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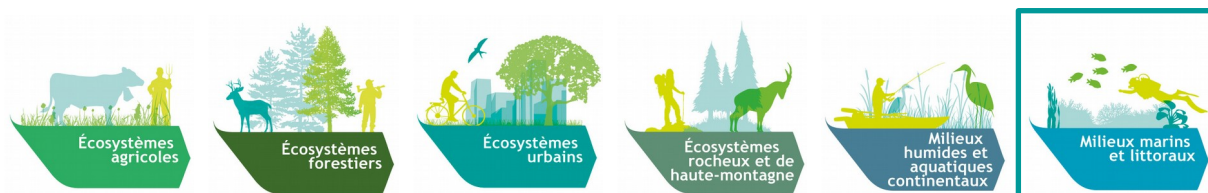
Commissariat général au développement durable



Marine and coastal ecosystems in France

Key messages for decision makers

AVRIL 2019



France, whose exclusive economic zone (EEZ) is the second largest in the world, benefits from a set of diverse marine and coastal ecosystems distributed throughout the globe. The French EEZ covers 11 million km² (more than 20 times the surface of metropolitan France), of which 97% are Overseas. France holds the fourth largest coral reef area in the world (55,000 km²). In metropolitan France, the coastline represents a 5,853-km stretch that includes rocky coastlines (41%), beaches and dunes (35%) and salt marshes (24%).

This evaluation was conducted by a team from the *Institut français de recherche pour l'exploitation de la mer* (Ifremer), the *Université de Bretagne occidentale* (UBO) and the *Agence française pour la biodiversité* (AFB) with the support of a working group. It has been reviewed by the EFESSE Scientific and technical advisory board and the key messages for decision-makers that emerged from were discussed and approved on 7 november 2017, by the EFESSE National stakeholders committee. The level of consensus observed and cross-references to the detailed sections of the report are presented in the margins of the messages.

To access the full report (in French): <https://www.ecologique-solidaire.gouv.fr/EFESE>

Marine and coastal ecosystems: key messages

1. The marine ecosystems under French jurisdiction are still very imperfectly known; it is thus necessary to interpret the available data and the assessments with caution. The understanding of the structure and functioning of marine ecosystems is decreasing as one moves away from the coastal zone and towards the open sea and the deep sea¹. Monitoring networks cover only a limited number of species and environmental status parameters². Efforts have so far mainly concerned the remarkable habitats or the ones at stake (coral reefs, large mudflats, eelgrass and posidonia meadows, canyons)³.

^{1,2,3} Well-established and accepted (§ 16)

Ecological condition, its evolutions and drivers

2. French marine and coastal ecosystems support an exceptional biodiversity that gives France a special responsibility, including to the international community¹. It is estimated that 80% of this marine biodiversity is present in overseas territories². Thanks to them, France is present in 4 of the 5 world oceans. The French EEZ is home to a large share of the 240,000 marine species recorded worldwide³. Some ecosystems are unique because they contain an extremely high number of species (tropical coral reefs, maërls banks, kelp forests), or because they are endemic (Posidonia meadows in the Mediterranean, highly isolated marine ecosystems)⁴.

^{1,2,3,4} Well-established and accepted (§ 3)



Coral landscape home to fish and corals of different species (Mayotte).

© Aymeric Bein - Agence française pour la biodiversité

3. The coastal zone contains particularly rich and productive marine ecosystems¹, including estuaries, marshes and coral reefs. Primary production is very high because it is not limited by the absence of light and is generally stimulated by the presence of large amounts of nutrients². This exceptional productivity contributes to feed the food webs, which are essential for the proper functioning of marine ecosystems³. Some offshore areas, in particular the continental slope, canyons and seamounts, also show high and less well-known wealth and productivity⁴.

^{1,2,3,4} Well-established and accepted (§ 3)

4. French marine and coastal environments still have a significant proportion of ecosystems that are not artificialised or relatively unmodified¹, but that are increasingly

¹ Well-established and accepted (§ 6 et 7)

threatened and whose protection is a major challenge². Marine ecosystems, in particular offshore marine ecosystems, are the ecosystems that are the most difficult to domesticate³. However, this statement is to be put into perspective because of the growing pressures on these ecosystems⁴. A significant number of them can still be protected⁵.

² Well-established and accepted (§ 3.4)
³ Well-established and accepted (§ 6)
^{4,5} Well-established but disputed (§ 12.3.3)

5. Coastal ecosystems are the most vulnerable because they are the most exposed to anthropogenic pressures, whose impacts are cumulative¹. They are the receptacle of chronic pollutions of terrestrial origin which accumulate there. The ecological state of Atlantic Channel bays, Mediterranean bays and lagoons, and lagoons in the tropics shows that nutrient inputs, mainly from watersheds, exceed the capacity of ecosystems to regulate them in many places, which induces eutrophication phenomena². Coastal ecosystems are also subject to disturbances related to offshore activities, some of which (coastal artificialization, fishing with certain towed gears, aggregates extraction, marine infrastructure) may ultimately result in the physical destruction of habitats³. Because they are not very resilient, habitats built by "engineer" species are very sensitive to destruction, as this is the case with coral reefs, whose recovery time can reach several decades⁴.

^{1,2,3,4} Well-established and accepted (§ 6)



A beach in the perimeter of the Parc naturel marin d'Iroise covered with green algae (Bretagne). © Yannis Turpin - Agence française pour la biodiversité

6. Although less prominent than in the coastal zone, the pressures on offshore marine ecosystems are numerous and growing¹. Pressures such as the accumulation of heavy metals and synthetic molecules (PCBs) in food webs, the accumulation of plastic litter in the environment, harvesting beyond the thresholds of durability, illegal discharges or accidental pollution, increasingly disrupt the functioning of offshore ecosystems². Deep ecosystems, which are not very resilient, are subject to increasing exploitation demands (extraction of hydrocarbons and minerals, search for molecules), whereas only certain activities are subject to precautionary measures (deep-sea fishing)³.

¹ Well-established and accepted (§ 6)
² Well-established and accepted (§ 6 and 7)
³ Well-established and accepted (§ 6.1)

7. Climate change is already inducing physicochemical changes in environments (rise in temperature and sea level, acidification, deoxygenation, stratification, currents, ...) **affecting the structure and functioning of marine ecosystems** (species and habitat distribution,

^{1,2,3,4} Well-established and accepted (§ 6.5)

community composition)¹. These changes affect phytoplankton, which plays a key role in the functioning of these ecosystems². Sea-level rise also modifies the favorable environmental conditions for the maintenance of seagrasses, mangroves and coastal marshes, and increases the risk of coastal erosion³. The rise in water temperature is one of the main causes of coral bleaching episodes overseas, which are multiplying and intensifying, and can lead to the death of the ecosystem⁴.

Ecosystem goods and services, natural heritage

8. The bundles of ecosystem goods and services associated with marine and coastal ecosystems vary according to ecosystem types, biogeographic conditions and forms of social demand¹. Some ecosystems or compartments offer "diversified" bundles (coral reefs, mangroves, lagoons, rocky bottoms, estuaries, soft beds and seagrass beds) while others are more "specialized" (beaches and dunes, plankton compartment, aquaculture areas, commercial species, deep ecosystems and protected species)².

^{1,2} Well-established and accepted (§ 5 et § 13)

9. The social demand regarding marine and coastal ecosystems can be driven by the search for individual benefits but also expressed by the production of norms and collective agreements concerning the use and management of these environments¹. Regulations and their application are aimed at preserving marine ecosystems and maintaining their capacity to provide services: monitoring of extraction activities, standards on polluting emissions, creation and management of marine protected areas².

^{1,2} Well-established and accepted (§ 13 et 9.1.7)

10. Marine ecosystems provide a high volume of essential food¹, the sustainability of which is not always guaranteed². Fishery and shellfish products contribute to food security by providing essential nutritional inputs, and even the livelihoods of certain populations, particularly in overseas territories. In metropolitan France, the consumption of seafood products depends very heavily on imports. Market fish production from marine waters under French jurisdiction in metropolitan France is estimated at 240 000 tonnes for a value of €680 million in 2014 and goods derived from shellfish farming represented 154 500 tonnes for a value of €535 million in 2013³. Growth prospects in terms of volume are very limited in the short term and depend, in the long term, on the generalization of responsible practices in fisheries and marine aquaculture and the development of new crops (seagrass). In recent years, overexploitation of fish resources has been significantly reduced in the Atlantic-Channel areas, but not in the Mediterranean and in the overseas territories, where stock status remains poorly known⁴. The productive capacity of goods derived from fishing activities and marine aquaculture also depends on the preservation of the functionalities of breeding and nursery areas and the improvement of water quality⁵.

^{1,2,3,5} Well-established and accepted (§ 9.1 et 9.2)

⁴ Well-established and accepted (§ 9.1)

11. The marine and coastal environments provide cultural services, through the pleasant landscapes they represent and species likely to be observed or fished. The metropolitan coastline hosts 31% of tourist overnight stays and concentrates 12% of the population on 4% of the territory¹. Water leisure and sport activities are practiced by more than half of the French population². Some of these activities are highly dependent on marine and coastal ecosystems, such as recreational fishing, of which practitioners spent €1.25 billion in 2006, or diving, with a turnover of €21 million in 2016³. Very widespread in France, and as important as professional fishing for certain species (bar, mackerel), recreational fishing is poorly monitored and relatively unstructured, making it difficult to control non-responsible practices⁴.

¹ Well-established and accepted (§ 11.2.1)

² Well-established and accepted (§ 11.1.1)

^{3,4} Well-established and accepted (§ 11.1.2 et 11.1.5)



Hikers on the coastal path along the Vermeille coast (Occitanie).

© Arnaud Bouissou - Terra

12. The contribution of marine and coastal environments to climate regulation is important¹. Globally, the ocean captures about a quarter of anthropogenic CO₂ emissions. The carbon sequestered annually in marine biomass and sediments, called "blue carbon", represents about 10% of atmospheric CO₂ sequestered by the ocean, the remaining 90% being attributed to physicochemical dissolution processes in marine waters². The coastal ecosystems of blue carbon (mangroves, seagrasses, coastal marshes) are particularly threatened whereas they have the peculiarity of being able to store carbon for millennia contrary to their terrestrial equivalents³.

^{1,2,3} Well-established and accepted (§ 10.3)

13. Regulatory services such as water quality regulation and coastal protection are of increasing concern but remain difficult to assess¹. It is increasingly recognized that maintaining a good state of coastal ecosystems reduces the health and economic problems inherent in eutrophication and microbiological and chemical contamination². The fight against coastal eutrophication, which depends on the nutrients regulation service by ecosystems, but also on physical and hydrodynamic factors, has led to an expenditure of nearly €270 million in 2016³. Coral reefs, mangroves, seagrasses and maritime marshes and dune ridges protect coastal areas against the risks of erosion and marine submersion, mainly overseas and on the Aquitaine coast⁴. According to available estimates, the annualized value of avoided damage through coastal ecosystems would range from a few tens (in the Indian Ocean and the West Indies) to several hundred (in Polynesia) millions of euros⁵.

^{1,2,3} Well-established and accepted (§ 10)
⁴ Well-established and accepted (§ 10.1)
⁵ Well-established and accepted (§ 10.2)

14. French marine and coastal ecosystems have a strong heritage dimension¹ which results from both local and identity-based dynamics centered on practices, and institutional dynamics centered on remarkable biodiversity. The identity-based inheritance processes that have been established at the initiative of the rather local communities aim in particular at safeguarding professional practices of exploitation that support cultural practices². At the same time, an "institutional" patrimonialization of remarkable elements of marine biodiversity is strengthening³. The strength of these attachments can be seen in the abundance of works of art inspired by the sea, the attraction for coastal environments and the associative dynamism⁴.

¹ Well-established and accepted (§ 12)
² Well-established and accepted (§ 12.2)
³ Well-established and accepted (§ 12.3)
⁴ Well-established and accepted (§ 12.4)



Seaside resort in Lège-Cap Ferret (Nouvelle Aquitaine).

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Options for integrated and sustainable management

15. The integrated management of marine and coastal ecosystems is a strong challenge, recognized by strategies for the conservation and sustainable use of marine ecosystems. The assessment of ecosystem services and natural heritage can help to make them effective¹. Indeed, these assessments provide a framework that allows:

¹ Well-established and accepted (§ 15.2)
^{2,3,4,5,6} Well-established and accepted (§ 15)

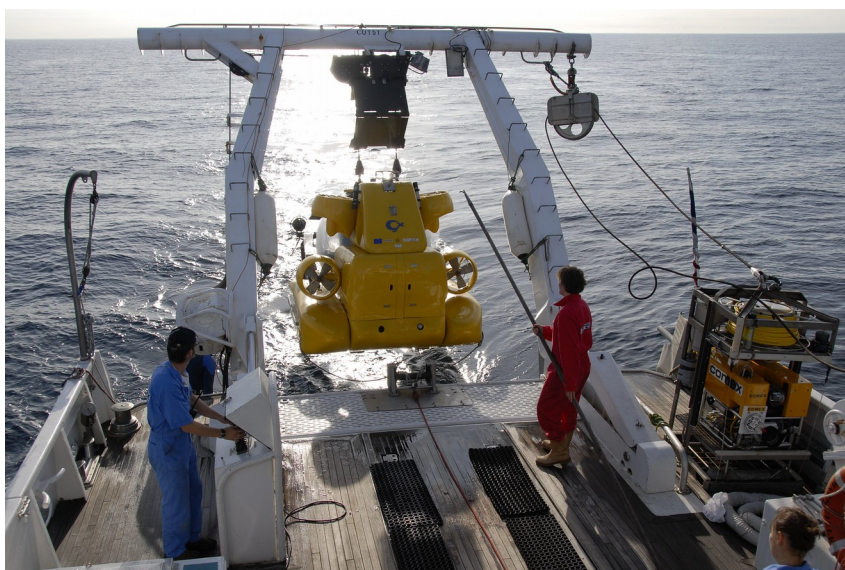
- to reveal multiple dependencies on the functioning of ecosystems²;
- to broaden and re-balance the spectrum of the issues taken into account, and thus not over-emphasize certain services (production of goods, market issues) to the detriment of other aspects (ecological functions, regulatory services, heritage dimension)³;
- to provide and articulate structured information across sectors (biodiversity conservation, economy, health, etc.)⁴;
- and finally to integrate sectoral issues by highlighting possibilities of conciliation and necessary arbitrations⁵.

Such assessments may support the integration of maritime spatial planning processes for sustainable "blue growth" with processes of ecosystem-based management, which include the conservation of marine biodiversity⁶.

Knowledge and data gaps and needs for further studies

16. While current data and knowledge on the functioning of French marine and coastal ecosystems are already sufficient to put in place an integrated management framework, considerable progress is still needed and possible¹. The main knowledge needs concern high-stake coastal ecosystems and require the development of monitoring of certain activities (recreational fishing) and modeling capacities (sedimentary dynamics, nitrogen cycle, habitat connectivity, pathogens, etc.). The ecosystems of the open sea and the abyss suffer from lacks in fundamental knowledge². Taking into account the effects of climate change is necessary and requires specific knowledge³. Finally, the production of knowledge on the attachment of our society to its marine and coastal ecosystems remains essential to facilitate the understanding and integration of the heritage dimension of these ecosystems in public policies⁴.

^{1,2} Well-established but disputed (§ 16)
³ Well-established and accepted (§ 16.3)
⁴ Well-established and accepted (§ 12.4.3)



Preparing the submarine for an exploratory dive in the Mediterranean Canyons (Occitanie). © Olivier Brosseau - Agence française pour la biodiversité

Stakeholder comments

Comment of the *Comité national des pêches maritimes et des élevages marins* (CNPMEM) on message [4] :

« The Comité national des pêches maritimes et des élevages marins (CNPMEM) issues the following points of vigilance and attention with regard to key messages:

The assessment of marine and coastal ecosystems and their ecosystem services faces significant gaps in knowledge on their ecological status and functioning. This is emphasized in Message [1] which highlights the need to be cautious about the interpretation of available evaluations and data. It is also recognized that this knowledge is decreasing as one moves away from the coast. In this sense, the CNPMEM does not subscribe to the drafting of Message [4], which should be more nuanced because it tends to consider that some "not artificialised or relatively little modified ecosystems" are "increasingly at risk" while there is no scientific evidence to support this contention on ecological state. On the other hand, it is not the "protection" of these ecosystems that is major stake but their maintenance in good condition (a formulation that would be more consistent with the drafting of Message [13]).

Finally, the CNPMEM wishes to add that the knowledge available is not only incomplete but also very uneven depending on the ecological compartments and the types of pressures considered. In particular, it highlights the lack of knowledge about the effects of land-based pressures, including pollution and waste, among which 80% results from land-based activities. Therefore, the "protective measures" referred to at the end of Message [4] should address all causes of degradation in order to maintain or restore the ecosystems for which preservation is an issue. It seems vain to hope that the "classical" tools for the management and protection of the marine environment (mentioned in Message n ° [9]) will make it possible to achieve the good ecological status of the marine environment and to preserve its functionalities, if we do not focus actions on the pressures coming from land-based activities. »

Comité national des pêches maritimes et des élevages marins (CNPMEM)



The EFESSE is a program and a science-policy-society platform led by the Ministry for an Ecological and solidarity transition. It aims at revealing the multiple values of biodiversity in order to facilitate their

integration in public policies and private decisions in France. The program builds on a shared conceptual framework and a national governance that brings together experts, policy makers and stakeholders. After a first phase ending with the publication of six broad assessments covering French ecosystems, EFESSE is starting a second phase whose operational and strategic character will be reinforced in order to develop the tools required to foster the ecological transition of the French society.

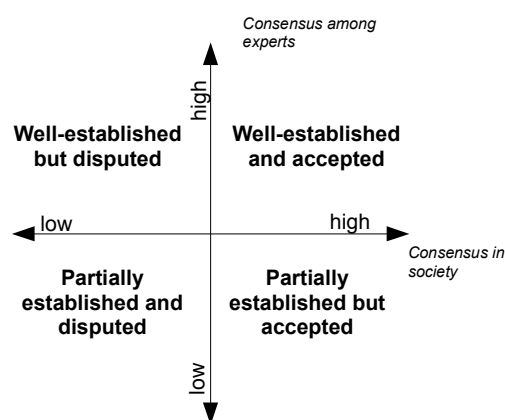
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The key messages for decision makers

The key messages for decision-makers are co-written by the EFESSE project team of the Ministry for an Ecological and solidarity transition and by the authors of the studies. In order to enhance their scientific credibility and their legitimacy in the eyes of decision-makers, they are subject to scientific advice and stakeholder approval.

Every assertion composing these messages is qualified on two dimensions. The **scientific consensus**, first, is informed on two levels. It is proposed by the authors of the study and submitted to an arbitration by the EFESSE Scientific and technical advisory board. The **societal consensus**, on the other hand, is informed on two levels. Unless opposition is expressed, the level of consensus is considered high. It is degraded as soon as a stakeholder disputes the assertion and makes the reasons for its disagreement explicit. This gives rise to the four qualifications which are presented opposite and indicated in the margin of the messages.



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