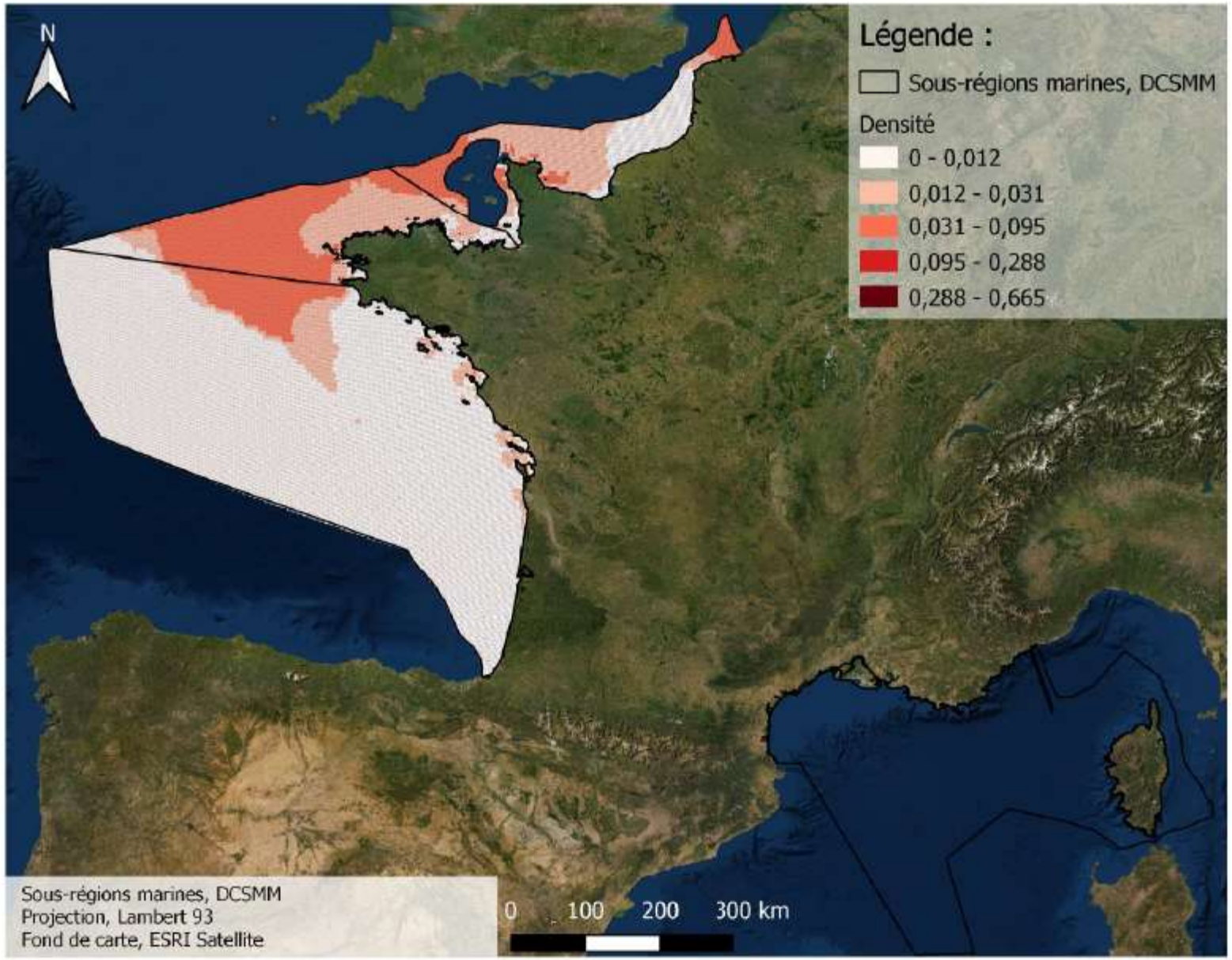
Source : projet MAIA, France

Données : CarpeDiem, OFB

Condition of benthic habitats
Distribution of the risk on physical integrity



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

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

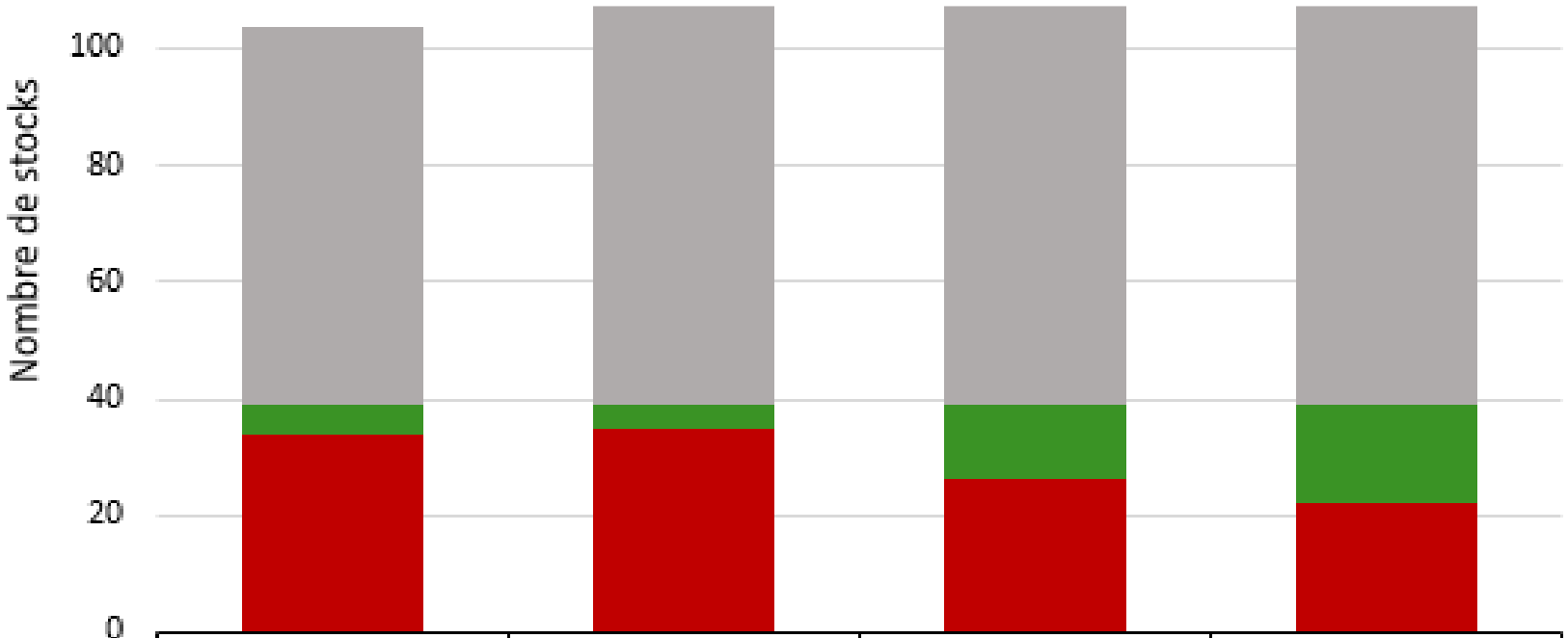
Reference/target condition

Potential indicators for reference/target conditions

Dimension	Current condition	**Reference condition**	Link to policy documents
Heritage	-Abundance of species (marine mammals, birds) -Red list -State of protected areas	-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	-Fish stocks -Water quality	-MSY -Contaminants levels	MSFD, WFD
Functionality	-Trophic levels -Physical integrity -Eutrophication -Marine debris -Nurseries & feeding grounds -Resilience metrics	-Pollutants levels -Thresholds of chemical and biological variables -Trends in marine debris -Non-declining surfaces	MSFD, OSPAR, WFD

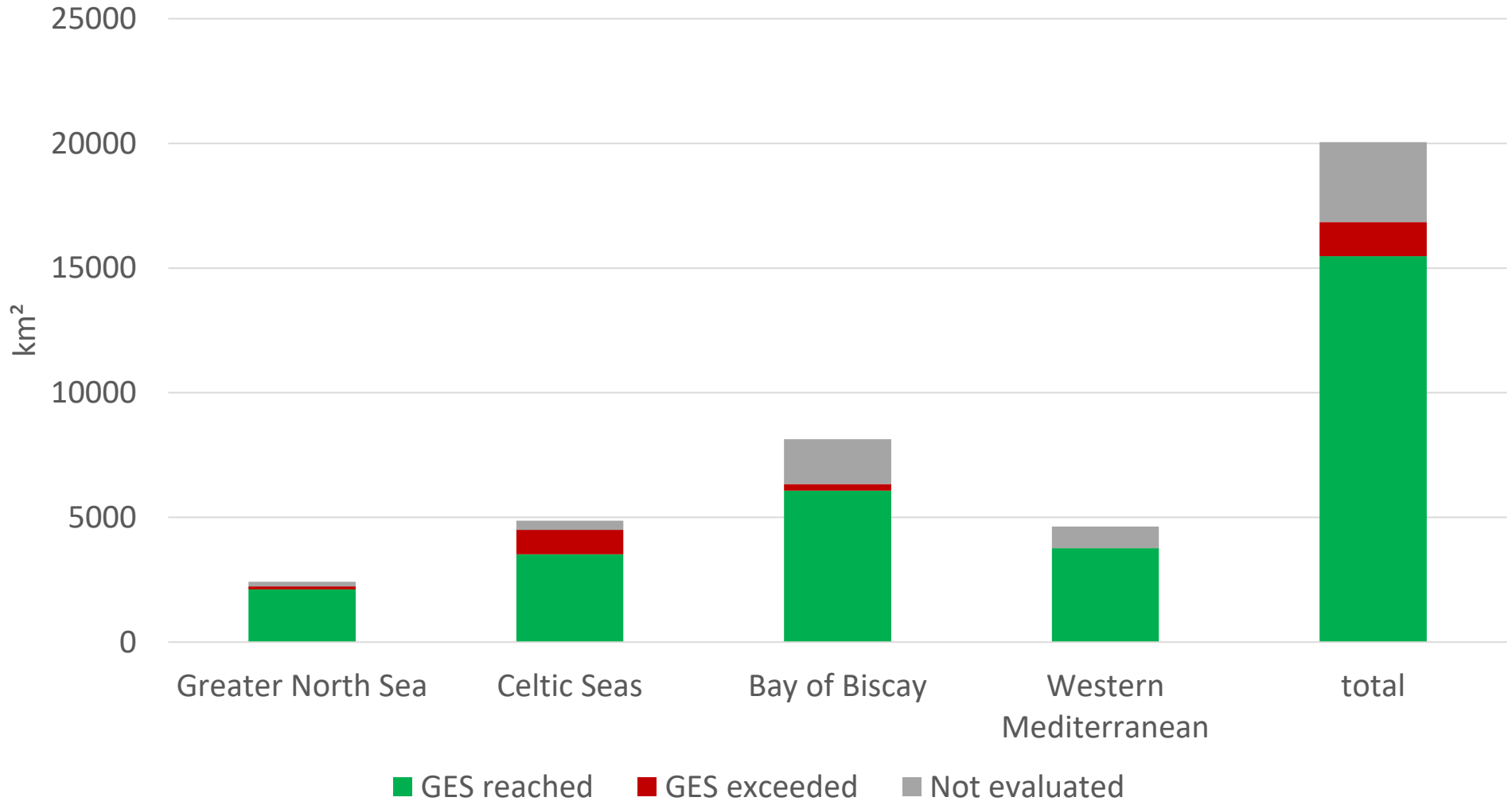
-Available
-Uncertain
-Not available

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



	2000	2006	2012	2018
BEE non évalué	65	76	76	76
BEE atteint	5	4	13	17
BEE non atteint	34	35	26	22

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

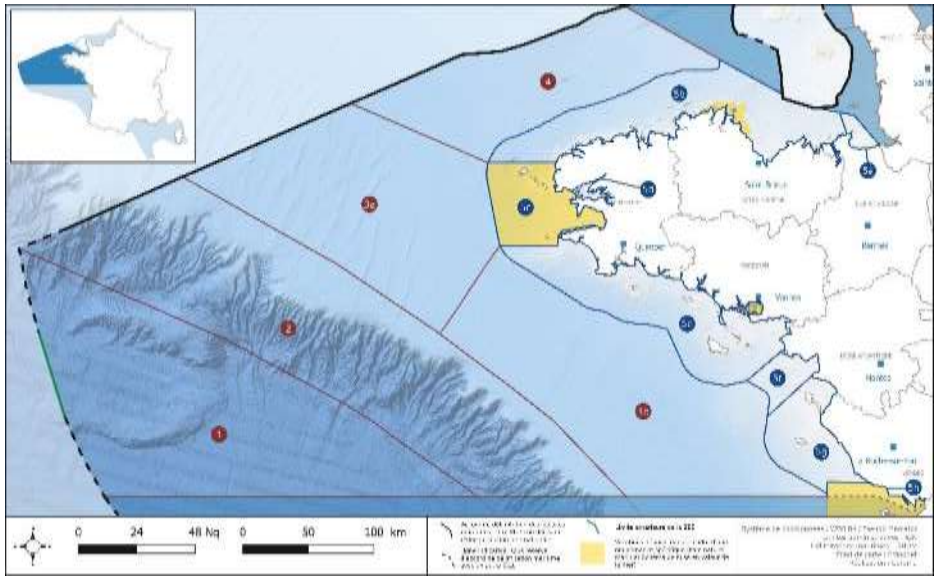


Policy use of marine ecosystem accounts

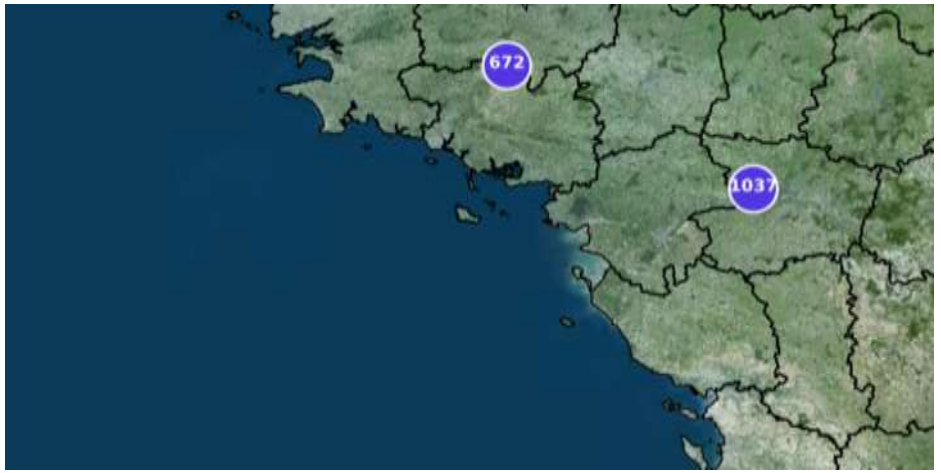
- Build standardized indicators to monitor the achievement of specific policy objectives, including spatially-explicit strategic objectives
- Monitor environmental degradation
- Assist in the identification of data gap
- Harmonize and integrate existing ecosystem monitoring processes
- Ease access to 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

https://maiaportal.eu/factsheets

Thank you for your attention

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