

Chapter 12

The Marine Conservation Landscape in Europe: Knowledge Support to Policy Implementation and Conservation Action



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Acronyms

AFS Convention	International Convention on the Control of Harmful Anti-fouling Systems on Ships
AMAP	Arctic Monitoring and Assessment Programme
ATEMP	AMAP's Trends and Effects Monitoring Programme
Baltic Sea Pharma	Platform to reduce pharmaceuticals in the Baltic environment
Black Sea Commission	Convention for the Protection of the Black Sea against pollution
BSAP	Black Sea Strategic Action Plan
CG PHARMA	HELCOM Correspondence Group on Pharmaceuticals
CLRTAP	Geneva Convention on long-range transboundary air pollution
COR GEST	Correspondence Group on GES and Targets in the Mediterranean
COR MON	Correspondence Group on Monitoring in the Mediterranean
DAIMON	Decision Aid for Marine Munitions
EcAp	Ecosystem approach
ECHA	European Chemicals Agency
ECOSTAT	WFD Working Group Ecological Status
EEA	European Environment Agency
EFSA	European Food Safety Agency
Eionet	European Environmental Information and Observation Network
EMBLAS-Plus	Improving Environmental Monitoring in the Black Sea—Special Measures
EMODnet	European Marine Observation and Data Network
EMSA	European Maritime Safety Agency
EN-HZ	HELCOM expert network on hazardous substances
ESAS	Advisory Group on the Environmental Safety Aspects of Shipping in the Black Sea
EUSBSR	EU Strategy for the Baltic Sea Region
EWG OWR	HELCOM Expert Working Group on Oiled Wildlife Response
GES	Good Environmental Status

GESAMP	Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection
EHS	GESAMP Working Group on environmental hazards of harmful substances carried by ships
WG 42	GESAMP Working Group on impacts of wastes and other matter in the marine environment from mining operations
HELCOM	Convention on the Protection of the Marine Environment in the Baltic Sea Area
ICES	International Council for the Exploration of the Sea
ICG 4PE	OSPAR RSC's subsidiary Intersessional Correspondence Group Delivering the Fourth Periodic Evaluation
ICG CTZ	OSPAR RSC's subsidiary Intersessional Correspondence Group Close to Zero
ICG EAC	OSPAR RSC's subsidiary Intersessional Correspondence Group Environmental Assessment Criteria
ICG MOD	OSPAR RSC's subsidiary Intersessional Correspondence Group MODelling
IMAP	Integrated Monitoring and Assessment Programme for the Mediterranean
IMO	International Maritime Organization
INPUT	OSPAR's working group on Inputs to the Marine Environment
JPI Oceans	Joint Programming Initiative Healthy and Productive Seas and Oceans
LBS	Advisory Group on Control of Pollution from Land-Based Sources in the Black Sea
London Convention	Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter
MAP	Mediterranean Action Plan
MARPOL	International Convention for the prevention of Pollution from Ships
MCWG	ICES's Marine Chemistry Working Group
MED POL	Mediterranean Pollution Assessment and Control Programme
MEPC	IMO's Marine Environment Protection Committee

MIME	OSPAR's working group on Monitoring and on Trends and Effects of Substances in the Marine Environment
MORS EG	HELCOM expert group on monitoring of radioactive substances
MSFD	Marine Strategy Framework Directive
NORMAN	Network of reference laboratories, research centres and related organisations for monitoring of emerging environmental substances
OIC	OSPAR's Offshore Industry Committee
OSPAR	Convention for the Protection of the Marine Environment in the North-East Atlantic
HASEC	OSPAR's Hazardous Substances and Eutrophication Committee
PA Hazards	Policy Area Hazards
PMA	Advisory Group on the Pollution Monitoring and Assessment in the Black Sea
PPR	IMO's Sub-Committee on Pollution Prevention and Response
PRESSURE	HELCOM working group on reduction of pressures from the Baltic Sea catchment area
REACH	Registration, Evaluation, Authorisation, and Restriction of Chemical substances
REMPEC	Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea
RESPONSE	HELCOM working group Response
RSC	OSPAR's Radioactive Substances Committee
SUBMERGED	HELCOM Expert Group on Environmental Risks of Hazardous Submerged Objects
Barcelona Convention	Convention for the Protection of Marine Environment and the Coastal Region of the Mediterranean
WFD	Water Framework Directive
WG Chemicals	Working Group Chemicals
WG MARITIME	HELCOM working group Maritime
WG STATE and CONSERVATION	HELCOM working group on state of the environment and nature conservation
WGBEC	ICES's Working Group on Biological Effects of Contaminants

WGMS	ICES's Working Group on Marine Sediments in Relation to Pollution
WISE Marine	Marine Information System for Europe

12.1 Biodiversity in Europe: Relevance, Instruments for Governance and Knowledge Base

Biodiversity loss impacts ecosystem functions and services at different levels and has implications for human life in terms of food provision, regulation of nature service uses, social and economic interactions and recreation (TEEB 2010). Conservation efforts in Europe, similarly to other regions around the globe, have been focused on setting the instruments and priorities for:

1. The management of habitat degradation and species protection.
2. Sustainable exploitation of natural resources.
3. Control of alien species introduction and pollution impacts.
4. Monitoring and mitigation of climate change impacts.

Europe holds a high diversity of wild animals and plants, some of them endemic. These species are protected under several policy instruments, including the Habitats Directive (92/43/ECC). The latter established the EU Natura 2000 network that represents the largest coordinated network of protected sites in the world (Maes et al. 2012), covering over 18% of land and 6% of the EU countries' surface area, respectively.

The most important environmental framework at the European level is the EU Biodiversity Strategy that aims at halting or significantly reducing biodiversity loss and degradation of ecosystem services in the EU by 2020, also contributing to diminishing global biodiversity loss. This Strategy is mainly based on two legal pillars: the Habitats Directive and the Birds Directive (79/409/EEC)—collectively called the Nature Directives—and establishes six main targets, each supported by a set of actions, to achieve important European conservation objectives by 2020:

1. Fully implement the Birds and Habitats Directives.
2. Maintain and restore ecosystems and their services.
3. Increase the contribution of agriculture and forestry to maintain and enhance biodiversity.
4. Ensure the sustainable use of fisheries resources.
5. Control invasive alien species (IAS).
6. Contribute to avert global biodiversity loss.

However, the mid-term review of the EU 2020 Biodiversity Strategy (EU COM (2015) p. 478) showed that, in spite of noticeable progress in biodiversity conservation at the EU level, biodiversity loss is continuing (mostly caused by habitat degradation), highlighting the need for additional and substantial measures to revert

this trend. This applies also to marine species and ecosystems that continue declining across Europe's regional seas. Many of these measures need to be based on cross-sectorial, articulated efforts from concerned stakeholders and based on the best available scientific evidence, fitted to the implementation needs. The EU Action Plan for nature, people, and the economy that followed this mid-term review mandated an improvement of the implementation of the Nature Directives to boost their contribution towards reaching the EU's biodiversity targets for 2020. The Action Plan focuses on four priority areas and comprises 15 actions to be carried out by 2020.

Marine resources are considered an important source of livelihood and economic income, providing different ecosystem services (e.g., bioremediation, food, and recreation) and contributing significantly to the global primary production (Charrier et al. 2017). The European seas cover 5.7 million km² and include several regional seas (Fig. 12.1) with 82% of the EU Member states having a coastline and with the maritime area under EU jurisdiction being larger than the total area of the EU. Almost half of the population in Europe is concentrated in the maritime areas which account for almost half of its Gross Domestic Product (GDP). The European Marine Strategy Framework Directive (MSFD, 2008/56/EC, <https://www.eea.europa.eu/data-and-maps/data/europe-seas#tab-gis-data>) is the overarching framework for community action in the field of marine environmental policy in Europe.

The governance and management framework for European marine waters has a central role in achieving a good conservation status and reversing the decreasing trend in marine biodiversity. Beyond the MSFD, marine governance in Europe involves different legal instruments, organizations and strategies. Some are exemplified below.

Marine Protected Areas (MPAs) Protected areas are valuable tools to reduce the pressures on biodiversity by enabling long-term protection and recovery of target organisms, habitats, and ecosystem services. The expansion of the marine protected area network has been partly driven by the need to meet European and international marine conservation targets and sustainable socioeconomic growth based on marine activities. Subsequently, the number and total area of MPAs has increased rapidly in recent years with most MPAs concentrated in intertidal and coastal waters. In 2012, 5.9% of the EU waters (within 200 nautical miles) were covered by MPAs, corresponding to 7725 sites and a total area of 338,623 km² (EEA report 2015). For example, in the Mediterranean, MPAs almost doubled both in number and in area between 2008 and 2012 (Gabrié et al. 2012) and altogether Portugal, Spain, and France have 134 MPAs covering 227.2 km² (Batista and Cabral 2016). However, in Europe the coverage of MPAs still needs to be extended and the existing management plans for these areas improved (Batista and Cabral 2016).

Regional Sea Conventions Regional Sea Conventions (RSC) have an important role in European regional seas governance, representing coordinated regional cooperation structures aimed at protecting the coastal and marine environment. There are four European Regional Sea Conventions as follows:

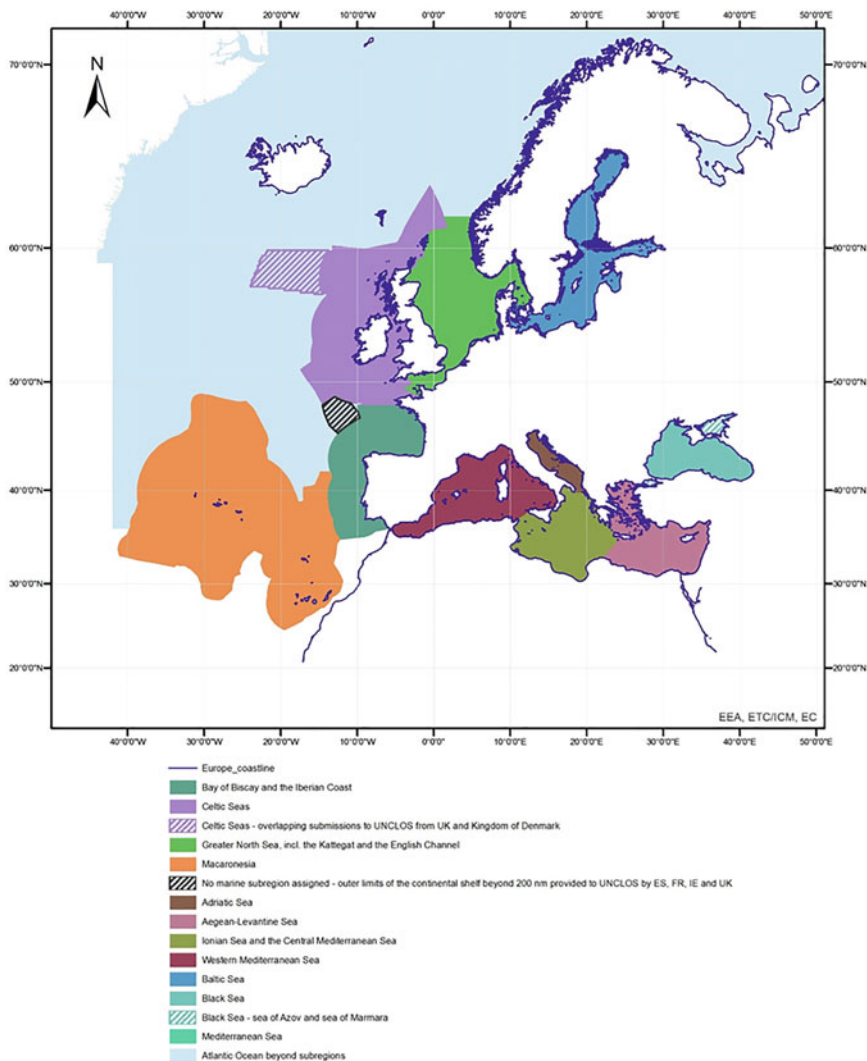


Fig. 12.1 Marine regions and sub-regions considered under the European Marine Strategy Framework Directive (the overarching framework for community action in the field of marine environmental policy in Europe) (2008/56/EC, <https://www.eea.europa.eu/data-and-maps/data/europe-seas#tab-gis-data>)

- The Convention for the Protection of the Marine Environment in the North-East Atlantic (OSPAR: <https://www.ospar.org/convention>).
- The Convention on the Protection of the Marine Environment in the Baltic Sea (HELCOM: <http://www.helcom.fi/about-us/convention>).

- The Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (Barcelona Convention: <http://web.unep.org/unepmap/>).
- The Convention for the Protection of the Black Sea (Bucharest Convention: <http://www.blacksea-commission.org/>).

The RSC periodically agree on Action Plans outlining the challenges, activities and goals to be developed at the regional level. The RSC interact closely with the European Commission developing the tools for implementation of marine policies at the regional level and providing support to contracting parties in meeting their national obligations towards the marine environment.

Regional Fisheries Management Organizations Regional Fisheries Management Organizations (RFMOs) are international organizations advising and managing fisheries in a specific area and formed by countries with fishing interests in the respective area. Some of them only deal with tunas while others deal with all fish stocks in the area. Some RFMOs only focus on international waters. Examples of RFMOs with activities in European seas are:

- *The International Commission for the Conservation of Atlantic Tunas* (ICCAT: <https://www.iccat.int/en/>): ICCAT compiles fisheries statistics for tuna and tuna-like species in the Atlantic ocean and its adjacent seas.
- *The North-East Atlantic Fisheries Commission* (NEAFC: <https://www.neafc.org/about>): NEAFC manages the fisheries resources in the North-East Atlantic with Denmark (Faroe Islands and Greenland), EU, Iceland, Norway, and the Russian Federation as contracting parties.
- *North Atlantic Salmon Conservation Organization* (NASCO: <http://www.nasco.int/about.html>): NASCO takes action in the conservation and management of the Atlantic salmon fisheries.
- *General Fisheries Commission for the Mediterranean* (GFCM: <http://www.fao.org/gfcm/background/about/en/>): GFCM works on the conservation of living marine resources as well as the sustainable development of aquaculture in the Mediterranean and in the Black Sea.

12.1.1 European Policy Initiatives and Legal Framework Related to the Conservation of the Marine Environment

There are several policy initiatives related to the EU sectorial priorities that have implications for the conservation of the marine environment. The economic sector connected to marine bio-based products and biotechnology is receiving increasing attention and support. Several initiatives (Bioeconomy Strategy, Blue Growth Strategy, and Circular Economy Action Plan) aim to design the frameworks for the sustainable development of these activities because of their potential to impact the

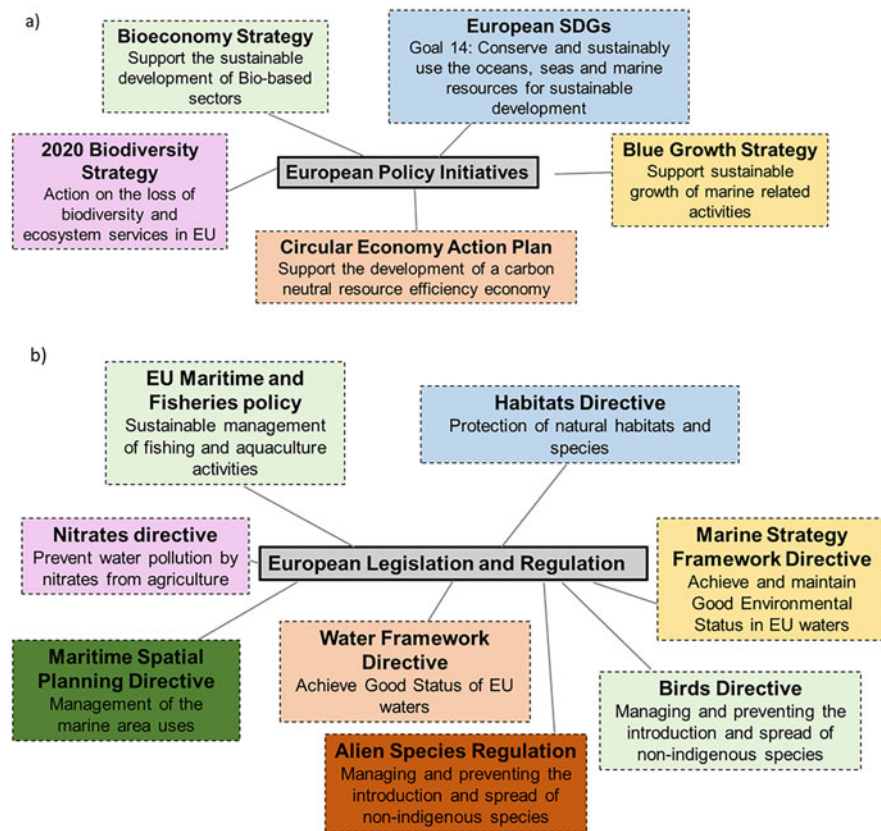


Fig. 12.2 European policy initiatives (a) and EU pieces of legislation (b) relevant for the governance of the marine environment and their relations to marine conservation in Europe

conservation of marine ecosystems (Fig. 12.2a). These initiatives include also the protection measures to be developed under the Biodiversity Strategy. Additionally, the EU has committed to incorporate the United Nations adopted 17 Sustainable Development Goals (SDGs). These include Goal 14 (Life Below Water) on the conservation and sustainable use of the oceans, seas, and marine resources for sustainable development, addressing marine pollution and the sustainable management of fisheries and aquaculture.

Several EU pieces of legislation also address marine conservation-related topics like the protection of species and habitats (e.g., Habitats Directive, Birds Directive, Regulation (EU) 1143/2014 on invasive alien species), the maintenance of the environmental quality (e.g., Water Framework Directive (2000/60/EC), Marine Strategy Framework Directive, Nitrates Directive (91/676/EEC)), the sustainable management of marine-related economic activities (e.g., EU Common Fisheries Policy (Regulation (EU) No 1380/2013), and the Maritime Spatial Planning Directive (2014/89/EU)) (Fig. 12.2b).

12.1.2 The Scientific and Research Landscape in Europe

Most of the scientific knowledge in Europe is produced by Universities and Research Institutes dedicated both to fundamental and to applied research (European Commission 2017; Powell and Dusdal 2017). Several of these institutions are part of thematic networks and hubs that translate research into innovation, promote global data sharing or are organized in research infrastructure consortia.

The EU framework programmes for research and innovation (<https://www.eda.europa.eu/procurement-biz/information/codeda-regulationaba/eu-framework-programme-for-research-and-innovation>) span over a 7-year timeframe and fund projects in EU and other countries. The current framework programme, Horizon H2020, started in 2014 and has a budget of around 70 billion euros for different actions. Most of the marine-related research is funded under the societal Challenge 2 on Food Security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy. Under societal challenges, the EU funds multi-partner collaborative projects bringing together at least three independent entities and the participation of several dozens of partners in these projects is common. Demonstrated impact, together with excellence and implementation, are the criteria based on which proposals are selected.

EU funding still constitutes only a small fraction of the total investment in research and innovation in Europe. In a 2013 speech to key research policy-makers and stakeholders the then EU Commissioner for Research, Innovation and Science, Máire Geoghegan-Quinn, mentioned that national research programmes account for 88% of the public research investments in Europe (Geoghegan-Quinn 2013). Consequently, the alignment of national research programmes across the EU is crucial. The Joint Programming Initiative Healthy and Productive Seas and Oceans (JPI Oceans) (<http://www.jpi-oceans.eu/>) tries to do just that. JPI Oceans is an intergovernmental platform, open to all EU Member States and Associated Countries with the participation of international partners on actions of mutual interest. JPI Oceans promotes the development of joint research programs based on participating countries' contributions with the aim of fostering cooperative initiatives and optimizing resources. The main challenges addressed by this initiative are related to the marine environmental status and spatial planning, mitigation of climate change and sustainability of anthropogenic activities and maritime economy.

The available knowledge to support policy implementation in marine conservation has increased through the mandatory periodic reporting by Member States on the status of different components of the marine environment under the related EU legislation, the coordination of initiatives at national and European level and the associated research. However, obtaining reliable and comprehensive data on the different areas of the marine environment is still a challenge. Pan-European organizations such as the European Marine Board (EMB: <http://www.marineboard.eu/>) function as advisory bodies and help bridge the gap between science and policy in marine research and technology.

12.2 The Knowledge-Implementation Pipeline in Europe

Providing conservation policy and management with the best available knowledge is fundamental for the successful, meaningful, and impactful implementation of evidence-based measures at the legislative, political, and practical levels. Mechanisms for an effective communication and knowledge transfer from evidence producers to stakeholders implementing conservation policy and actions have been the focus of intense debate over the last decade (Hulme 2014; Cvitanovic et al. 2016). It has been argued that a proportion of the knowledge produced has poor value or significance to directly support decision-making and therefore it is being seldom used by practitioners (Anderson 2014; Bertuol-Garcia et al. 2018). Even when directly relevant, the ways of conveying that knowledge are frequently not effective (Bainbridge 2014).

The reasons pointed out for this arthritic knowledge transfer in conservation science can be summarized in different categories of arguments. The most important barriers identified in the literature are: (1) the *accessibility to scientific information* by stakeholders (Pullin et al. 2004; Dicks et al. 2014; Anderson 2014; Bainbridge 2014); (2) the *insufficient motivation and awareness of researchers to conduct applied research* tailored by implementation priorities (Cook et al. 2013; Balme et al. 2014; Hulme 2014); (3) the *lack of alignment between the temporal and spatial coverage of research studies and action needs* (Knight et al. 2008; Cook et al. 2013) and (4) the *lack of willingness of stakeholders to integrate the available evidence into their decision-making frameworks* (Ntshotsho et al. 2015).

In the marine context in Europe, an exception to this general pattern is the stock assessment and related maximum sustainable yield estimation performed by organizations such as the International Council for the Exploration of the Sea and the General Fisheries Commission for the Mediterranean and delivered to the European Commission or to RFMOs. This suggests that when there is a clear legislative requirement, scientific advice can more easily find its way into policy implementation. However, even in the case of fisheries assessment and management, the suggested advice is not always taken up by policy-makers and there is often a profound inertia in preventing the integration of new knowledge, adjusted models, and innovative approaches (Stephenson et al. 2017).

Studies evaluating the effectiveness of the knowledge-implementation flow in conservation are relatively rare in the peer-reviewed literature. However, a number of successful and unsuccessful cases of knowledge uptake leading to action are available (Table 12.1) reflecting negative and positive interactions between knowledge producers and end users. Success cases refer to a positive impact of managers' involvement in the articulation between research and implementation. Another example is the positive impact in public dissemination and communication between researchers and stakeholders when conservation policies are based on the best available knowledge. Negative interactions refer mainly to the failure in bridging research results and implementation needs and the inability of practitioners to integrate research results into practice.

Table 12.1 Non-exhaustive list of examples of published scientific studies evaluating the effectiveness of knowledge transfer between producers and users in conservation science in Europe

Scope and reference	Goals	Main findings
Protected areas in Sweden, Sweden (<i>Angelstam et al. 2011</i>)	Evaluation of the policy implementation process between 1991–2010 and assessment of ecological knowledge use for conservation planning	Positive transfer and application of available knowledge in conservation
Marine protected areas in Scotland, UK (<i>Bainbridge 2014</i>)	Integration of scientific knowledge into policy making by providing user-friendly formats to present available data	Positive translation of available knowledge into conservation
Conservation science of <i>Triturus cristatus</i> in England, UK (<i>Griffiths 2004</i>)	Comparison of the number of papers published in conservation science and the number of mitigation projects conducted in response to developmental threats	Negative perception by practitioners of the relevance of research outcomes and by researchers of the use of produced knowledge in management decisions
Habitat conservation policy as part of the Habitats Directive in Europe, European Union (<i>Jeanmougin et al. 2017</i>)	Evaluation of how the conservation policy contributes to conservation: is it science-based, operational, and legitimate?	Negative evaluation of the application of available knowledge on the implementation of the Habitats Directive
BONUS programme: policy driven joint Baltic Sea research programme (2007-2020), EU Baltic Sea States (<i>Snoeijjs-Leijonmalm et al. 2017</i>)	Assessment of the potential of the BONUS projects to address the challenges faced by the Baltic ecosystems and bibliometric analysis of BONUS funded papers	Positive effect on reducing fragmentation in research funding and policy and contribution of BONUS products and participants to public policies and relevance
<i>Upupa epops</i> (hoopoe) demographic recovery in the Swiss Alps, Switzerland (<i>Arlettaz et al. 2010</i>)	Recovery response of <i>U. epops</i> populations after application of tailored conservation actions based on evidence-based conservation guidelines	Positive outcome of the practical involvement of researchers in the implementation of conservation measures by stakeholders
UK Research Council's Rural Economy and Land Use (RELU) Programme, UK (<i>Phillipson et al. 2012</i>)	Evaluation of stakeholders' engagement level and impact in 38 of RELU's research projects	Although only happening in part of the cases, positive impact of stakeholders' involvement at the knowledge production stage (i.e., input to the research projects)
Management plans from major conservation organizations in the UK, UK (<i>Pullin et al. 2004</i>)	Examination of the process of Nature Reserve Management Plans formulated by several conservation organizations	Majority of management plan stakeholders do not systematically consider available scientific evidence and do not disseminate the outcomes of their actions
Effectiveness of research-based knowledge for the implementation of genetic conservation programs in EU-28 (<i>Pérez-Espona et al. 2017</i>)	Compilation of the peer-reviewed publications addressing conservation genetics and analysis by target species	Research outputs relevant for conservation and management of European species are abundant but fail to focus on species of conservation interest

The studies listed were related to the group of barriers identified in the main text. Note: Green cells highlight positive impacts

The following sections illustrate examples of supporting mechanisms, platforms, networking activities and initiatives to promote the production and uptake of knowledge on marine conservation at the European level. All these initiatives have a focus on the EU-28 level although many are also covering other countries. This exercise does not intend to exhaustively list all of the ongoing EU initiatives in marine conservation nor does it necessarily reflect the landscape at the country level.

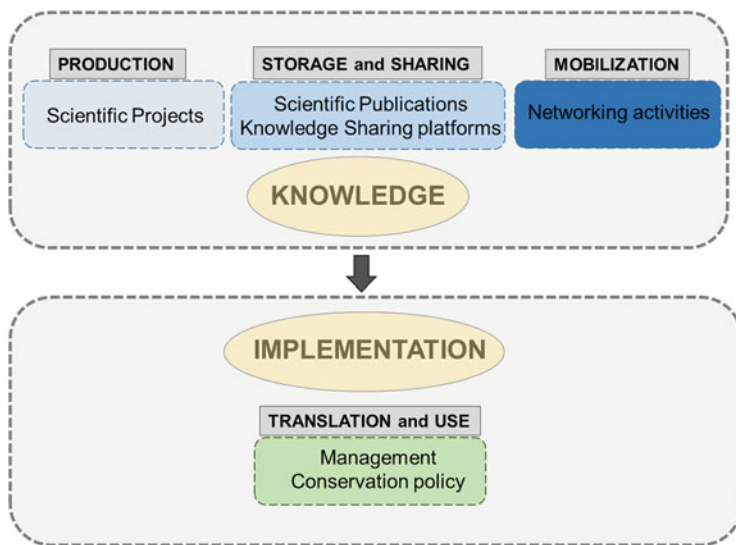


Fig. 12.3 Framework used in this chapter to assess the knowledge production-implementation flow in marine conservation in Europe

Instead, it aims to provide a snapshot of how the knowledge-implementation gap in Europe is being bridged by exemplifying ongoing relevant activities in Europe, discussing the potential constraints to implementation in relation to the general topics identified in the literature and identifying best practices.

12.3 The Knowledge Production-Implementation Flow in Marine Conservation in Europe

This section will characterize the knowledge production-implementation flow in marine conservation in Europe and its main gaps and strengths. Two main components are considered (Fig. 12.3):

1. *Generation and dissemination of knowledge by the scientific community*: This component includes (a) the production of scientific knowledge, as measured by the number of scientific projects supported by EU research funding in marine conservation, (b) the knowledge storage and sharing as illustrated by the scientific production (peer-reviewed publications) and sharing platforms (raw data, expertise or relevant information for marine conservation), and (c) the knowledge mobilization related to initiatives promoting networking activities in the field of marine conservation.

2. *Use of available evidence by decision- and policy-makers*: This component will be illustrated by four case studies describing different initiatives where knowledge was used and combined to inform marine conservation action.

12.3.1 The Knowledge Production Component

Scientific projects that generate knowledge encompass a range of products from simple graduate thesis to multimillion Euro projects implemented by multinational consortia with dozens of collaborating organizations. As an example, the EU-funded AtlantOS project on ocean observations brings together 67 partners from 13 EU Countries and six non-EU countries and territories to develop a sustainable, efficient, and fit-for-purpose Integrated Atlantic Ocean Observing System (<https://cordis.europa.eu/project/rcn/193188/factsheet/en>).

Tracking all marine-related projects in Europe is challenging, particularly considering different national languages. Therefore, this section focuses on research supported by EU funding streams which are more easily accessible. Additionally, EU research policy (supported by its own funding instruments) is considered to shape the entire European research landscape, in particular with instruments such as the ERA-NETSs (http://ec.europa.eu/research/participants/docs/h2020-funding-guide/cross-cutting-issues/era-net_en.htm), which incentivize participating countries to align funding of their national research programmes with projects of common European interest. The current marine ERA-NET is the BlueBio project (<https://bluebioeconomy.eu/>) that brings together 16 European countries and includes several calls and other activities covering all aspects of the blue bioeconomy.

Among the EU funding streams, the last two research and innovation framework programmes, the 7th Framework Programme (FP7) and Horizon 2020 (H2020), have provided by far the main support for research at the European level. However, some information on other EU funding streams that have a research component are included, such as the LIFE programme (<https://ec.europa.eu/easme/en/life>) and the grants provided by the European Maritime and Fisheries Fund (EMFF, https://ec.europa.eu/fisheries/cfp/emff_en).

FP7, the European Union's Research and Innovation funding programme for 2007–2013, had a budget of 50 million Euros and funded 25,778 research projects. A search done using only three keywords (marine, ocean, sea) in the Community Research and Development Information Service (CORDIS, <https://cordis.europa.eu>), the European Commission's primary source of results from the projects funded by the EU's framework programmes, retrieved a total of 471 projects with a total budget of around 960 million Euros. This represents roughly 1.8% of the total number of EU-funded projects and 1.9% of the EU budget.

Refining this list of 471 projects by adding any one of the keywords in Table 12.2 resulted in a total of 402 projects specifically related to marine conservation with a total budget of around 875 million Euros. This roughly represents 85.3% of all

Table 12.2 Keywords used to screen marine conservation FP7 and H2020 projects in CORDIS

Acidification	Cephalopod	Demersal	Eutrophication	Molluscs	Plastics	Seabird
Algae	Climate	Diatom	Fish	Oceanographic	Pollution	Seagrass
Bacteria	Conservation	Dolphin	Habitat	Pelagic	Remediation	Seal
Benthic	Copepod	Ecology	Invasive	Physiology	Reproduction	Shellfish
Biodiversity	Crustacean	Ecosystem	Litter	Phytoplankton	Scabed	Whale
						Zooplankton

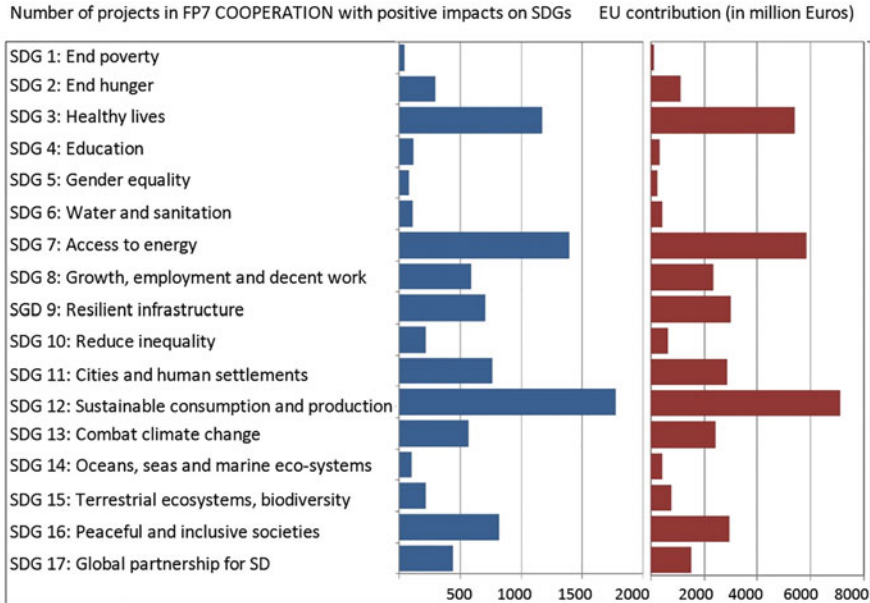


Fig. 12.4 Number of projects in FP7-Cooperation with expected positive impacts in the different SDGs and respective monetary EU contribution (Fresco et al. 2015)

marine projects and 91.1% of the marine-related funding but 1.6% of all FP7 projects and 1.7% of the total FP7 funding.

In accordance with the Fig. 12.4, the evaluation of FP7 once the programme ended (Fresco et al. 2015) revealed that FP7 cooperation projects related to SDG14 (the most relevant for marine conservation) are rather few in number and in funding compared to other SDGs, e.g., related to energy, health, and terrestrial ecosystems (Fig. 12.4).

FP7's successor for 2014–2020, H2020, has a budget of around 70 million Euros. A similar search in CORDIS revealed that, in the five first years of H2020, 463 marine projects were funded totaling around 900 million Euros. Of these, 244 projects are related to marine conservation and their total budget is approx. 500 million Euros, i.e., roughly 52.7% and 55.6% of all marine EU-funded projects. This could suggest a decrease in funding of marine conservation projects but because H2020 is not completed yet this figure should be taken with caution.

However, specifically with respect to blue sky research funded under the Excellence pillar by the European Research Council (ERC) and according to the interim evaluation of H2020 (European Commission 2017), of the 19 key hot research fronts in which ERC grantees are working, two are explicitly related to marine conservation (microplastic pollution in the marine environment and carbon cycle of inland waters and the ocean) and another two are implicitly related to marine conservation (biodiversity loss and its impact on ecosystem functions and ecosystem services and

HOT RESEARCH FRONTS	
1. Outbreak, prevention and control of microbial contamination of fresh produce	11. Phosphors for white LEDs
2. Mechanism of plant innate immunity	12. Sodium-ion batteries
3. Microplastic pollution in the marine environment	13. Galactic center gamma-ray excess
4. Biodiversity loss and its impact on ecosystem functions and ecosystem services	14. Property and application of monolayer/few-layer black phosphorus
5. Global warming hiatus	15. Observations of the cosmic microwave background (CMB) by Planck
6. Carbon cycle of inland waters and the ocean	16. Baryon acoustic oscillation (BAO) related research based on sky survey missions like SDSS
7. Clinical trials of direct-acting antivirals (DAAs) for hepatitis C infections	17. The internet of things, cloud manufacturing and related information technology services
8. Immune checkpoint inhibitors anti-PD-1 antibodies in melanoma immunotherapy	18. Research on measurement-device-independent quantum key distribution
9. The molecular mechanism for origin, development and differentiation of macrophage	19. DEA (Data Envelopment Analysis) based assessment of environmental and energy efficiency
10. Differentiation, function, and metabolism of T cells	
EMERGING RESEARCH FRONTS	
1. Effects of systemic insecticides (neonicotinoids and fipronil) on non-target organisms and environment	4. Research fronts on perovskite
2. Elemental composition of the North Atlantic Ocean and Southern Ocean	5. Experimental realisation of fractional Chern insulators
3. Principles of chromatin looping and evolution of chromosomal domain architecture	6. Studies of Comet 67P/Churyumov-Gerasimenko by Rosetta

Source: ERCEA, Thematic assessment of the European Research Council (see Annex 2), 2017

Fig. 12.5 Key hot and emerging research fronts in which ERC grantees are working under H2020 (European Commission 2017)

global warming hiatus) (Fig. 12.5). Additionally, of the six emerging research fronts in which ERC grantees are working, one is explicitly marine related (Fig. 12.5).

The LIFE programme is the EU's funding instrument for the environment and climate action. The current funding period 2014–2020 has a budget of 3.4 billion Euros. This is not a research programme per se but it includes science-related activities that have a clear relation to nature conservation and environmental protection. A search in the LIFE database (<http://ec.europa.eu/environment/life/project/Projects/index.cfm>) for the years 2014–2018 showed that of a total of 755 LIFE projects, 73 (9.7%) were related to marine conservation.

The European Maritime and Fisheries Fund (EMFF) is the fund for the EU's maritime and fisheries policies for 2014–2020. A part of it is directly managed by the European Commission and funds studies that may include science-related activities. A search in the dedicated fund webpage (<https://ec.europa.eu/easme/en/emff-projects>) showed that until 2018 the programme funded 78 projects with 24 of them (30.8%) directly related to marine conservation while the rest are more related to other blue economy activities (e.g., maritime surveillance).

The overall analysis of these results indicates that marine-related topics contributed to less than 10% of all the funding programs considered, with the exception of the EMFF which is, of course, a full marine programme. However, marine science is particularly prevalent in EU-funded blue sky research. Within the marine research area, marine conservation contributed to more than 50% of the funded projects except for the EMFF that is more targeted to maritime economy.

12.3.2 *Knowledge Storage and Sharing: Scientific Publications*

For this section, only studies published in peer-reviewed scientific journals and indexed in publication databases were considered. The scope of the analysis included research conducted from 2010 to mid-2018 and publication details were gathered by searching the ISI Web of Knowledge, using the terms “marine *and* conservation”, “marine *and* ecology”, “marine *and* management” and “marine *and* policy”.

Although research published as grey literature might contain relevant information, these documents were not included in the analysis due to low accessibility and consistency which impaired a comprehensive sampling of these works. Nevertheless, we consider that the analysis of the peer-reviewed literature provides a comprehensive picture of the scientific production in the field of marine conservation in Europe.

We grouped the results by geographical location of the study, as ascertained by the authors’ affiliation (inside/outside Europe; country in Europe), publication year (2000–2018), research areas (following the categories established in ISI web of knowledge), and publication quartile. The majority of marine research comes from outside Europe, with European-based studies representing 41% of the studies retained by the search (Fig. 12.6a). In Europe, these publications were scattered among 39 countries. Most of the countries (62%) published less than 500 papers while only 5 countries produced more than 1000 publications between 2010 and 2018 (Fig. 12.6b).

The number of publications in the field of marine conservation in Europe gradually increased from 2010 to 2015 and has, since then, stabilized at around 1500 publications per year (Fig. 12.7a). The number of publications has decreased slightly in 2018 but that is likely a reflection of only half of the year being considered in the search. These publications are distributed among several different research subdisciplines but 10 of these research subdisciplines contribute to 69% of the total number of published papers. The top three subdisciplines are marine freshwater biology, ecology, and environmental sciences, each one corresponding to more than 10% of the papers (Fig. 12.7b). The distribution per quartile of the publications (ranking of the publications based on their factor in a given topic category) was analyzed considering the journals with more than 80 papers published between 2010 and 2018, corresponding to 91% of the total number of publications. The number of journals considered was 39 out of the total number of 197. These publications were distributed among quartiles Q1, Q2, and Q3 of the distribution of the scientific journal rankings (SJRs) with 86% of the publications falling under the first quartile (Fig. 12.7c).

The scientific productivity measured by the number of peer-reviewed publications in the field of marine conservation in Europe is slightly under half of the publications in this field worldwide. Although the impact of these publications might extend way beyond the local scope, these results show to some extent the potential of

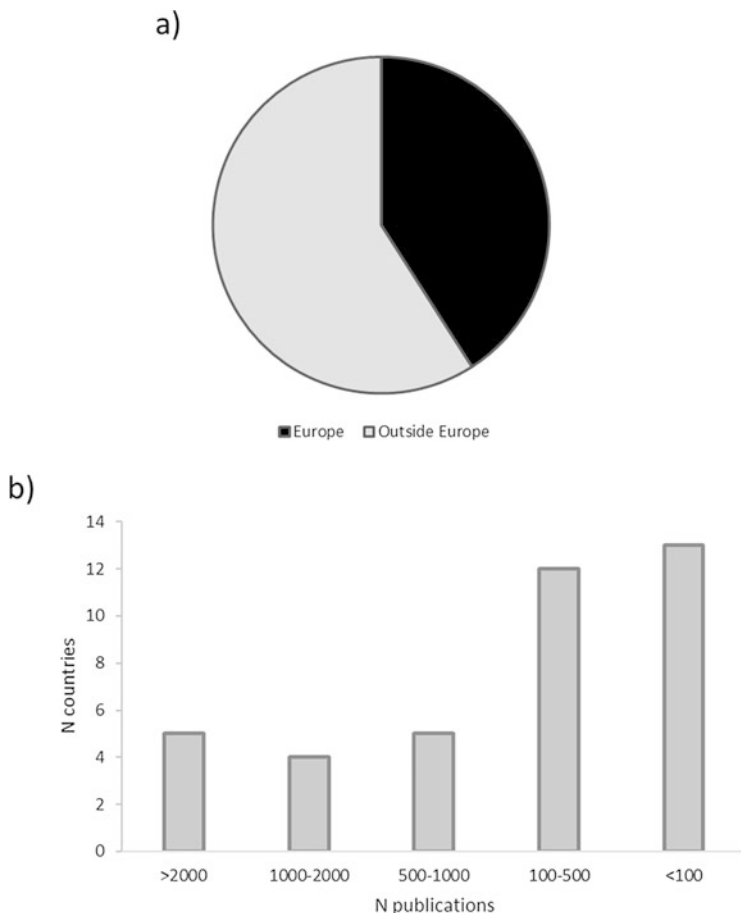


Fig. 12.6 (a) Proportion of publications per region (Europe/Outside Europe) as per the search criteria used; (b) Distribution of the number of publications by a number of European countries publishing in marine conservation

the knowledge provided by the European research community to support implementation in marine conservation. Some issues highlighted as barriers in the previous section of this chapter, such as the mismatch between implementation needs and scientific research topics or the contribution of fundamental research to the total scientific production, are only evaluated in general terms in this exercise. However, more technological areas, for example engineering or science technology, represented the minority of the publications. Thus, it is expected that a considerable part of the peer-reviewed published literature will potentially contribute to inform knowledge-based management plans or policy initiatives. It is clear that the impact factor of the published research is a relevant issue as demonstrated by the almost complete dominance of scientific journals from quartile 1 in the publication list. This

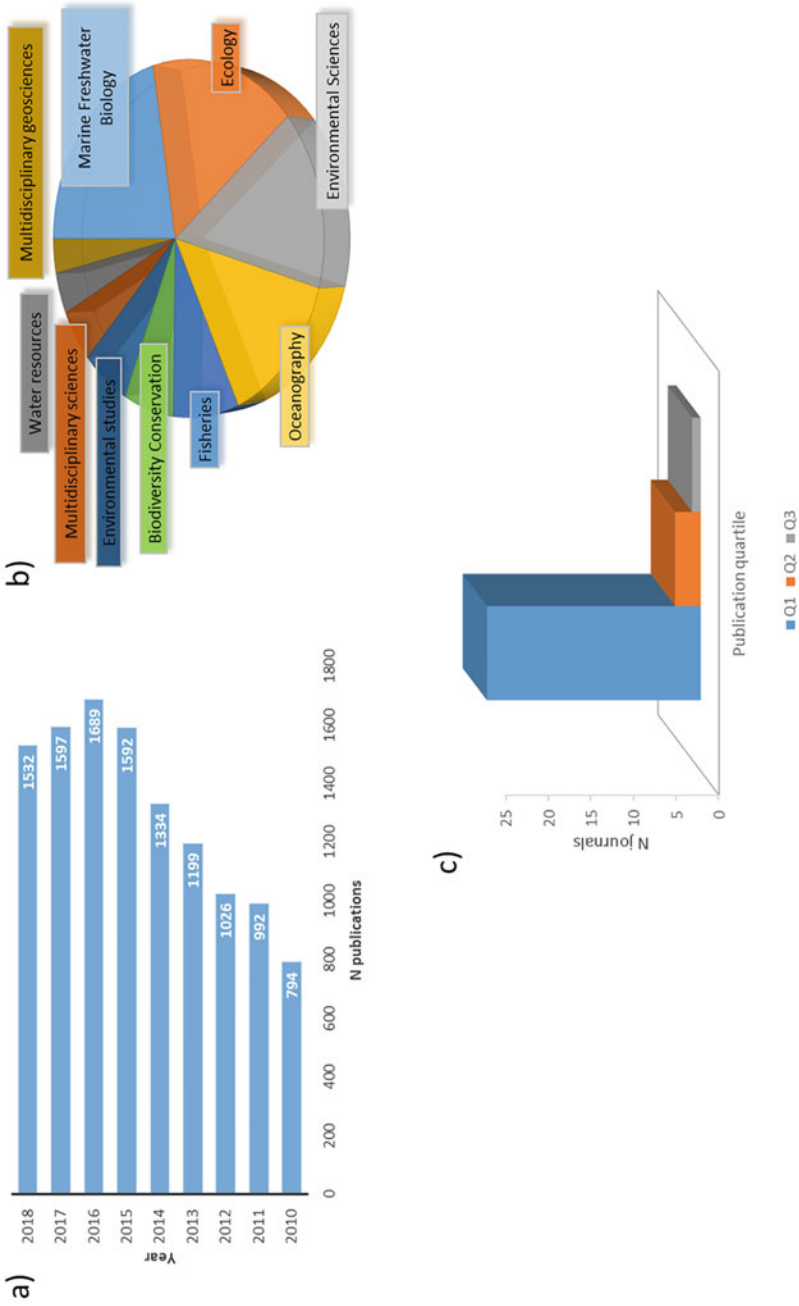


Fig. 12.7 (a) Temporal trend (early 2010 to mid-2018) in the number of publications related to marine conservation in Europe; (b) Distribution of number of publications by each of the 10 research subdisciplines (as defined in ISI web of knowledge) with highest number of publications (2010–2018); (c) Quartile distribution of the journals with more than 80 publications related to marine conservation (2010–2018)

trend is understandably related to the pressure researchers face to publish in high impact scientific journals. The impact factor is the most commonly used metric of research quality for career development and job performance. Frequently, applied research conducted at a local scale (potentially the most useful for conservation action) is not as suitable for publication in high impact journals as conceptual, wide scoped, or fundamental research. This was one of the main constraints identified previously in this chapter to an effective knowledge transfer and seems to be also an issue in marine conservation science in Europe. However, the high number of publications in quartile 1 also reflects the potential impact and broad interest in this topic. Additionally, the temporal trend in the yearly number of publications showing a steady increase from 2010 to 2016 reflects the development of this research field and was very timely to feed the many initiatives evolving at the European level related to the marine environment such as the Blue Growth or the Biodiversity Strategies, and the Marine Strategy Framework Directive.

12.3.3 Knowledge Storage and Sharing: Platforms and Initiatives

An important bridge to narrow the knowledge-implementation gap consists in ensuring that published data, expertise, or infrastructures are organized to provide centralized access to information and knowledge. Here, examples of web platforms or consortia sharing marine data and knowledge at the European level were mapped and listed. For each platform, the type of data, objective, source and collection process are described, when available (Table 12.3).

There are a variety of platforms at the European level aiming to cover, in a coordinated and centralized way, different areas relevant to marine conservation. These platforms include raw data (environmental and biological), information on infrastructure and research topics networks or target specific groups of species (e.g., alien species, Table 12.3). Although some of these data sharing platforms encompass terrestrial, freshwater and marine records, and their geographical scope is not only European, there are already several examples of platforms exclusively dedicated to curate marine data. This coverage of areas and topics at the European level represents an important effort to optimize resources and it greatly increases the quality and impact of knowledge transfer when informing policy sectors or facilitating access to harmonized data by users. This facilitation will certainly positively impact the effectiveness and adequacy of political initiatives. These platforms also streamline the work of researchers using cross-sectorial data with wide geographical coverage. One of the barriers previously identified was the difficulty of practitioners to access relevant published information. These platforms are an opportunity to facilitate access to information in a coordinated way. It was not assessed in this work if the thematic and infrastructure networks have the necessary support to be maintained in the long-term or if there is a geographical balance in accessibility or equal

Table 12.3 Examples of knowledge sharing platforms working with European information also related to marine conservation

Data sharing platform	Description
<i>EMODnet</i> (European Marine Observation and Data Network: www.emodnet.eu)	<i>EMODnet</i> is a network of organizations supported by the EU's integrated maritime policy with the objective of providing easily accessible, reliable, and accurate information on different topics related to the marine environment that is publicly available to marine data users. The website provides information on a variety of topics including bathymetry, geology, seabed habitats, chemistry, biology, physics, and human activities
<i>EASIN</i> (European Alien Species Information Network: https://easin.jrc.ec.europa.eu/)	<i>EASIN</i> is a scientific network developed by the European Commission's Joint Research Centre with the objective of providing support to European Alien Species policies. <i>EASIN</i> constitutes the central platform of the official information system foreseen under Article 25 of the EU Regulation 1143/2014 on Invasive Alien Species supporting its implementation. <i>EASIN</i> data also serve the broader scientific community. By collecting available information from projects and publications at the European and global level this platform provides easy access to data on Alien Species, including marine ones, reported in Europe
<i>EurOcean</i> (European Centre for information on Marine Science and Technology: http://www.eurocean.org/)	<i>EurOcean</i> is a non-governmental organization aiming to promote initiatives supporting the Blue Growth and the implementation of the European Maritime Policy. It facilitates the knowledge transference in the field of marine sciences and technologies among different stakeholders. EurOcean databases cover three main domains: <ul style="list-style-type: none"> • Marine research infrastructures: Marine research infrastructures database includes information on infrastructures and equipment used to collect ocean data. • Marine knowledge management: the Marine knowledge gate is an online repository cataloguing marine research projects. • Science and technology communications: with activities promoting ocean literacy and awareness.
<i>GBIF</i> (Global Biodiversity Information Facility: https://www.gbif.org/)	<i>GBIF</i> is an intergovernmental collaboration between countries and international organizations joining efforts to advance free and open access to biodiversity data. It includes 40,415 datasets from 1231 publishing institutions. Twenty European countries participate in this

(continued)

Table 12.3 (continued)

Data sharing platform	Description
	initiative accounting for 43% of the 1,011,821,225 records of the database. Some of these are marine records.
<i>OBIS</i> (The Ocean Biogeographic Information System: http://iobis.org/)	<i>OBIS</i> is a free and open-access data and information portal on marine life with 45 million observations of nearly 1,200,000 species. The information provided is based on the collaboration with the scientific community and refers to the biodiversity and biogeography of marine species including also environmental parameters (physical and chemical).
<i>AQUANIS</i> (The information system on aquatic non-indigenous and cryptogenic species: http://www.corpi.ku.lt/databases/index.php/aquanis/)	<i>AQUANIS</i> is an information system on aquatic non-indigenous and cryptogenic species present in marine, brackish, and coastal freshwater in Europe and neighbouring regions. It includes information on the biology of the species, introduction pathways, potential impacts and geographical information on species distribution.
<i>WORMS</i> (The World Register of Marine Species: http://www.marinespecies.org/about.php)	<i>WORMS</i> provides a comprehensive list of names of marine species to facilitate the consistency of taxonomic designations. The content of the lists is controlled by taxonomic and thematic experts that combine information from other marine species lists and provide additional details on bibliographic references and biogeographic data.
<i>WRIMS</i> (The World Register of Introduced Marine Species: http://www.marinespecies.org/introduced/)	<i>WRIMS</i> reports which species included in <i>WORMS</i> have been introduced by human activities to geographic areas outside of their native distributional range.
<i>ICES</i> (The International Council for the Exploration of the Sea; https://www.ices.dk/Pages/default.aspx)	<i>ICES</i> is an intergovernmental marine science organization gathering expertise from a very extended network of scientists from different marine fields and covering a high extension of maritime areas. It provides evidence on the state and sustainable use of the seas and oceans. <i>ICES</i> coordinates the work of 150 expert groups covering fundamental and applied science on different marine trophic levels. <i>ICES</i> also manages datasets and provides advice to policy bodies on marine science related topics.
<i>MARS network</i> (The European Network of Marine Stations) https://www.marinstations.org/	<i>MARS network</i> is a foundation connecting European marine research institutes and marine stations in a forum to discuss topics related to fundamental research and inform policies related to marine conservation.

(continued)

Table 12.3 (continued)

Data sharing platform	Description
<i>EMBRC-ERIC</i> (The European Marine Biological Research Centre) http://www.embrc.eu/	<i>EMBRC-ERIC</i> is a European research infrastructure consortium in the field of fundamental and applied marine biology and ecology. The consortium develops initiatives to facilitate the mobility and access to research facilities and services in different areas of expertise as well as coordination of educational programmes.
<i>EuroGOOS</i> (The European Global Observing System) http://eurogoos.eu/	<i>EuroGOOS</i> is an international association of national governmental agencies, private companies, and research organisations, including members from 18 European countries, aiming at providing coordinated operational oceanographic services. EuroGOOS provides data and collaborates with other pan-European data portals.
<i>WISE Marine</i> (The Marine Information System for Europe) https://water.europa.eu/	<i>WISE Marine</i> is a portal and infrastructure for sharing European-level information on marine topics in support of ocean governance and ecosystem-based management. This initiative is a partnership between the European Commission and the European Environmental Agency and provides information on EU water policies, access to datasets and maps, and ongoing water related research activities.

opportunities for all the European countries. These are aspects that will influence the impact of these initiatives at the European level. Another important topic, when considering data sharing platforms, is to understand if, regardless of the apparently already reasonable coverage of topics, the comprehensiveness, coverage and quality of data related to each topic is high. Of paramount importance to the quality and effectiveness of these platforms is their ability to transfer data from knowledge production to knowledge visualization and sharing.

To assess the main constraints to the transfer and integration of available and published data to data sharing platforms, a short questionnaire was sent to the contact points of 16 platforms from which seven replied. The questionnaire comprised four questions:

1. Which are the main data sources used by your platform to collect information?
2. How easy is it to thoroughly map and access the information needed to include in your platform?
3. Is the information found adequate to meet your needs regarding content and format?

4. Which are the main constraints encountered when accessing the information you need?

The outcomes of this survey highlight that the main knowledge sources used by data sharing platforms are scientific publications, monitoring datasets, and project databases (Fig. 12.8a). Project reports were the least used source of information (probably because they are more difficult to access; Fig. 12.8a). Most of the respondents identified difficulties in mapping the relevant information needed although the access to this information was only moderately difficult (Fig. 12.8b). The content of the information sources was considered appropriate to the needs of the platform, but the format was often inadequate (Fig. 12.8c). The main constraints identified to access the available information were the fragmentation of information and confidentiality issues (Fig. 12.8d). The difficulty to find the information needed was not identified by any of the respondents as a constraint (Fig. 12.8d), suggesting that finding information is easy but accessing it often becomes a limitation.

The results of the questionnaire show that scientific knowledge that is potentially useful for marine conservation action in Europe is moderately difficult to access by data gathering platforms. Publications on applied studies, with potential relevance for management and conservation policy, are often contained in non-peer review literature (e.g., reports and other grey literature). The documents most frequently reporting results from local studies are often difficult to track and to extract relevant information since they are commonly written in national languages. Additionally, data (e.g., environmental) collected by individual institutions might be difficult to gather in a coordinated, harmonized, and comparable way because of geographically different monitoring schemes. Some regions have much more developed monitoring schemes, that include different environmental parameters and variables as well as temporal timeframes assessed. Platforms providing data have to overcome these challenges by developing strategies and tools to harmonize the information displayed, maximizing the knowledge support to research, management, and policy initiatives. One of the main issues raised are the different formats used for knowledge storage which leads to difficulties in extracting information. This might contribute to the fact that project reports are the least used source of information by data platforms. Fragmentation of the information and confidentiality issues were also identified as constraints to access the information. This fragmentation probably is due to the different developmental states of science across European countries. To conclude, the information needed is easy to find but difficult to map and extract.

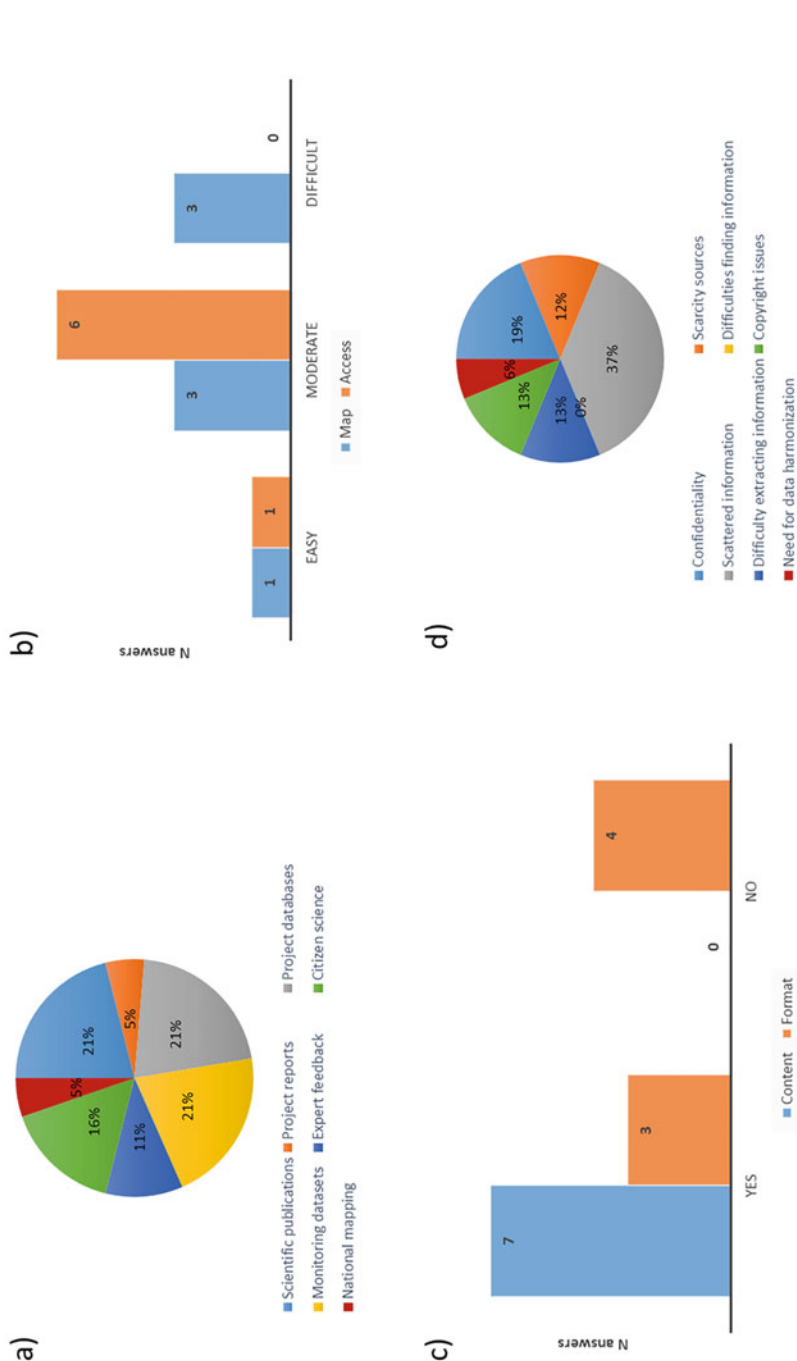


Fig. 12.8 Replies from contact points of data sharing platforms to the survey. **(a)** Data sources used; **(b)** Facility to map and access information; **(c)** Adequacy of content and format; **(d)** Constraints

12.3.4 Knowledge Mobilization

There are several EU-level initiatives promoting networking and facilitating knowledge exchange and transfer as well as capacity building, supporting either exclusively marine activities or scientific activities in which marine topics are also included. Below, we detail some of these initiatives.

The *Projects for Policy (P4P) initiative* (https://ec.europa.eu/info/research-and-innovation/strategy/support-policy-making/scientific-support-eu-policies/p4p_en) aims to use research and innovation project results to shape policy-making. The European Commission identifies policy areas which deserve particular attention, analyses the related knowledge which comes from research and innovation programmes and delivers recommendations in the form of P4P reports to reach out to partners and stakeholders and contribute to a highly impactful policy making process. One of the first P4P reports is on blue economy (<https://publications.europa.eu/en/publication-detail/-/publication/ada65c0f-ae9-11e7-837e-01aa75ed71a1/language-en/format-PDF/source-69927165>).

COST-European Cooperation in Science and Technology The *COST Association* (<http://www.cost.eu/>) supports collaborative transnational networking activities, through the financial support to *COST Actions*, covering all scientific and technological domains across Europe. The objective of these COST Actions is to promote impactful scientific developments contributing to Europe's development in Research and Innovation. This is achieved by building researchers' capacity, promoting networking and opportunities for knowledge exchange, and increasing the knowledge transfer between stakeholders from different sectors. COST Actions cover a range of networking activities such as workshops, conferences, training schools, short-term scientific missions, and dissemination activities and include also the participation of non-EU28 countries.

As an attempt to illustrate the contribution of these Actions to marine conservation knowledge mobilization in Europe, the EurOcean database (<http://www.eurocean.org/>) was used to analyze the share of COST Actions dedicated to marine conservation between 2010 and 2018. The EurOcean database categorizes the projects by disciplines, activities, and themes. Table 12.4 lists the project tags and keywords selected for the search.

Table 12.4 Project tags and keywords used to screen marine conservation projects at the European level in the EurOcean database

Keywords		Project tags	
Conservation	Ecology	Seaweed and other sea-based food harvesting	
Physiology	Remediation	Environmental impact assessment	
Global warming	Ecosystem	Survey and monitoring (not research related)	
Climate change	Benthic	Marine technology and responsible research and innovation	
Fisheries	Phytoplankton		
Pollution	Eutrophication	Marine and coastal tourism	Recreational activities
Biodiversity	Ecosystem services	Protection of habitats	Marine research
Biological invasions	Habitat	Biotechnology	Marine pollution
Ocean acidification	Algae	Climate change	Carbon capture and storage
Bacteria	Seabirds	Marine litter	Marine aquatic products
Diatoms	Mammals	Fisheries	
Zooplankton	Contaminants	Aquaculture	
Litter	Plastics	Chemical oceanography	
Demography	Phenotypic traits	Biological oceanography	
Reproduction	Pelagic	Physical oceanography	
Fauna	Trophic webs	Marine geology	
Deep sea		Environment	

Marine conservation represents a small part (less than 5%) of the COST Actions supported from 2010 to 2018 (Fig. 12.9a). Taking into consideration that a high variety of topics is covered by COST initiatives it is already significant that this number of Actions in marine conservation is supported. Given that each Action has a duration of 4 years there were likely several of these initiatives in marine conservation running in parallel between 2010 and 2018. These Actions involved researchers from more than 30 countries with most of the participating countries being involved in more than 15 COST Actions during this period (Fig. 12.9b).

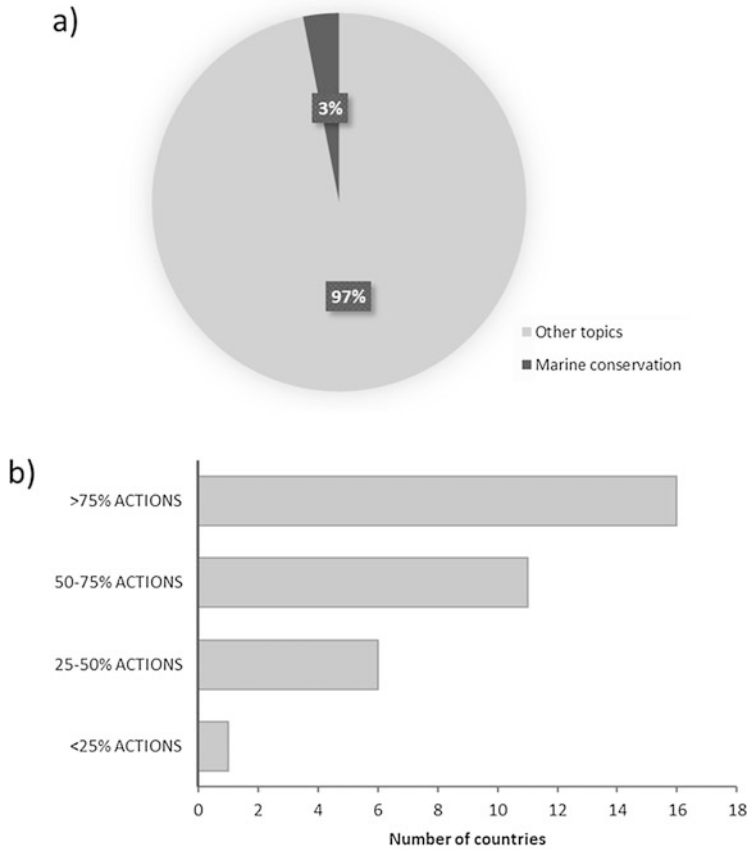


Fig. 12.9 (a) Proportion of COST Actions supported from 2010 to 2018 in the field of marine conservation; (b) Number of countries participating in the COST Actions funding Marine Conservation from 2010 to 2018

This kind of initiatives has an important potential impact in facilitating the access to research facilities and technologies, support capacity building especially for less intensive research countries and foster the participation of these countries in research consortia.

An example of an ongoing COST Action in the topic of marine conservation is described in Box 12.1.

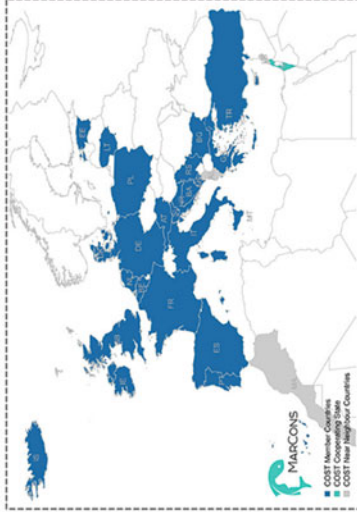
Box 12.1 Description of the MarCons COST Action (www.marcons-cost.eu)

MarCons

Advancing marine conservation in the European and contiguous seas

This COST Action aims to bridge the gap between conservation science and policy makers by promoting regional coordination and transboundary conservation, proposing specific conservation actions, considering climate change and biological invasions and providing guidance to a more effective spatial management of marine areas

- **WG1: FROM DESCRIPTION TO PREDICTION OF CUMULATIVE HUMAN IMPACTS ON MARINE ECOSYSTEMS TO INFORM CONSERVATION PLANNING:** advance the understanding of cumulative impacts of human stressors (e.g. related to climate change, on marine biodiversity and ecosystems) considering their spatial and temporal heterogeneity and their impact on marine species, communities and ecosystems.
- **WG2: PRESENT CHALLENGES AND LIMITATIONS IN MARINE CONSERVATION:** to address relevant gaps in marine conservation and to identify the most critical actions to significantly improve the protection of the marine biodiversity of the region.
- **WG3: MARINE CONSERVATION AND BIOLOGICAL INVASIONS:** to offer methodological approaches and tools for designing networks of MPAs that are more resilient to biological invasions and to propose management actions to mitigate the impacts of invasive species on biodiversity and ecosystem services.
- **WG4: INTEGRATED CONSERVATION PLANNING ACROSS TERRESTRIAL, FRESHWATER AND MARINE ECOSYSTEMS:** to synthesize existing knowledge on integrated conservation planning across terrestrial, freshwater and marine ecosystems aiming at biodiversity conservation and the sustainability of ecosystem services, and to develop methodological tools for improving this integration within the framework of ecosystem-based management.
- **WG5: REGIONAL COORDINATION AND TRANSBOUNDARY CONSERVATION:** To explore the conditions for the development of successful transboundary conservation in a region of multiple states.
- **WG6: GOVERNANCE OF MARINE PROTECTED AREAS:** to evaluate how different geopolitically and biogeographically representative examples of MPAs are governed across the European and contiguous seas and analyze governance approaches in relation to effectiveness in achieving conservation objectives.



MarCons will contribute towards the targets of a series of European policies and international conventions by providing methods and tools for their implementation, and proposing ways to address some of their requirements and obligations: Framework Directive for Maritime Spatial Planning, Habitats and Birds Directives, the Marine Strategy Framework Directive, the Regulation on the prevention and management of the introduction and spread of invasive alien species, the Water Framework Directive, the Biodiversity Strategy, the Convention on Biological Diversity, the Barcelona Convention, the OSPAR Convention, the Bern Convention, the Helsinki Convention and The Convention on the Protection of the Black Sea Against Pollution.

Towards improving the knowledge-implementation flow, MarCons has established links and investigated possibilities for joint meetings with existing networks of stakeholders, such as MedPAN, the network of Mediterranean MPAs, and ICES working groups. Policy briefs will be translated to local languages and will be disseminated in native languages and will be disseminated in accessible form for managers, policy makers and the general public. A final conference will be organized to disseminate all the outputs of this Action to stakeholders and the wider public. MarCons participants have already started to apply the developed frameworks and tools in their countries.

Box 12.1 exemplifies how these initiatives work in practice promoting transboundary synergies between a high number of European countries and stakeholders to coordinate efforts in marine conservation. This coordination is particularly important for the marine environment where national borders do not apply and thus actions taken in national waters will potentially impact the neighbouring countries. Additionally, these initiatives promote the gathering of the critical mass and expertise needed to produce and provide advice in a coordinated and harmonized way for the wide European level.

EUROMARINE-European Marine Research Network *EuroMarine* (www.euromarinenetwork.eu) was launched in 2014 and is based on the connection between former European Networks of Excellence on marine sciences: the European Network of excellence for Ocean ecosystems analysis (EUR-OCEANS), the Marine Genomics Europe, and the Marine Biodiversity and Ecosystem Functioning EU Network of excellence (MarBEF). The objective of this consortium is to promote marine research activities providing expertise, facilitating knowledge exchange, and increasing capacity building in the marine research-related topics.

This consortium annually supports networking and capacity building activities (workshops, sponsorship of congress attendance etc.) through internal calls for proposals aiming to advance knowledge on emerging important scientific topics in marine sciences.

An example of a recent Euromarine initiative is the Marine Forest for Stakeholders (Marforstake: <https://www.euromarinenetwork.eu/activities/marine-forests-stakeholders>) workshop that gathered stakeholders connected to marine conservation to discuss the research needs in relation to marine conservation in Europe (Fig. 12.10). From this workshop a collaborative paper addressing the topic at the European level was prepared that is currently under development.

This kind of program exemplifies the advantages of developing initiatives at the European level fostering the participation of a representative group of experts and shortening potential financial constraints for participation. It gives the opportunity to build concerted opinions and approaches with wide European significance reducing fragmentation in political advice.

12.3.5 Knowledge Translation and Use

In this section, we describe four case studies illustrating different processes of gathering and transferring knowledge at the EU level. This knowledge was used to inform specific EU policy initiatives or priorities related to different aspects of the marine environment conservation.

Case study 1 provides a detailed and extended description of marine contaminants, a topic of concern at the EU level. It illustrates the role of the different initiatives, governance structures and regulatory and management approaches that can aid in the implementation of the European Marine Strategy Framework



Fig. 12.10 Description of the Marforstake workshop (2017) funded in the framework of EuroMarine calls

Directive. This case study intends to show the complexity of the network of actors and interactions that influence, provide knowledge and interact to support, in a coordinated way (ideally), well-developed knowledge-based policies in Europe.

The other case studies refer to examples of specific knowledge production initiatives developed to meet direct policy needs. *Case study 2* refers to a scenario where advice from the scientific community is requested to answer a particular question directly driven by the policy sector. *Case study 3* describes the development of a database to support specific needs related to the implementation of an EU regulatory framework. Finally, *case study 4* describes the process of collection of very specific information to support EU level initiatives on an emerging marine-related sector. In this case, the knowledge available was not of sufficient quality to support informed actions on the topic.

12.3.5.1 Case Study 1: Integrating Knowledge from Scientific Community, Regional/European Bodies, Stakeholders and International Organizations for Policy Implementation Support: The Marine Strategy Framework Directive (MSFD) Descriptors on Chemical Contaminants

Background Different anthropogenic pressures, including chemical pollution, can affect the health of our seas and oceans. Attaining and bringing together the necessary knowledge to identify the most relevant contaminants, their potential environmental impacts, and best approaches for their monitoring and assessment, pose a great challenge for managers and researchers all around the world. Here, we provide an overview of major players (across Europe and beyond), whose efforts for capturing, understanding, and improving knowledge on chemical pollution-related matters might be transferred into policy support.

Policy context The MSFD, aims at achieving Good Environmental Status (GES) in all EU marine waters by 2020. The MSFD includes a set of 11 qualitative descriptors that describe and help understand what GES means in practice.

Two of these descriptors deal specifically with chemical contaminants: D8 aims at concentrations of contaminants not giving rise to pollution effects and D9 refers to contaminant levels in edible tissues of fish and other seafood compared to human health threshold values (MSFD Commission Decision on criteria and methodological standards on GES, [2017/848/EU](#)).

Knowledge Sources European legislation, specialized agencies, committees, and working groups from regional frameworks, international conventions and other international agreements as well as dedicated research programmes can act as source of knowledge and information of relevance for MSFD implementation regarding chemical contaminants.

EU Legislation

Water Framework Directive The MSFD has a very close link with the Water Framework Directive (WFD). Under the Common Implementation Strategy (CIS) of the WFD, the work supporting the prioritization of substances and the technical aspects of the chemical status assessment takes place within the Working Group Chemicals. This group collaborates closely with the WFD Working Group Ecological Status (ECOSTAT) to link the chemical and ecological status of surface waters.

Food legislation Regarding MSFD D9, member states shall consider the contaminants and maximum levels in food established in the Commission Regulation (EC) No 1881/2006. In this context, the European Food Safety Agency (EFSA) has a crucial role by providing scientific advice and risk assessments on a wide range of chemicals. This work is carried out by the EFSA's Panel on Contaminants in the Food Chain.

Registration, Evaluation, Authorisation, and Restriction of Chemical substances (REACH) Regulation (EC No 1907/2006) This regulation aims at improving the protection of human health and the environment through the better and earlier identification of the intrinsic properties of chemical substances. The European Chemicals Agency (ECHA) helps companies to comply with REACH, advances the safe use of chemicals, provides information on chemicals, and addresses chemicals of concern.

Regional Sea Conventions

The MSFD also includes provisions for cooperation at (sub)regional level on issues like the identification of additional relevant contaminants and threshold value establishment. To this end, EU Member States can benefit from the established regional cooperation structures (the RSC), which aim to protect the marine environment and bring together Member States and neighbouring countries in the shared marine basins.

OSPAR The work related to hazardous substances is implemented through the OSPAR's Hazardous Substances and Eutrophication Committee (HASEC), along with its subsidiary working groups on Monitoring and on Trends and Effects of Substances in the Marine Environment (MIME) and Inputs to the Marine Environment (INPUT).

The OSPAR's Offshore Industry Committee (OIC) collects and assesses data on the use and discharge of offshore chemicals, accidental spills, and emissions to air.

The OSPAR's Radioactive Substances Committee (RSC) carries out periodic evaluations to reduce discharges of radioactive substances to the North-East Atlantic. There are four RSC's subsidiaries Intersessional Correspondence Groups: Delivering the Fourth Periodic Evaluation (ICG 4PE), Close to Zero (ICG CTZ), Environmental Assessment Criteria (ICG EAC), and MODelling of additional concentrations of NORM in seawater from discharges of produced water from the offshore oil and gas sector (ICG MOD).

HELCOM The Working group on reduction of pressures from the Baltic Sea catchment area (PRESSURE) provides the technical basis to the work on inputs of hazardous substances from both diffuse and point sources on land. This includes the HELCOM Correspondence Group on Pharmaceuticals (CG PHARMA), which provides scientific background for the management of pharmaceuticals and their impacts in the environment.

The working group on the state of the environment and nature conservation (WG STATE and CONSERVATION) covers monitoring and assessment functions as well as issues related to nature conservation and biodiversity protection.

The work related to hazardous substances is supported by the HELCOM expert network on hazardous substances (EN-HZ), which serves as a discussion platform that provides expert advice to HELCOM working groups. Moreover, the expert

group on monitoring of radioactive substances in the Baltic Sea (HELCOM MORS EG) focuses on the monitoring and assessment of radioactive substances.

Regarding pollution events, the Maritime Working Group (WG MARITIME) works to prevent any deliberate operational discharges as well as accidental pollution from ships. The Response Working Group (RESPONSE) works to ensure swift and right joint response to maritime pollution incidents. Within RESPONSE, the Expert Working Group on Oiled Wildlife Response (EWG OWR) acts as a forum for the exchange of information on progress and best practices in oiled wildlife response, while the Expert Group on Environmental Risks of Hazardous Submerged Objects (SUBMERGED) compiles and assesses information about hazardous objects, including chemical munitions dumped in the Baltic Sea.

The Barcelona Convention The Mediterranean Action Plan (MAP) is the institutional framework for cooperation in addressing common challenges of marine environmental degradation in the Mediterranean. The main MAP components in relation to chemical pollution are the Mediterranean Pollution Assessment and Control Programme (MED POL), which aims at preventing and eliminating land-based pollution and the Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea (REMPEC), which targets prevention and reduction of pollution from ships.

The Integrated Monitoring and Assessment Programme (IMAP) is based on the ecosystem approach (EcAp), which is the guiding principle to MAP Work Programme. The EcAp process builds on the expert level discussions of the EcAp Coordination Group, including the Correspondence Groups on GES and Targets (COR GEST) and the Correspondence Group on Monitoring (COR MON) on Pollution.

The Black Sea Commission The Advisory Groups to the Black Sea Commission are its main source of expertise, information and support to implementation of the [Black Sea Strategic Action Plan](#) (BSAP). The Advisory Group on the Pollution Monitoring and Assessment (PMA) establishes a regionally coordinated network of National Status and Trends monitoring programmes; the Advisory Group on Control of Pollution from Land-Based Sources (LBS) provides technical support for the assessment and control of discharges of pollution from land-based sources; and the Advisory Group on the Environmental Safety Aspects of Shipping (ESAS) coordinates the regional approach to emergency response.

In addition, the Working Group on the WFD assists the Black Sea Commission in promoting the principles of the WFD. The European Union and the United Nations Development Programme (EU-UNDP) EMBLAS-Plus (Improving Environmental Monitoring in the Black Sea—Special Measures) aims to help improve protection of the Black Sea environment.

Multilateral Environmental Agreements

The Stockholm Convention (<http://www.pops.int/>): To lead to gradual decrease of the presence of persistent organic pollutants (POP) in the environment.

The Rotterdam Convention (<http://www.pic.int/>): To promote shared responsibility and cooperative efforts among Parties in the international trade of certain hazardous chemicals and contribute to the environmentally sound use of those hazardous chemicals.

The Basel Convention (<http://www.basel.int/>): To protect human health and the environment against the adverse effects of hazardous wastes.

The Minamata Convention on mercury (<http://www.mercuryconvention.org/>): To protect human health and the environment from the adverse effects of mercury.

The Geneva Convention on long-range transboundary air pollution (CLRTAP); (<http://www.unece.org/env/lrtap/welcome.html.html>): To reduce air pollution.

The International Convention for the prevention of Pollution from Ships (MARPOL); ([http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-\(MARPOL\).aspx](http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-(MARPOL).aspx)): To prevent pollution by oil from ships.

Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Convention and Protocol); (<http://www.imo.org/en/OurWork/Environment/LCLP/Pages/default.aspx>): To control all sources of marine pollution and prevent pollution of the sea through regulation of dumping into the sea of waste materials.

International Convention on the Control of Harmful Anti-fouling Systems on Ships (AFS Convention); ([http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/International-Convention-on-the-Control-of-Harmful-Anti-fouling-Systems-on-Ships-\(AFS\).aspx](http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/International-Convention-on-the-Control-of-Harmful-Anti-fouling-Systems-on-Ships-(AFS).aspx)): To prohibit the use of harmful organotin compounds in anti-fouling paints used on ships and prevent the potential future use of other harmful substances in anti-fouling systems.

The Bonn Agreement (<https://www.bonnagreement.org/>): To combat pollution in the North Sea Area from maritime disasters and chronic pollution from ships and offshore installations.

The Lisbon Agreement (<https://www.wipo.int/treaties/en/registration/lisbon/>): To protect the North-East Atlantic against pollution.

Other Relevant European and International Bodies

The European Environment Agency (EEA); (<https://www.eea.europa.eu/>) provides independent information on the environment for policy makers as well as the general public.

The European Maritime Safety Agency (EMSA); (<http://www.emsa.europa.eu/>) aims at reducing the risk of maritime accidents and marine pollution from ships.

The International Maritime Organization (IMO); (<http://www.imo.org>) has responsibility for the safety and security of shipping and the prevention of marine and

atmospheric pollution by ships. The IMO's Marine Environment Protection Committee (MEPC), initially focused on the prevention of marine pollution by oil, resulting in the adoption of MARPOL. MEPC is aided by a number of IMO's Sub-Committees, such as the Sub-Committee on Pollution Prevention and Response (PPR).

IMO relies on the work by affiliated bodies and programmes like the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP). At present, IMO is the lead agency for four active Working Groups in GESAMP, including:

- WG 1 (EHS Working Group) to examine data for evaluating the environmental hazards of harmful substances carried by ships.
- WG 42 to provide independent advice on impacts of wastes and other matter in the marine environment from mining operations.

The Arctic Monitoring and Assessment Programme (AMAP; <https://www.amap.no/>) focuses on the monitoring and assessment of the status of the Arctic region with respect to pollution and climate change issues. Within AMAP, the Trends and Effects Monitoring Programme (ATEMP) is a harmonized programme for monitoring the trends and effects of contaminants.

The International Council for the Exploration of the Sea (ICES) (Table 12.3) coordinates the work of many expert groups, including:

- Marine Chemistry Working Group (MCWG), which focuses on the status and fate of pollutants in marine ecosystems.
- Working Group on Biological Effects of Contaminants (WGBEC), which examines the biological effects of contaminants in the marine environment and helps identify research and monitoring needs.
- Working Group on Marine Sediments in Relation to Pollution (WGMS), which conducts work on sediment-related science and advice.

The Policy Area Hazards within the EU Strategy for the Baltic Sea Region (EUSBSR) (PA Hazards) is a platform of cooperation between policy and science to reduce the use and emissions of hazardous substances to the Baltic Sea. Within PA Hazards, there are several relevant ongoing flagship projects, e.g.,:

- Baltic Sea Pharma Platform to reduce pharmaceuticals in the Baltic environment.
- DAIMON to evaluate the impacts of dumped ammunition.
- CHANGE to reduce the supply of toxic compounds from antifouling paints in leisure boats.

Research

A challenge in the implementation of the MSFD is to achieve the necessary knowledge upon which integrated management can build the tools for assessing progress towards GES. Many research initiatives can contribute to the development

of knowledge and improvement of understanding of the elements that define the status of the marine environment, including those developed under Horizon Europe, JPI Oceans, LIFE programme, and the specific DG ENV/MSFD proposals to support MSFD implementation.

Platforms for Data Collection and Sharing Information

WISE Marine (Table 12.3) shows the information and knowledge gathered or derived through the MSFD.

The European Environmental Information and Observation Network (Eionet; <https://www.eionet.europa.eu/>): Partnership network of the EEA to gather data on several topics related to the environment.

EMODnet (Table 12.3): The portal EMODnet Chemistry provides access to marine chemistry data sets and data products related to eutrophication and contaminants.

Network of reference laboratories, research centres and related organisations for monitoring of emerging environmental substances (NORMAN; <https://www.norman-network.net/>): Network to enhance the collection and exchange of data on emerging environmental substances.

Knowledge Implementation and Dissemination This “Marine Contaminants Landscape” (Fig. 12.11) intends to help EU national authorities, researchers, and stakeholders understand ongoing processes and interactions relevant for the assessment and monitoring of chemical contaminants in European marine waters. More collaborative efforts between the different stakeholders and expert groups are necessary for effective transfer of the knowledge into policy support and identification of opportunities to multiply and synergize efforts. With this purpose, the JRC of the European Commission established the MSFD Expert Network on Contaminants, a network of experts to exchange information and support EU Member States in MSFD implementation, while also providing interactions with the Regional Sea Conventions and other relevant platforms or frameworks.

12.3.5.2 Case Study 2: Scientific Knowledge to Inform Policy Priorities: *Food from the Oceans Initiative*

Background The “Food from the Oceans” report was published in 2017 by SAPEA (Horizon 2020—funded Science Advice for Policy by European Academies) as an evidence review report on the potential of the oceans to supply the expected global increase in food demand. The specific question to be answered was “*How can more food and biomass be obtained from the oceans in a way that does not deprive future generations of their benefits?*”

The work developed to answer this question involved working groups including experts from a range of specialization fields. The report produced (High level group



Fig. 12.12 Evidence review report and a part of the dissemination brochure of the Food from the Oceans scientific opinion

of scientific advisers 2017) establishes the state of the art on the topic of sustainable food extraction from the ocean and sets a group of recommendations on how to guarantee the sustainable exploitation of marine resources for food.

Policy Context Requested by Commissioner Karmenu Vella (Environment, Maritime Affairs and Fisheries), this report will inform the preparation of the future European Maritime and Fisheries Fund. Among the recommendations of the report is the expansion of aquaculture production, with potential implications for the Maritime Spatial Planning Directive and the Common Fisheries Policy. Finally, this information is relevant for the Blue Growth and Bioeconomy strategies and the Circular Economy Action Plan.

Knowledge Sources Consulted The scientific opinion from the Food from the Oceans Initiative is based on publicly available scientific evidence and literature (including grey literature), workshops, and consultation with the scientific community.

Knowledge Implementation and Dissemination The scientific opinion was published as an evidence review report and was showcased in different initiatives at the European Commission, European Parliament, and stakeholders and expert thematic meetings (Fig. 12.12).

12.3.5.3 Case Study 3: International Network on Alien Species for Research and Support to Policy: EASIN

Background EASIN was officially started by the JRC in 2012 with the objective of providing a single point of access to scientific information and georeferenced distribution data on alien species occurring in Europe, for the effective support of policies and scientific research on biological invasions in Europe (Katsanevakis et al. 2012, 2015). This network, interconnecting existing databases at national, European and global level, currently integrates information on approximately 14,000 alien species (of which approximately 1400 are marine), which can be searched and mapped online. The network indexes all information needed to:

(1) Efficiently link to existing online databases and retrieve spatial information for alien species distributions in Europe; (2) Access more detailed information in other sources, such as research articles, factsheets, and webpages; (3) Analyze spatial and temporal trends and patterns of biological invasions. Among the information compiled are species taxonomy, synonyms, common names, biology, year of first introduction, pathways, impacts, and occurrence records.

Policy Context In general, EASIN work technically and scientifically supports the European Commission and EU Member States on biodiversity-related policies (including the relevant assessment needs of the MSFD). Specifically, EASIN constitutes the central platform of the official information system foreseen under Article 25 of the EU Regulation 1143/2014 on Invasive Alien Species (IAS) supporting its implementation.

Knowledge Sources Consulted EASIN NOTSYS, scientific peer-reviewed publications, grey literature (e.g., reports from Member States), species occurrence and distribution databases (e.g., GBIF; Global Invasive Species information network, <http://www.gisnetwork.org/>; Ellenic Network on Aquatic Invasive Species, <https://elnais.hcmr.gr/>; The Mediterranean Science Commission; <http://www.ciesm.org/>; Marine Mediterranean Invasive Alien Species; <http://www.mamias.org/>) and citizen science records.

Knowledge Implementation and Dissemination The knowledge generated by EASIN activities is disseminated and implemented by using different channels:

Direct support to policy implementation, for example:

- Through written advice entailing official collaboration with the MS (Tsiamis et al. 2017, 2019a, b), provide baseline information on the EU geographical distribution of the IAS of Union concern, which among other things, can provide useful information to MS obligations under the EU Regulation on IAS, and factual basis for the review of the application of the IAS Regulation. Tsiamis et al. (2019b) provide refined national baseline inventories of alien species in the context of the MSFD.
- Through providing access to specific datasets: Country-level EASIN data packages for IAS of union concern, obeying to the requirements of EU Regulation

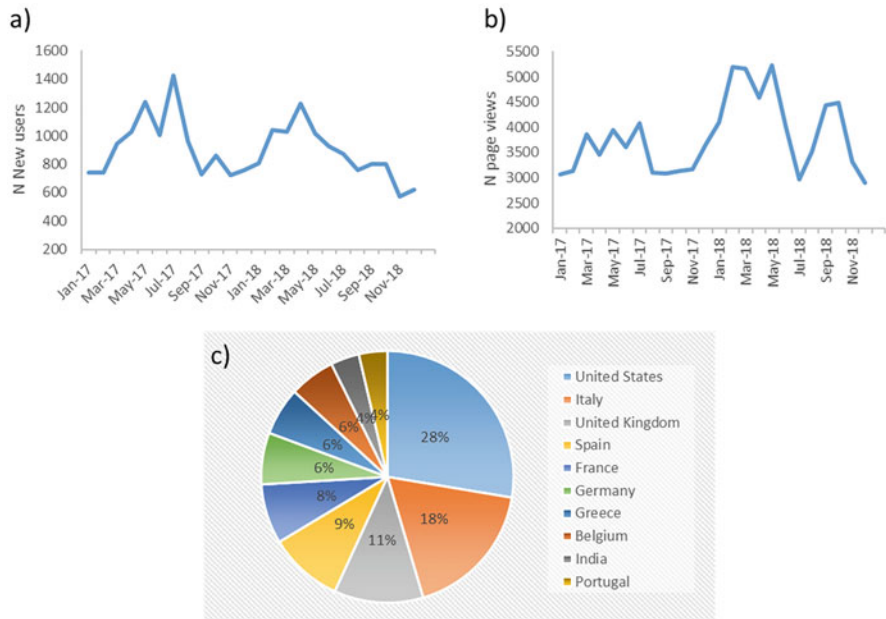


Fig. 12.13 Statistics of the EASIN platform in the period between January 2017 and December 2018 for the number of (a) new users, (b) number of page views and (c) country distribution of users

2017/1454 and Directive 2007/2/EC (INSPIRE), in support to MS reporting under Article 24 of the IAS Regulation (<https://easin.jrc.ec.europa.eu/easin/Services/Reporting>).

- Through a notification system (NOTSYS): A dedicated tool facilitating a timely comprehensive notification of detection of IAS of Union concern, and related eradication measures, as well as allowing an effective communication between the EC and MS.

Public use of the EASIN platform The EASIN web platform provides web services, search and mapping tools through which EASIN data and information can be accessed. The site shows a monthly number of new users ranging from approximately 600 to 1400 (Fig. 12.13a) and a number of page views ranging from approximately 2700 to 5100 (Fig. 12.13b). Considering the total number of users, Europe is the main user but individually there is a big share of USA and India occupying the first and third positions (Fig. 12.13c).

Scientific Publications EASIN data and information proved to be suitable for scientific research. The JRC EASIN team alone is author or co-author of 19 papers in peer-reviewed journals since 2012 analyzing mainly spatial and temporal trends, and patterns of biological invasions in Europe based on EASIN data. Special focus was placed in the analysis of marine biological invasions in terms of numbers of

species introduced, their distribution, pathways and gateways of introduction and origins (Katsanevakis et al. 2013a, b, c; Nunes et al. 2014; Tsiamis et al. 2018) patterns and impacts (Katsanevakis et al. 2014a, b), due to the specific requirements on alien species in the MSFD. The knowledge generated is the basis to policy support contributions in the context of the MSFD.

12.3.5.4 Case Study 4: Knowledge Collection from an Emergent Industry Sector to Support Policy Development: The Algae Industry Dataset in EMODnet Human Activities

Background The algae industry dataset was collected in the framework of the JRC's Biomass assessment study (https://ec.europa.eu/knowledge4policy/projects-activities/jrc-biomass-assessment-study_en) to complement the available data on algae production in Europe. These data were very fragmented and of insufficient quality to produce the needed robust and overarching analysis of the status and potential of the European algae sector.

Policy Context The algae biomass production is an important resource for the European Strategies on Bioeconomy and Blue Growth. These initiatives aim to boost the development of the bio-based sectors while assuring the sustainability of the natural resources and exploitation methods. The development of this sector has also several implications and potential impacts for:

- EU regulations related to the quality of the marine environment: Habitats directive, MSFD, WFD.
- EU regulations related with the introduction and control of alien species into marine territory: Alien species regulation.
- EU regulations establishing the rules for the coordinated and sustainable management of the uses in the marine environment: Maritime spatial planning directive, common fisheries policy, Environmental impact assessment directive (2011/92/EU).

The knowledge gathered in the algae industry directory can support or provide insights to this framework of EU regulations.

Knowledge Sources Consulted The algae producing companies in Europe were mapped, both considering seaweeds and microalgae, and information on the location of the production facilities and production method collected. The underlying information consulted was the database shared by the European Algae Biomass Association (EABA) and information collected from individual stakeholders (researchers, managers, and industry) from different countries.

Knowledge Implementation and Dissemination A total of 200 companies were mapped, the information needed and available retrieved from the companies webpages and the companies contacted to confirm the collected information.

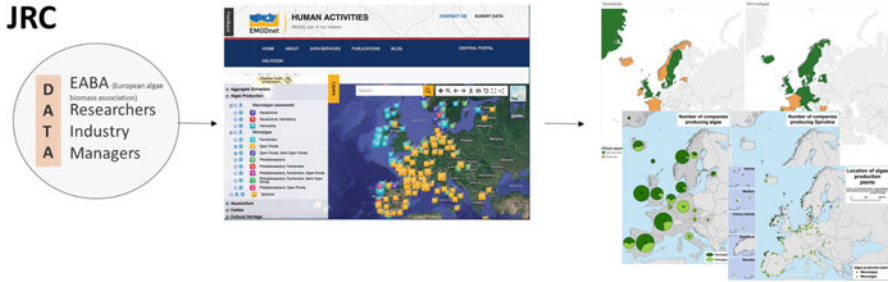


Fig. 12.14 Description of the process of data collection, display and example of products for the EMODnet algae production portal

The database was launched in November 2018 and is available on the EMODnet portal (<http://www.emodnet-humanactivities.eu/view-data.php>) for consultation and download. The information from the database was already used to perform data analysis included in presentations and expert group discussions (e.g., workshop on algae production in Europe) and publications (e.g., Blue Economy Report 2018–2019) (Fig. 12.14). This information will be regularly updated and new relevant categories will be added.

However, as already referred in the previous sections of this chapter, during the work performed in this case study several obstacles to gather data with the needed coverage and reliability were found. Examples are the limitations related to confidentiality issues, difficulties from data providers to understand the impact of good quality local data on the wide EU level analysis, difficulties from data providers to picture how the collected data would be reflected in impactful initiatives to the companies daily life, lack of time, and no perception of reward.

12.4 Conclusions

The marine conservation landscape in Europe harnesses on several instruments to promote knowledge production and exchange, data sharing, networking activities and scientific advice in support of the European level initiatives and legal frameworks related to this topic. Marine conservation is in the spotlight due to the documented global decrease in biodiversity which includes biodiversity decreases in the marine environment. Further, the extent of marine areas in Europe and the socioeconomic and ecological importance of marine resources warrant EU-level coordinated conservation implementation. The exploitation of new economic and biotechnological possibilities based on the marine environment must be in line with the maintenance of the good conservation status of marine ecosystems. This principle is the drive to several initiatives promoting the sustainable development of

marine related activities and conservation measures targeting marine communities and the ecosystem services they provide. The information presented and discussed in this chapter shows that Europe has a good scientific production in the marine conservation field that, although not always regionally balanced, has the potential to adequately inform policy and management frameworks. It was not explicitly evaluated if the application of research outcomes in marine conservation is well developed in Europe and covers the topics and geographical extension requested by implementation measures. The survey conducted on knowledge sharing platforms provides some hints on this topic reporting on the non-adequacy of the data format and on scattered and difficult to map information for some cases. However, most of the data included in these databases are extracted from scientific publications and projects datasets which shows how the knowledge produced is being collected and incorporated in tools to facilitate implementation, coordination and harmonization at the European level. Additionally, the initiatives described in the case studies section provide practical examples of how scientific knowledge can be transferred directly to scientific advice or support initiatives and provide information concerning the entire European area, not only targeting the policy sector but also to be used by researchers and managers. The network of interactions between so many platforms, initiatives, and consortia can be complex to manage; implying a huge coordination effort to efficiently integrate the available but fragmented information from different geographical regions. This is due to the fact that national conservation priorities differ across European countries which consequently lead to regional differences in the development status of particular conservation areas. The initiatives supporting coordination efforts in a given sub-area of marine conservation can help to avoid duplication of initiatives, improve harmonization, facilitate synergies, and promote capacity building across European regions. This coordination will obviously positively impact the quality of data available and the knowledge advice on specific relevant topics for implementation.

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