



Proposal and Recommendations for a Science-Policy Interface (SPI) to support MSFD Implementation

STAGES - Science and Technology
Advancing Governance of Good
Environmental Status



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August 2014



The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement no 308473. This publication reflects the views only of the author, and the European Union cannot be held responsible for any use which may be made of the information contained therein.

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Acknowledgements:

The STAGES project would like to thank the marine stakeholder community for their engagement in the STAGES consultation and development of this report. The consultation was conducted in the form of an online survey (May–July 2013), stakeholder workshop (12 February 2014) and reviews of a Concept paper on a future MSFD SPI prepared by EMB and JRC and presented to the MSFD Project Coordination Group on 10 March 2014. In particular we'd like to specifically thank the following people for their further discussions and insight:

Francesca Somma (EC, JRC), Ana Cristina Cardoso (EC, JRC), Georg Hanke (EC, JRC), Gert Verreet (OSPAR Commission), Anna Cheilari (EC, DG ENV), Leo de Vrees (Ministry of Infrastructure and the Environment/Rijkswaterstaat, the Netherlands), Nikolas Zampoukas (EC, DG Research and Innovation), Irina Makarenko (Black Sea Commission), Tatiana Hema (UNEP-MAP), Gyorgi Gurban (UNEP-MAP), Maria Caparis (UNEP-MAP), Hermanni Backer (HELCOM), Lisette Enserink (Ministry of Infrastructure and the Environment/Rijkswaterstaat, the Netherlands), Julia Baker (University of Southampton, UK), Doris Abele (Alfred Wegener Institute, Germany), Jan van Tatenhove (University of Wageningen, the Netherlands), Audrey Legat (University of Wageningen, the Netherlands), Saskia Van Gaever (Ministry of Public Service Health, Food Chain Safety and Environment, Belgium), Barbara Škevin Ivoševi (Ministry of Environmental and Nature Protection, Croatia), Lisette Enserinck (Rijkswaterstaat, Netherlands), Wendy Bonne (JPI-Oceans Secretariat), Jacky Wood (NOC, UK), Tom Redd (NOC, UK), David Mills (CEFAS, UK), Jo Foden (CEFAS, UK), Trine Christiansen (EEA), Constança Belchior (EEA).

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Executive Summary

The year 2014 marks the mid-point between the launch of the Marine Strategy Framework Directive (MSFD) and the goal of Good Environmental Status (GES) in 2020. Although a lot of progress has been made, the current use of Europe's seas is not sustainable. In its recent publication called 'Marine Messages' (EEA, 2014), the European Environment Agency recommended that "urgent action and protection of the seas and ocean should be top of the EU agenda". In addition, the European Commission Healthy Oceans – Productive Ecosystems (HOPE) conference declaration¹ urged political leaders "...to turn words into action and encourage all stakeholders, including the private sector, to take the measures necessary to deliver "Good Environmental Status" for Europe's seas and oceans by 2020."

Scientific knowledge is at the heart of successful implementation of the Marine Strategy Framework Directive (MSFD), forming a key component of the wider knowledge-base underpinning decision making. However, whilst there has been a high investment in MSFD-relevant research across Europe and at regional and national levels, there remains a significant deficit in the transfer of the knowledge generated through such research to policy makers and wider stakeholders. There is a need for more effective science-policy interfaces that foster knowledge management and stakeholder interaction to harness, communicate, synthesise and evaluate such knowledge to enhance policy decisions. Whilst many structures and initiatives either directly or indirectly support MSFD implementation through knowledge production, knowledge-use and working at the science-policy interface, the European Commission has identified the need for a strategic long-term Science-Policy Interface (SPI) to support implementation of the MSFD.

This was addressed in the context of the EU STAGES project² (September 2012 – August 2014) which is assessing and recommending ways to improve the structural aspects of transferring knowledge from science to inform policy and decision making in support of MSFD. The aim of this paper is to present a proposal for an effective MSFD SPI with recommendations for step-wise implementation of a SPI that is fit for purpose and that can support MSFD implementation in the long-term. This takes into account stakeholder views and expectations based on an extensive consultation through online surveys, workshops and informal discussions together with assessment of best practice and input of key recommendations from across the STAGES project outputs.

Cross-cutting themes for a science-policy interface to support the MSFD

The proposal has been developed in the context of five cross-cutting themes that are considered crucial to strengthen the MSFD SPI into the second MSFD cycle and beyond. These include the need for SPI processes that foster bottom-up (science-driven) and top-down (policy-driven) dialogues, the need for relevant and timely interaction with wider stakeholders, and to take into account the geographical scales and cyclical nature of the MSFD implementation process. A summary of cross-cutting themes together with recommendations are presented in Table 1. Further detail is outlined in Section 3 of this report.

¹ <http://ec.europa.eu/environment/marine/hope-conference/index.htm>

² www.stagesproject.eu

Balancing bottom-up (science-driven) versus top-down (policy-driven) approaches	<ol style="list-style-type: none"> 1. Develop a structured approach to stimulate multi-way dialogues with feedback mechanisms to match policy needs with the latest knowledge and advice. 2. Foster dialogue between policy and science to determine the level of detail and optimum packaging required for targeted stakeholder uptake.
Engagement of MSFD Stakeholders	<ol style="list-style-type: none"> 1. Involve wider stakeholders, where appropriate, in the science and technical advisory process e.g. through the flexible expert network and conferences and through regional science agendas. 2. Assess how existing and emerging industry and innovation networks could act as a platform for dialogue e.g. Knowledge Innovation Community (KIC) and related Technology Alliances.
Optimising the SPI alignment to the MSFD policy cycle	<ol style="list-style-type: none"> 1. Recognise the multiple time-scales at play and identify where alignment of the longer-term research agenda and MSFD policy cycle could provide windows of opportunity to support MSFD implementation. 2. Facilitate top-down communication that can react to short and longer-term policy needs.
Towards coherence at different geographical scales	<ol style="list-style-type: none"> 1. Develop a strategic approach to enhance coherence within and between marine regions e.g. through Regional Sea Conventions and utilising knowledge brokers. 2. Support Member States to develop a sub-regional approach e.g. through Regional Sea Conventions, macroregional strategies and through targeted funding. 3. Build on existing initiatives to form a structured SPI and dedicated human capacity for Knowledge Brokerage at national level.
Exchange and alignment with other legislative requirements and agreed standards	<ol style="list-style-type: none"> 1. Create a framework for a MSFD Common Implementation Strategy (CIS) SPI activity. This could include a CIS-SPI Working Group with correspondents sourced from existing MSFD stakeholder representatives across sectors and geographical scales. 2. Promote dialogue between MSFD and related policies e.g. WFD to recognise best practice and common standards and move towards a more coherent, integrated approach.

Table 1. A summary of recommendations across 5 cross-cutting themes required to build an effective science-policy interface to support MSFD. See Section 3 of this report for further detail.

Key components for building an effective, long-term science-policy interface to support MSFD implementation

The proposal identifies four components that are considered crucial to build a fully functional science-policy interface to support MSFD implementation, namely: Harnessing MSFD-relevant scientific knowledge, scientific and technical advice, expert evaluation and synthesis of scientific knowledge and knowledge brokerage. These four components are presented with key recommendations in Figure 1 below. Section 4 of this report presents a more detailed analysis of each component in the context of a full architecture for a science-policy interface to support MSFD implementation.

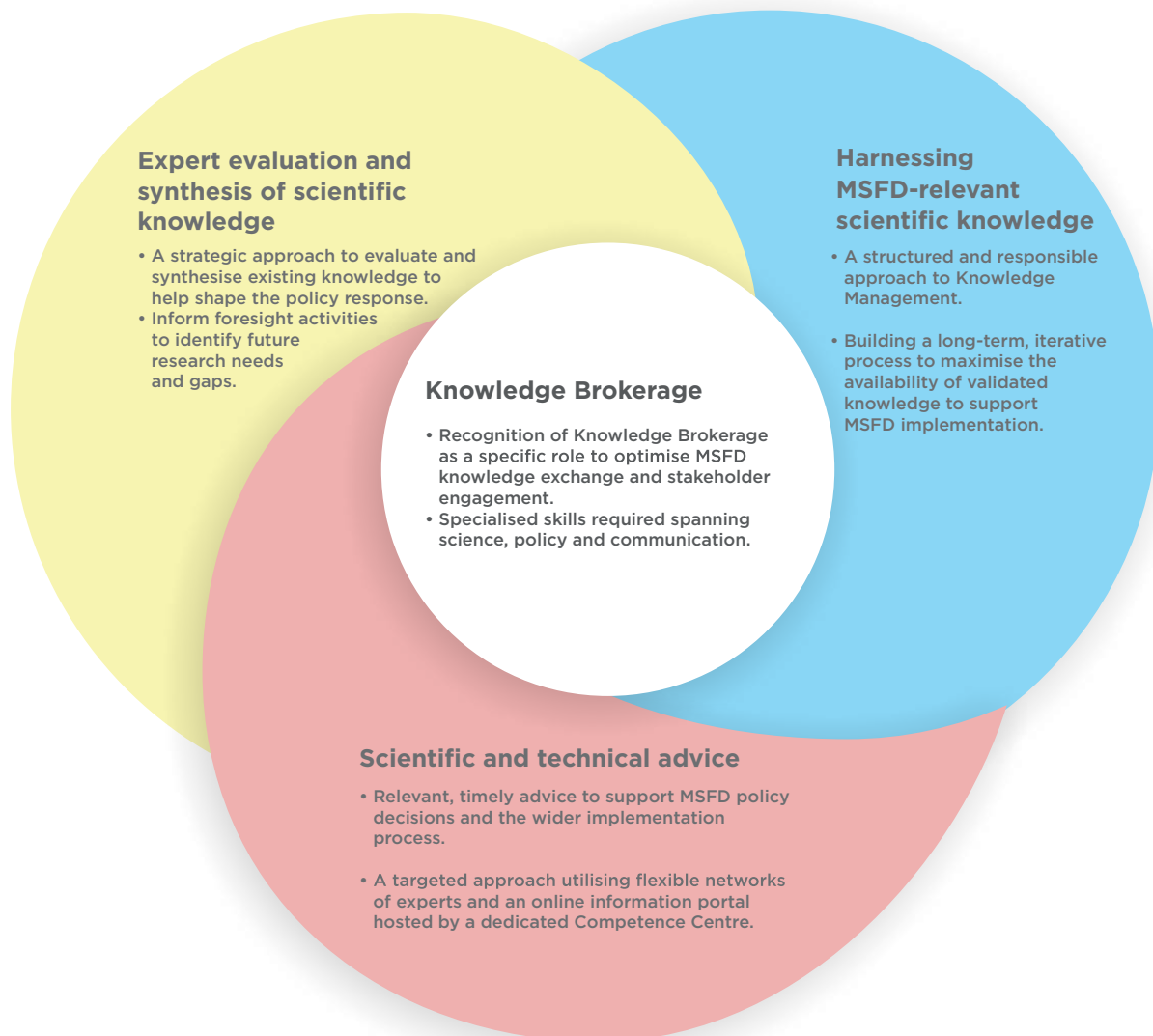


Figure 1. The four key components of a science-policy interface to support MSFD with a summary of specific recommendations. See section 4 of this report for more information.

Architecture for a fully functional science-policy interface to support MSFD implementation

The four key components outlined above are presented in Figure 2 in the context of an architecture for a fully functional SPI to support MSFD implementation. The diagram identifies a series of inter-linked processes that are cyclical and iterative to optimise MSFD-relevant knowledge management at each stage of the policy cycle.

Knowledge brokerage is an integral component of the SPI that encompasses elements of knowledge transfer, exchange, communication and dissemination to promote a more active and iterative dialogue between the science, policy and wider stakeholder arenas. It could be conducted by a variety of entities and actors, building on existing capabilities and initiatives. Section 4 of this report provides further detail on the proposed architecture and key components, assessing existing initiatives, identifying potentially key stakeholder groups and proposing actions and recommendations.

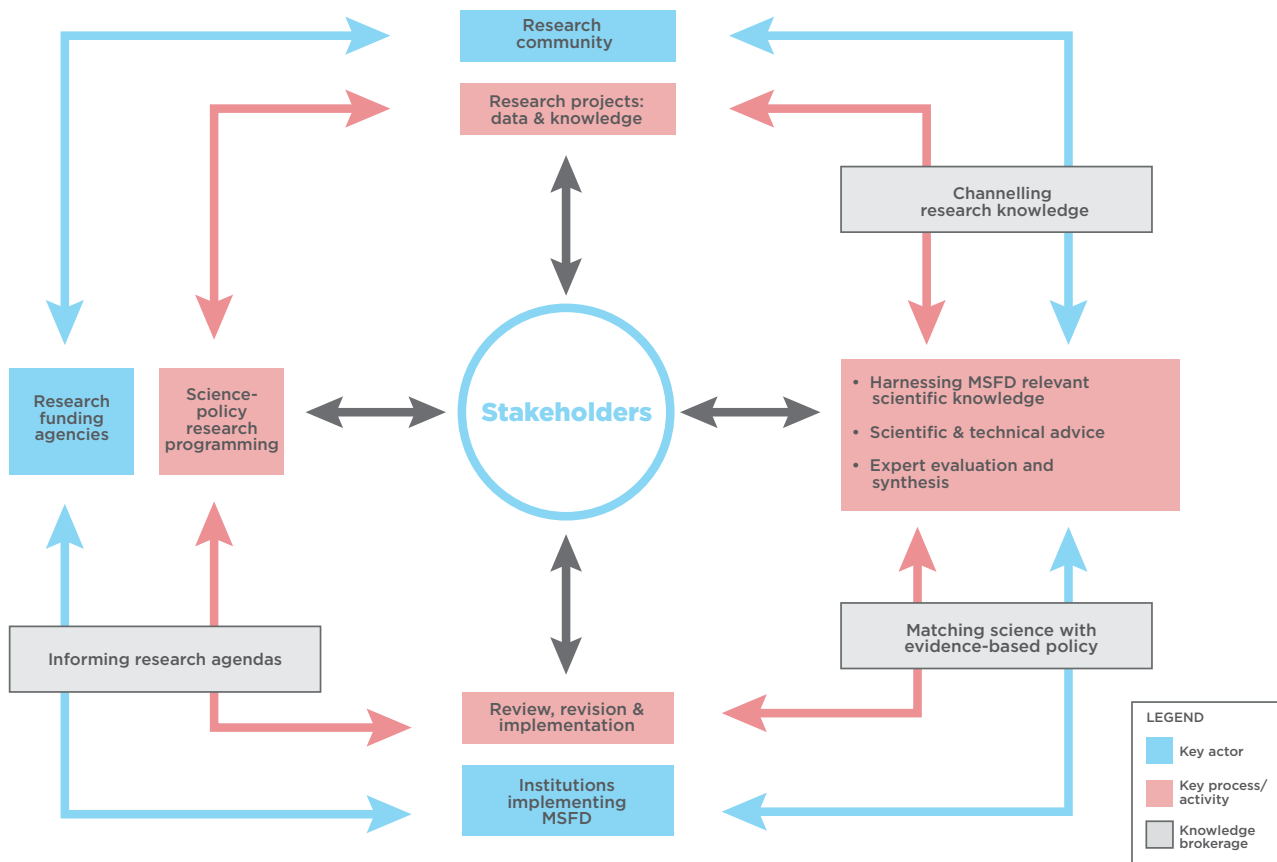


Figure 2. Architecture of the proposed science-policy interface (SPI) to support MSFD implementation. The figure presents key components and inter-linked processes for an effective SPI that can optimise scientific knowledge-based decision making. This was informed by results from a stakeholder consultation including discussions with key actors and best practice analysis. Knowledge brokerage is an integral cross-cutting component required to optimise the information flow and stakeholder dialogue. In this diagram, grey boxes indicate where enhanced capacity for active knowledge brokerage is particularly recommended. The diagram is also presented with supporting text in Section 4 (Figure 9). Figure produced by the European Marine Board.

Towards a roadmap for SPI implementation

Figure 3 presents a roadmap showing how the SPI architecture vision could be implemented in a step-wise approach and building on existing infrastructures and initiatives. Recommendations for action are presented for three time-periods, namely; short-term actions (here 2014-2016) that are considered highly achievable (i.e. components already in development and/or significant new funding is not required); mid-term goals (2016-2020) that move the SPI towards strategic long-term operation; and long-term (beyond 2020) which sets the vision for a strategic SPI that is active and self-sustaining across all four key components. Further detail is presented in section 5 of this report.

Roadmap for SPI to support MSFD

MSFD Policy Timeline

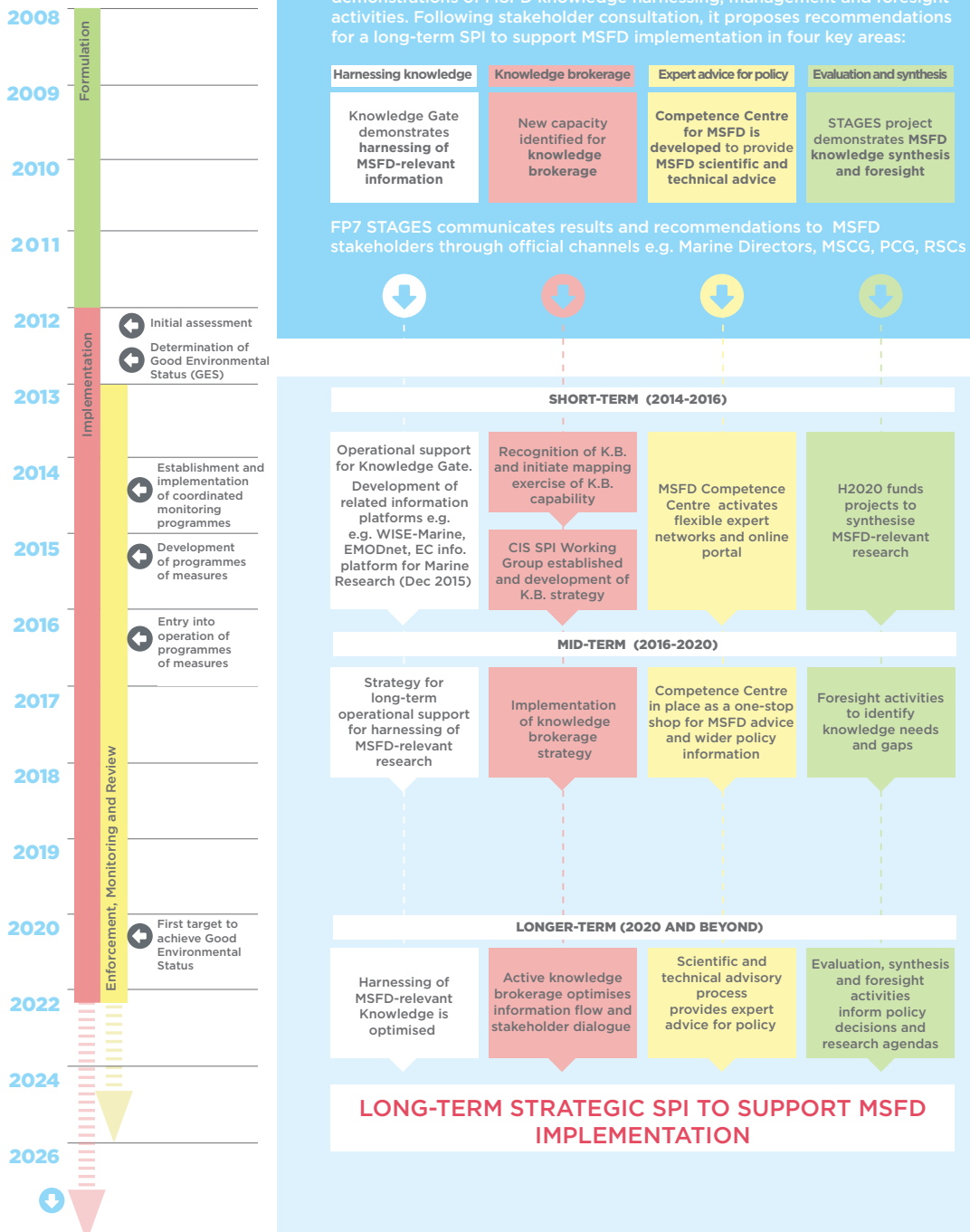


Figure 3. Roadmap for a science-policy interface to support MSFD implementation.

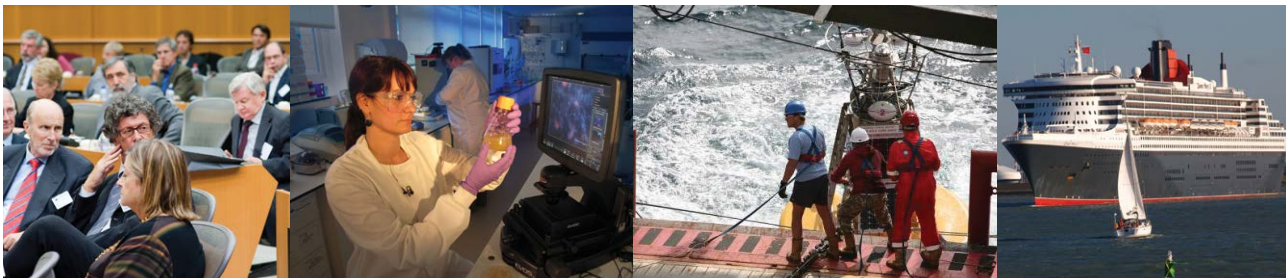
Actions for a step-wise implementation are presented in the context of the MSFD policy stages and key milestones in the first MSFD cycle and beyond. Further information is provided in section 5 of this report.

1. Introduction

The EU STAGES project³ is addressing the structural aspects of transferring knowledge from science to inform policy and decision making in support of MSFD.

In this paper, STAGES presents a proposal with options for a future Science-Policy Interface (SPI) which can effectively support MSFD implementation. This has been developed as a key deliverable of Work Package 4, “Building a Science-Policy Interface to support MSFD implementation,” led by the European Marine Board (EMB) in collaboration with STAGES partners. The proposal takes into account the results of a number of preparatory tasks conducted as part of STAGES Work Package 4, including best practice reviews, a survey targeting 436 stakeholders from 30 countries, and a stakeholder consultation workshop. Results on stakeholder views and expectations for a science-policy platform to support MSFD implementation are presented in STAGES Deliverable D4.1 (Larkin *et al.*, 2014). In addition, the SPI proposal takes into account key outputs and recommendations from related STAGES activities, namely Work Package 2, “Identify, Extract, Analyse and Synthesise the knowledge,”⁴ and Work Package 3, “Knowledge Gaps Assessment and Foresight.” (Le Moigne *et al.*, 2014). Where possible, recommendations focus on enhancing existing initiatives and infrastructures and using entities that are already active in the science-policy interface supporting MSFD implementation.

This paper provides the context and rationale for developing a Science-Policy Interface to support MSFD implementation and identifies guiding principles and cross-cutting areas to enhance implementation of MSFD. It presents an architecture for the proposed SPI and outlines the four key components of the SPI in more detail, proposing key roles, areas of activity and short-, mid- and longer-term ambitions.



Examples of marine stakeholders (EMB, 2013)

³ www.stagesproject.eu

⁴ See *EurOcean Marine Knowledge Gate 2.0 and Marine Directive searches therein* <http://www.kg.eurocean.org>

2. Context for a Science-Policy Interface (SPI) to support MSFD Implementation

2.1 Rationale

The Marine Strategy Framework Directive (2008/56/C) is the environmental pillar of the EU Integrated Maritime Policy (European Commission, 2007). Adopted in 2008, the MSFD has completed its first phase and is now one step closer to the concrete implementation of an ecosystem approach to the management of human and natural pressures impacting our seas (European Commission, 2014a). However, the submission of Member States' first assessments in December 2013 revealed a lack of data availability across Europe that will be required to achieve the ambitious target of Good Environmental Status (GES) of European marine waters by 2020. In addition, although implementing the MSFD is, first and foremost, a Member State responsibility, a real need was identified for regional coherence and coordination between Member States and across multiple geographical scales (sub-regional, regional and European).

Science-policy interfaces can be defined as *"...social processes which encompass relations between scientists and other actors in the policy process, and which allow for exchanges, co-evolution, and joint construction of knowledge with the aim of enriching decision-making"*.

Van den Hove, 2007. *Futures* Vol 39, p. 807-826.

Much of this knowledge may exist as a result of significant investment by the European Commission (e.g. Seventh Framework Programme⁵) and by other European, regional and national research funders. However, the harnessing of knowledge and identification and packaging of MSFD-relevant knowledge is far from optimal. In addition, there is insufficient capacity in place to synthesise and evaluate existing knowledge and to define research gaps and needs in the short-, mid- and longer-term. Science-policy interfaces are crucial to promote the interplay between the science and policy

domains, fostering dialogue, knowledge management and exchange between diverse stakeholder groups, marine sectors and across multiple geographical scales (European Marine Board, 2013). Such science-policy interfaces are, in many cases, multidimensional and adaptable with exchange and dialogue recognised as a social activity where scientific knowledge is just one component of a wider knowledge base and must be credible, legitimate and relevant (Young *et al.*, 2014; European Commission, 2012).

There are many science-policy interfaces and platforms already in place at national, regional and European levels directly and indirectly supporting MSFD implementation and coordinated through the European Common Implementation Strategy for MSFD⁶. Other initiatives such as Regional Sea Conventions already have in place mechanisms for regional coordination of MSFD activities, e.g. the OSPAR Intersessional Correspondance Group for MSFD, or are further developing mechanisms to support MSFD implementation through a range of activities. However, the situation across marine regions is highly diverse and this becomes even more evident at the national level. Other geographical scales such as the sub-regional scale are yet to be capitalised on for MSFD but could add significant value to supporting Member States in implementing MSFD. At a national level, the situation lacks coherence with some countries having a relatively mature MSFD governance structure and operational science-policy interface to support MSFD implementation. Other countries lack the funding, human capacity and awareness of best practice in SPI to develop this further.

⁵ Between 2007 and 2013 the EC contributed an average of €350 million towards marine and maritime research [source, European Commission, 2014b]

⁶ More detail is provided in Larkin *et al.*, 2014

The need for further enhancements to the existing SPI was identified in the STAGES stakeholder consultation with less than 30% of stakeholders perceiving the existing SPI to be “Very effective” or “effective” at any geographical scale (see red line, Figure 4).

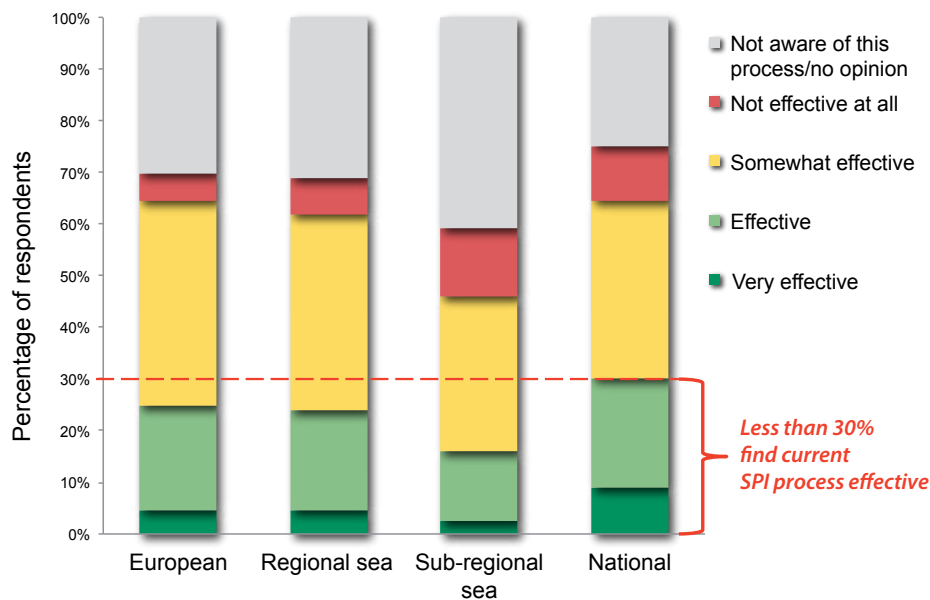


Figure 4. Stakeholder perceptions of the effectiveness of existing Science-Policy Interfaces supporting MSFD implementation at European, Regional; Sea, Sub-regional sea and National levels. (Question 9, STAGES Stakeholder Consultation, 2013.)

Building on these existing initiatives and identifying gaps where new capacities are needed is crucial to further support MSFD implementation into the future. The MSFD Common Implementation Strategy (CIS) document for 2014 and beyond (European Commission, 2014c) outlines some cross-cutting activities for enhancing the science-policy interface. This includes scientific advice building on the work already established by the Joint Research Centre (JRC) of the European Commission and the International Council for the Exploration of the Sea (ICES). The MSFD Project Coordination Group is also highlighted as an important platform for exchange of information on relevant projects and coordination of activities including the identification of MSFD-relevant knowledge and of future short-, mid- and long-term research needs. These recommendations were taken into account whilst developing this SPI proposal. In addition, ongoing consultations (Redd *et al.*, 2014) by the FP7-funded CSA Oceans⁷) have also been a useful reference for stakeholder views on the wider science-policy interface development across Europe. Results have identified a need for improvements to all stages of the science-policy process including:

- Improving information exchange between science and policy makers for existing and new knowledge, including knowledge translation and education around the respective needs of research and policy communities facilitating interactions between them through informed science commissioning and evidence collection, enhancing the engagement of scientists in the policy development and implementation processes.
- Building capacity to ensure the next generation of scientists and policy makers understand each other to facilitate the co-design of science based policy.

⁷ A Coordination Action in support of the Joint Programming Initiative on Healthy and Productive Seas and Oceans

2.2 STAGES stakeholder consultation on the MSFD Science-Policy Interface

STAGES Work Package 4 conducted an extensive stakeholder consultation to seek perspectives from marine stakeholders on needs and expectations for the MSFD science advisory process and wider science-policy interface. This was a three-step process; stakeholder identification, online survey and stakeholder workshop (see information below, further detailed in Larkin *et al.*, 2014). To optimise the SPI, the STAGES stakeholder consultations highlighted improvements in key areas including packaging knowledge outputs, access to knowledge and harnessing relevant information, stakeholder interaction and information flow, geographical scale and more strategic planning e.g. to align science-policy time-lines. Importantly, a new capacity was identified for Knowledge Brokers e.g. individuals with science-policy-communication skills base that can act as independent and credible ‘brokers’ to facilitate science-policy dialogues and the communication/ dissemination process supporting MSFD implementation.

1. Stakeholder Identification: Over 600 marine stakeholders were identified from across marine and maritime sectors (including public and private) and spanning national, regional and European levels. Sources of information included an initial STAGES inventory of MSFD stakeholder organisations, input from the FP7 ODEMM project and open sources including the EU MSFD and Regional Sea Convention stakeholder lists.

2. Online survey: Design, implementation and analysis. In summer 2013, STAGES launched a 6 week online Consultation aimed at gathering stakeholder opinions and perceptions on three key areas:

- MSFD knowledge production, availability and access;
- Stakeholder involvement in the current MSFD science-policy interface; and
- Tools and mechanisms for enhancing the existing science-policy interface.

436 Stakeholders were invited from 30 countries, representing a diverse range of stakeholder groups and marine sectors (see Figures 5 and 6 below). 113 responses (25.9% response rate) were submitted from 23 countries.

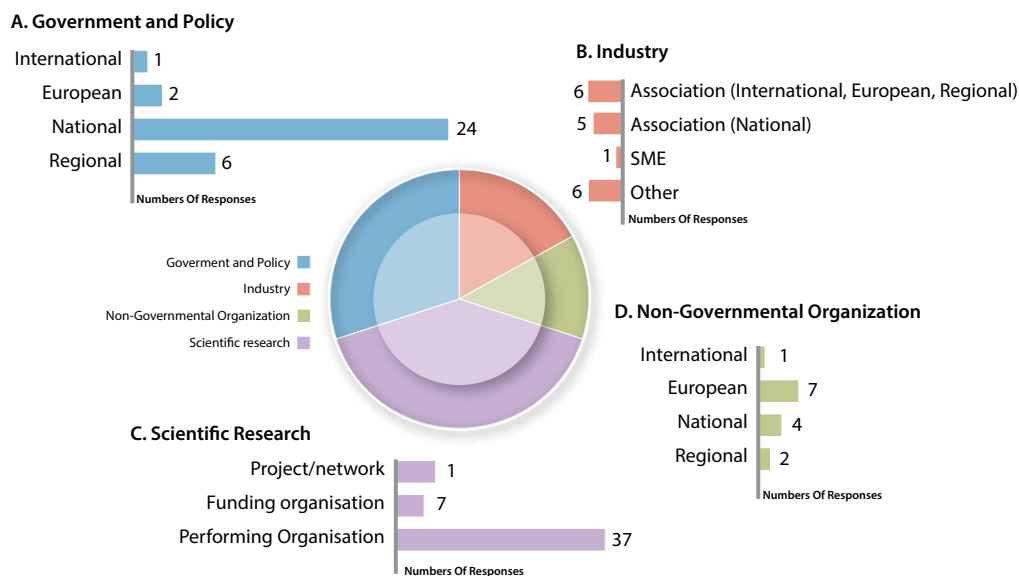


Figure 5. Stakeholder responses by organisation type and marine sector(s).

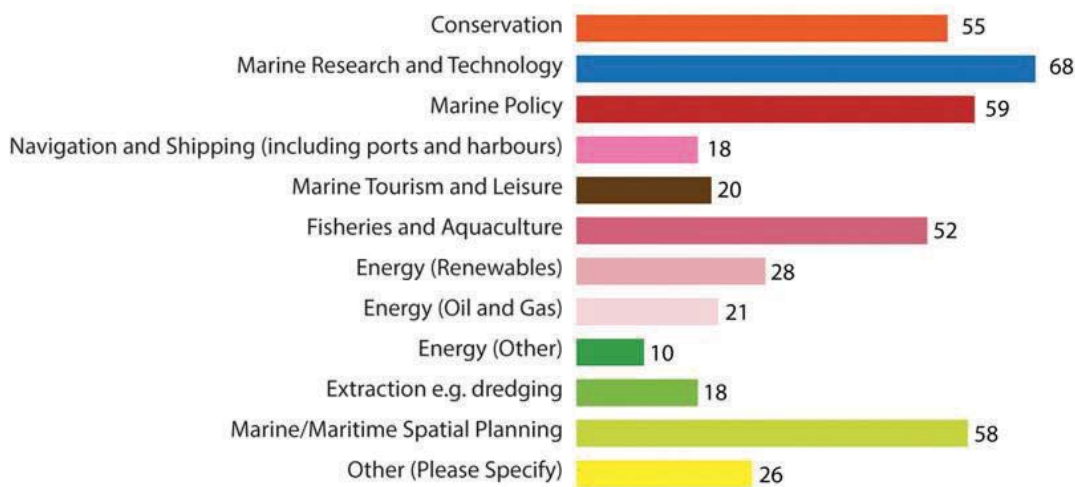


Figure 6. Stakeholder perspectives on marine sector(s) of interest

3. Stakeholder workshop: On 12 February 2014 a STAGES WP4 interactive workshop was held to further assess stakeholder views to optimise a future MSFD SPI. 45 participants were invited from the extensive database of MSFD stakeholders, ensuring a cross-section of marine sectors and geographical scales (international, European, regional and national). Breakout discussions focused on two topics, namely: Which Knowledge and When? moderated by Gert Verreet (Deputy Secretary at OSPAR Commission; STAGES Advisory Board) and Choosing the best SPI tools, moderated by Jan van Tatenhove (Special Professor in Marine Governance, Wageningen University, FP7 ODEMM project).



Breakout session at STAGES stakeholder workshop, 12 February 2014.

Best Practice: A review was also conducted of wider environmental SPI best practice, models and case studies and more specific MSFD governance structure analysis. Various methods were used including a desk-based literature review, contacts with relevant projects, communication with the European Commission (DG Environment) and attending meetings organized by other SPI initiatives. Specific examples of science-policy conferences attended include meetings of the Common Implementation Strategy (CIS) and SPI for the Water Framework Directive (WFD), e.g. the CIS-SPI and SPI-Water Cluster Final Conference which both took place in 2012 (see Larkin *et al.*, 2014 and Redd *et al.*, 2014 for further review).

Relevant other initiatives: Throughout the STAGES project, the European Marine Board and other STAGES

partners interacted with existing and potential MSFD SPI actors to assess the current status, best practice and inform future developments. There was regular interaction with the European Commission (DG Research and DG Environment, Marine Environment and Water Industry Unit) as key clients of the SPI Proposal. The EMB Secretariat also fostered interactions on science-policy interfaces and MSFD Stakeholders with related European initiatives, including the FP7 projects PERSEUS⁸, ODEMM⁹ and SPIRAL¹⁰. A dialogue is ongoing with the CSA Oceans¹¹ project (a project of JPI Oceans) where potential areas for collaboration were noted as science-policy best practice, survey design and stakeholder identification. In 2013, the EMB also published the foresight report, Navigating the Future IV, with a dedicated chapter (13) on European marine science-policy interfaces which sets out recommendations for developing long-term and effective science-policy interfaces (European Marine Board, 2013).

Towards a Concept for a Science-Policy Interface to support MSFD implementation: In light of the increasing interest and anticipated impact of the MSFD SPI, EMB was also invited by the European Commission (DG Environment) to develop a Concept Paper on the MSFD SPI. This was produced in February 2014 in collaboration with the European Commission's Joint Research Centre (JRC). The paper was presented at the MSFD Project Coordination Group (PCG) meeting on 10 March 2014 and disseminated to PCG members for review.

2.3 Guiding principles

The STAGES stakeholder consultation and best practice on MSFD Science-Policy Interfaces together with wider STAGES outputs have informed a set of guiding principles for the MSFD SPI:

- Effective dialogue and transfer of knowledge
- Enhanced knowledge accessibility
- Improved identification and uptake of relevant and timely knowledge
- Joint Construction and Co-evolution of knowledge
- Building on existing structures and initiatives

⁸ <http://www.perseus-net.eu>

⁹ <http://www.liv.ac.uk/odemmm>

¹⁰ <http://www.spiral-project.eu>

¹¹ In particular JPI-Oceans CSA WP5 where potential areas for collaboration were identified regarding a parallel consultation, science-policy best practice, survey design and stakeholder identification.

3. Cross-cutting themes for a Science-Policy Interface to support the Marine Strategy Framework Directive

A number of cross-cutting themes are outlined below which will strengthen implementation of the MSFD in the second MSFD cycle and beyond.

3.1 Balancing bottom-up versus top-down approaches

Marine knowledge underpins the successful implementation of the MSFD. A wealth of existing knowledge has already been produced which could have relevance for MSFD implementation. Deciding on which knowledge is relevant should be managed through an ongoing interaction between the knowledge producers (e.g. the scientific community) and MSFD implementers (e.g. national competent authorities). Optimisation of the identification, harnessing and uptake of such knowledge requires an active SPI including bottom-up (science-driven) and top-down (policy-driven) dialogues and matching of knowledge and policy needs. This is also vital to inform the identification of research needs and priorities and hence setting the future science agenda.

The STAGES consultation also identified a need for more top-down communication of what stakeholders need, e.g. a more strategic approach for policy to science communication, providing information on the questions needing to be answered to support MSFD policy implementation. This could also serve as a crucial feedback mechanism for policy makers to review and assess the MSFD implementation process and to relay information on scientific and technical knowledge requirements to inform research agendas and knowledge producers. Currently there is a lack of infrastructure/fora in place to gather, process and communicate these views and needs.

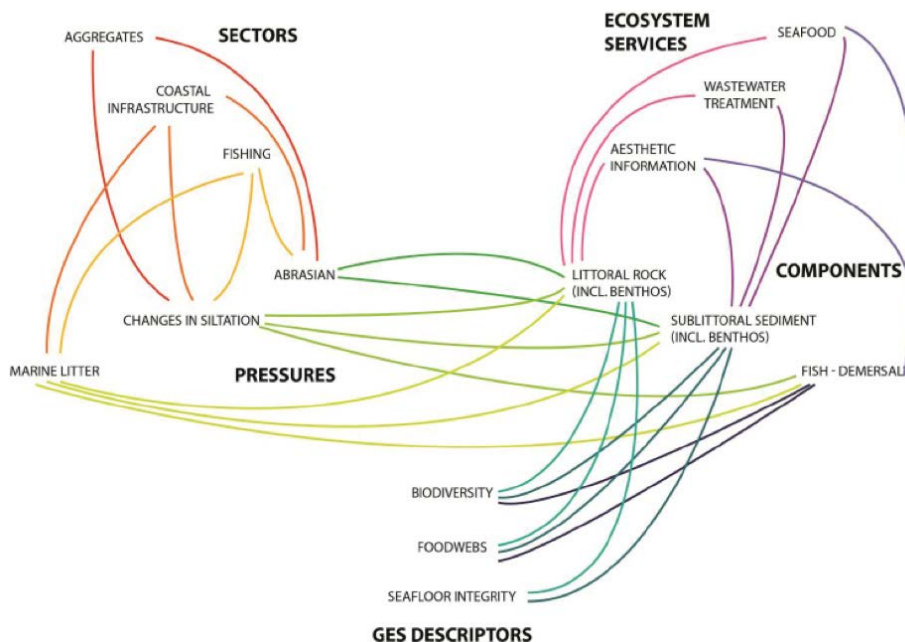


Figure 7. Threats to GES: understanding the relationship between sectors/pressures and the state of ecological components. Source: FP7 ODEMM project ¹²

¹² Options for Delivering Ecosystem-based Marine Management', FP7 ODEMM project: <http://www.liv.ac.uk/>

Such bottom-up and top-down discussions are also crucial to rationalize and find common ground on the scope and level of detail of knowledge required to support MSFD implementation. For instance, the FP7 ODEMM project looked into the inter-linkages of knowledge required for MSFD implementation (Figure 7). This identified a need for more clarity on what the MSFD descriptors mean, giving greater priority to threats, making links to measures and to ecosystem services and improving the regional scale approaches of governance.

Recommendations:

1. Develop a structured approach to stimulate multi-way interactions involving bottom-up (science-driven) and top-down (policy-driven) processes with feedback mechanisms to match policy needs with the latest knowledge and advice.
2. Foster dialogue between policy and science to determine the level of detail and optimum packaging required for targeted stakeholder uptake.

3.2 MSFD stakeholders: from knowledge producers to users

An effective SPI draws on a diverse stakeholder community of knowledge producers and users (see box for definitions). The STAGES stakeholder consultation noted that better two-way communication and information-exchange is needed in the MSFD implementation process to promote discussion and consolidation between stakeholders. It was also noted that while the principle dialogue may be between the scientific and policy communities, the process should be open to other stakeholders to contribute and use knowledge. An SPI could help to raise awareness of the MSFD to a wider stakeholder community, including the implications and opportunities for them presented by the MSFD implementation. This was further identified by the HOPE conference of the European Commission conference, which noted a strong support from the public for more action on marine environmental protection.

MSFD Knowledge Producer:

Marine stakeholder that produces knowledge for MSFD such as datasets, products and services e.g. environmental status maps, predictions, reports.

MSFD Knowledge User: Marine stakeholder that utilises knowledge as part of the MSFD reporting and implementation process.

The STAGES consultation highlighted a greater need to engage stakeholders more efficiently at all stages of the research cycle, from the identification of gaps to the co-evolution of research. It was noted that

Wider Stakeholder involvement in the MSFD SPI:

Around 30% of Stakeholders responding to the STAGES Consultation said they do not currently contribute to the MSFD policy process but would like to. This shows a real willingness to be actively involved in the production and/or use of knowledge to support MSFD implementation.

Results from STAGES stakeholder Consultation (Larkin *et al.*, 2014; Baker, 2013)

based on the diversity of marine sectors and geographical scales, the potential stakeholder list for MSFD is extensive and that stakeholder interaction needs to be targeted, timely and appropriate to avoid stakeholder fatigue. In addition, it is becoming increasingly important to engage economic actors to achieve better integration with the objectives of Blue Growth and take into account the diverse, multi-stakeholder community supporting MSFD implementation. Mechanisms to involve the private sector and foster dialogue between industry, research and policy could include Technology Alliances, building on the work achieved by EU Technology Platforms (e.g. the Waterborne Technology Platform and the Fisheries Technology Platform) and proposals for a Blue Growth Knowledge Innovation Community (KIC) (European Commission, 2014b)¹³.

¹³ KICs bring together research, higher education and business with the aim of reinforcing the EU's innovation capacity. A second wave of KICs has been due to begin operation in 2014, bringing the total number to seven, while a third wave is due to be selected in 2018.

Recommendations:

1. Involve wider stakeholders, where appropriate, in the science and technical advisory process e.g. through the flexible expert network and thematic conferences.
2. Assess how existing and emerging industry and innovation networks could act as a platform for dialogue e.g. Knowledge Innovation Community (KIC) and related Technology Alliances.

3.3 A question of time: Optimising the SPI alignment to the MSFD policy cycle

MSFD is a continuous effort, cyclical in nature and demanding new knowledge and insight (Figure 8). However this knowledge must be relevant and delivered at the right time to ensure its uptake into policy. There is a need to maximize the interplay between the research (longer-term) and policy (shorter-term) time-frames both to optimize knowledge uptake throughout the full research cycle and to ensure new research is addressing knowledge gaps relevant to policy needs.

“With only 6 years remaining, there is an urgency for Member States to act decisively and to work together if the threats to the marine environment are to be overcome. Action cannot wait until the beginning of the next MSFD implementation cycle; we must start immediately, as Member States set out their programmes of measures to achieve GES by 2020.”

Healthy Oceans – Productive Ecosystems (HOPE) Conference programme, A European conference for the marine environment, 3–4 March 2014, Brussels.

Lessons are clearly being learned from the first assessment for MSFD. However, with 2020 as the target date for achieving GES under MSFD, the identification of gaps, commissioning of new research and providing scientific advice to policy cannot wait until the next MSFD implementation cycle. The science-policy interface should have both short-term (fast-track) and mid- to longer-term goals.

The STAGES consultation noted that stakeholder interaction needs to be targeted, timely and appropriate to avoid stakeholder fatigue. It was also suggested that there should be more top-down communication of what stakeholders need, e.g. a more strategic approach for policy to science communication, providing information on MSFD policy implementation to the scientific community. Currently there is a lack of infrastructure or strategic fora in place to collect, process and communicate these views and needs.

Aligning the long-term science/research agenda and the policy cycle: There is a need for an effective science-policy interface to find ways of optimising the alignment of multiple time-scales and approaches, e.g. between the need for rapid responses to requests for existing knowledge and scientific advice to inform policy uptake and the longer-term scientific process for knowledge production, synthesis, identification of knowledge gaps and informing research agendas for developing new knowledge.

Towards the next steps in MSFD implementation: In terms of the MSFD first cycle, Member States are still in the process of developing their Marine Strategies, having already submitted Part 1 (initial assessment) and Part 2 (monitoring programmes). The next stage is generating programmes of measures during 2014–2015 to be included in national plans to be put into effect from 2016. In addition, Member States have a reporting obligation for MSFD progress on implementation of the programmes of measures. This requires that Member States shall, within three years of the publication of each MSFD programmes of measures or update, submit a brief interim report describing progress in the implementation of that programme¹⁴. There is potential for implementing best practice for stakeholder interaction and for enhancing the science advisory process,

¹⁴ E.g. For the Netherlands, the programme of measures as part of the Marine Strategy will be included in the new National Water Plan in 2014-2015 and put into effect from 2016.

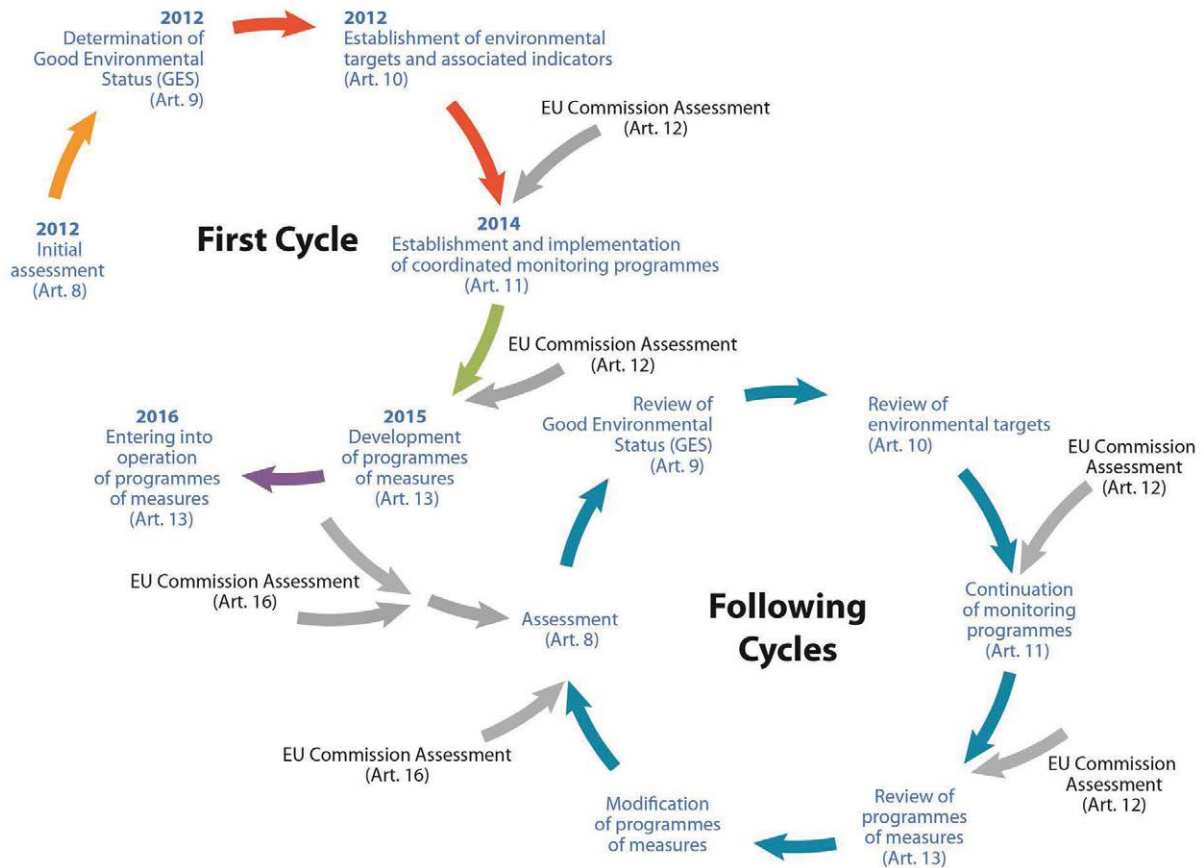


Figure 8. MSFD policy cycle. Re-drawn based on original from European Commission, DG Environment.

particularly through national, sub-regional and regional geographical scales to support development of these measures. In addition, some Member States have been successful in receiving European funding to develop their programmes of measures for MSFD. One example is Estonia which started a dedicated European project in 2014 to develop its programme of measures through grants from the European Economic Area and Norwegian Financial Mechanisms 2009-2014 from the programme of “Integrated marine and inland water management”¹⁵.

Recommendations:

1. Recognise the multiple time-scales at play and identify where alignment of the longer-term research agenda and MSFD policy cycle could provide windows of opportunity to support MSFD implementation.
2. Facilitate top-down communication that can react to short and longer-term policy needs.

3.4 Towards coherence at different geographical scales

In the STAGES Consultation, pragmatic top-down coordination and oversight at a European scale was considered to be important and many Stakeholders from organizations with national and regional mandates commented on the usefulness of being engaged in the European Common Implementation Strategy

¹⁵ The project runs from March 2014 to April 2016 and will develop the programme of measures for the Estonian marine area in compliance with the requirements of the EU Marine Strategy Framework Directive.

governance structure e.g. MSCG, PCG and Working Groups for MSFD coordination.

Although implementing the MSFD is first and foremost a Member State responsibility, the analysis of first assessments has identified a real need for regional coherence and coordination between Member States and across multiple geographical scales (sub-regional, regional and European). This is particularly pertinent for the marine environment where national political boundaries have no ecological relevance regarding assessments of Good Environmental Status. In fact, marine ecosystem dynamics are inherently non-linear and resolving temporal and spatial variability in the oceans remains notoriously difficult¹⁶. Member States therefore need to work across geographical scales, in particular at a sub-regional and regional level, to achieve a holistic ecosystem approach.

The Healthy Oceans – Productive Ecosystems (HOPE) Conference (3–4 March 2014) noted the important role played by the Regional Sea Conventions (RSCs) as a *“strong pillar for marine conservation and for better coordination among Member States as well as with third countries, emphasizing the growing body of good practices at regional and national level on which further action must be based.”* It also defined the need for a coordinated, consistent, coherent and comparable monitoring programme across regions at Regional level with the following recommendations for RSCs:

- Align timetables and assessment methodologies of regional assessments
- More systematic use of joint regional reports
- Use reporting from other EU instruments (e.g. WFD, Habitats Directive)

HOPE conference programme. <http://ec.europa.eu/environment/marine/hope-conference>

In 2014 the European Commission Joint Research Centre (JRC) published a scientific and policy report (EUR 26473 EN) with in-depth assessments of the EU Member States’ submissions for the MSFD under articles 8,9 and 10. The report also assessed the level of integration and forms of cooperation between Regional Sea Conventions:

- RSCs offering observer status to other RSCs e.g. OSPAR and Black Sea Commission on HELCOM
- Joint working groups: HELCOM and OSPAR are jointly working to reduce the introduction of alien species to the Baltic Sea and the North Sea. A joint HELCOM-OSPAR working group was established in 2012 to work on the Ballast Water Management Convention exemptions. HELCOM has previously together with OSPAR as well as the Barcelona Convention (REMPEC) issued joint guidance on voluntary ballast water exchange. Further, HELCOM and OSPAR are working on harmonizing their Guidelines on disposal of dredged material at sea. A workshop is planned for the near future.
- Projects e.g. HELCOM is also an active partner in a project called “Environmental monitoring of the Black Sea with focus on nutrient pollution”, shortly Baltic2Black, lead by the Black Sea Commission. The project aims to enhance the protection of the Black Sea from eutrophication by transfer of knowledge between the Baltic Sea and the Black Sea on monitoring and assessment of eutrophication and nutrient pollution, devising eutrophication related targets, as well as on cutting land-based nutrient loads.
- Aligning timing and content of Quality Status Reports (e.g. OSPAR and UNEP-MAP examples).

Regional Sea Conventions have been identified as a crucial platform for Member states to coordinate their actions on the implementation of the Marine Strategy Framework Directive within marine regions. In an operational sense this is being taken forward at a European level through the Project Coordination Group (PCG) and a further study by von Homeyer et al. 2013 which specifically addressing the most important support needs of the RSCs with respect to their role in supporting the regional coordination of national implementation of the MSFD.

¹⁶ <http://www.unepmap.org/index.php?module=news&action=detail&id=157>

Stakeholder involvement is seen to be very variable across the four RSCs. Whilst some RSCs invite stakeholders as official observers at meetings e.g. OSPAR, stakeholder engagement in other RSCs e.g. the Black Sea Commission was noted as ad hoc. In the STAGES consultation, stakeholder involvement was noted as positive and in many cases necessary. However, it was also noted this should be targeted, realistic and appropriate to minimise stakeholder fatigue. This highlights the need for a strategic overview of stakeholder engagement in RSCs and the wider MSFD SPI. RSC structures and activities supporting MSFD are at very different levels of maturity across Europe's marine regions. For example, the OSPAR Quality Status Report 2010 was specifically designed to inform and support implementation of MSFD by its contracting parties. In addition, OSPAR has an Intersessional Correspondence Group as part of its governance structure to discuss MSFD implementation and share best practice between contracting parties towards achieving regional coherence in aspects such as monitoring programmes and programmes of measures. Revisions to regional strategies such as the Mediterranean Strategy for Sustainable Development¹⁶ also likely to be a driving force for achieving regional coherence into the future. In contrast, the Black Sea Commission has no strategic or long-term mechanism in place to fund these activities. Previously, the European Commission (DG Environment) funded a project on Black Sea MSFD implementation which initiated the process of all BSC countries engaging with the MSFD, but this finished in December 2012 with no further funding. Whilst each RSC has set up its own regional monitoring programme, these are not always specific to MSFD. For example, a fundamental issue for BSC compatibility with MSFD is that the current monitoring programme does not reflect the indicators/descriptors of the MSFD and it is not clear, therefore, how much knowledge in these areas is available across the BSC.

Interaction with other RSCs: The level of existing interaction between RSCs was assessed in the STAGES consultation, both in responses to the survey and based on follow-up interviews with the RSC Secretariats. Table 2 gives a summary of perceptions from each of the four RSCs. Key challenges limiting dialogue and exchange were identified as human capacity and financial constraints limiting attendance at physical meetings. Ways forward include thematic conferences (e.g. by MSFD descriptor) as a mechanism to exchange methodologies.

Towards a more strategic science advisory process at regional level: A strong knowledge base is required to underpin MSFD policy decisions and implementation. However, judging the relevance of knowledge to the MSFD policy process is really dependent on how the question is framed and the efficiency of science advisory processes in place to respond to these policy needs – there is a need to be very specific about what and why. At a regional level, RSCs such as the OSPAR Convention have recognised that a strategic plan is required for the planning and development of coordinated research needs in the medium and longer-term. The resulting OSPAR science agenda (OSPAR, 2014), approved by the OSPAR Commission on 27 June 2014. This will involve multi-disciplinary science (natural and socio-economic) sourced from a range of knowledge producers and is complimentary to existing OSPAR activities such as the Joint Assessment and Monitoring Programme (JAMP). By setting out processes to further engage science providers and science funders in MSFD implementation, it also paves the way for defining research needs and better coordination of national science programmes.

Interaction with third countries including land-locked countries: A significant portion of European regional seas watershed (catchment area) lies in non-EU and landlocked states. In some cases non-EU countries are contracting parties and this is a particular issue for UNEP-MAP and the BSC. The Black Sea Commission noted that historically there was reluctance from non-EU countries to engage in MSFD related work. A European Commission (DG Environment) project which finished in 2012 provided a better focus for this exchange and all countries are now more aware of MSFD and the benefits. However there remains a need to align BSC monitoring with MSFD to make it more compatible. Because pollution draining into the sea originates from such countries, cooperation with these countries is of utmost importance in order to be able to tackle the problems faced by the Baltic Sea.

OSPAR COMMISSION (Northeast Atlantic)

Through PCG (RSCs are active members, not just observers as for other EU level groups e.g. MSCG). Other contact across RSCs is rather ad hoc. OSPAR has bilateral contact e.g. with HELCOM, some with UNEP-MAP and little with Black Sea.

HELCOM have led the way for indicator based assessments (8 years) – OSPAR made a decision to follow this only recently so can learn from HELCOM.

A consultation meeting among RSC would be useful in order to strengthen cooperation.

BLACK SEA COMMISSION (Black Sea)

In general there is minimal interaction between Conventions.

Meetings are seen as a good way forward. BSC are discussing ways to align more with MSFD and UNEP international assessment of marine waters

UNEP-MAP (Mediterranean)

At the International Marine Litter conference in Berlin on 10-12 April 2013, It was a UNEP/MAP proposal that RSCs discussed the potential for a conference on marine litter in each Regional Sea. The opinion that the Regional Sea Convention's role in supporting MSFD should be more greatly respected was also reinforced.

HELCOM (Baltic Sea)

Closely following the work of other regional sea commissions, especially OSPAR and the Black Sea Commission. Both Commissions are also observers to HELCOM and can thus follow up on HELCOM activities. Also, three countries (Denmark, Germany and Sweden) are Contracting Parties to both HELCOM as well as OSPAR. e.g. HELCOM has previously together with OSPAR as well as the Barcelona Convention (REMPEC) issued joint guidance on voluntary ballast water exchange. Further, HELCOM and OSPAR are working on harmonizing their Guidelines on disposal of dredged material at sea. HELCOM is also an active partner in a project called "Environmental monitoring of the Black Sea with focus on nutrient pollution", shortly Baltic2Black, lead by the Black Sea Commission.

Table 2 Interactions between Regional Sea Conventions with relevance to the MSFD and wider Common Implementation Strategy for CIS. Results from the STAGES stakeholder consultation.

Cross-regional cooperation also plays an important role to achieve coherence across marine regions through transfer of related existing best practices from other regions. Some initiatives have already been funded to foster cross-regional cooperation, e.g. the Baltic2Black project¹⁷ implemented jointly by the Black Sea Commission (BSC) and the Helsinki Commission (HELCOM). However, such projects have a limited duration and a longer-term strategic approach to cross-regional cooperation is required such as alignment of regional quality assessment reports, monitoring programmes and best practice.

Sub-regional scale: The STAGES consultation recognised the work achieved so far by Regional Sea Conventions and other Regional initiatives and the potential to expand the activities to further support MSFD into the second cycle and beyond. In addition, the sub-regional sea level was perceived by stakeholders to be under-utilized and currently the least effective existing governance structure, with the largest number of Stakeholders (>35%) commenting they were unaware of this process or had no opinion. European projects such as PISCES, Celtic Seas partnership¹⁸ and GES-REG¹⁹ have demonstrated the effectiveness of a sub-regional approach to enhance coordination, capacity building and engagement of stakeholders to support MSFD implementation. However, RSCs have noted the sub-regional approach is not currently balanced e.g. in the Northeast Atlantic, OSPAR

¹⁷ http://www.blacksea-commission.org/_projects_Baltic2Black.asp

¹⁸ PISCES ECLIFE+ project (ended 2012): <http://www.projectpisc.es.eu>. See also: <http://celticseaspartnership.eu>

¹⁹ GES-REG, EC Central Baltic Interreg IV A (2007-2013): <http://projects.centralbaltic.eu/project/449-ges-reg>

noted the North Sea region has the strongest functioning cross-border collaboration. More cross-border input is recommended in other OSPAR regions e.g. Portugal, Spain, France.

Recommendations:

1. Develop a strategic approach to enhance coherence within and between marine regions e.g. through Regional Sea Conventions and utilising knowledge brokers. Inter-regional cooperation could be further supported by building on the work already achieved by RSCs as a platform for sharing and implementing good practices and fostering better coordination among Member States. This could include a longer-term strategic approach to RSC communication and through alignment of reporting time-lines and packaging of information e.g. regional quality assessment reports, monitoring programmes. Knowledge brokers could play a role in synthesizing the key outputs and messages from each RSC environmental status reports.
2. Support Member States to develop a sub-regional approach e.g. through Regional Sea Conventions macroregional strategies and through targeted funding, e.g. Member State involvement in coordination projects such as GES-REG. Future efforts could make further use of coherence line of structural funding (€340 billion will be made available in the period 2014-2020) and aligning with macroregional strategies (e.g. for the Baltic Sea and the new Adriatic-Ionian strategy).
3. Build on existing initiatives to form a structured SPI and dedicated human capacity for knowledge brokerage at national level.

National Case Studies for the MSFD Science-Policy Interface

Based on reviews of best practice and feedback from the Stakeholder consultation, WP4 identified a lack of coherence in MSFD Science-Policy Interfaces at National level. To add value to existing and ongoing studies (e.g. European Commission, 2012; Redd *et al.*, 2014). STAGES WP4 is further investigating the effectiveness of existing MSFD Science Policy Interfaces at the National scale. Examples of the existing governance and science-policy process supporting national MSFD implementation is presented in Table 3 from four Member States, namely Croatia, the Netherlands, Belgium and France. Information includes the main challenges currently existing for each MSFD SPI at national level and the current status and maturity of an SPI to support MSFD implementation. Further detail is provided in the STAGES report on the full Stakeholder Consultation (Larkin *et al.*, 2014). The case studies of the four countries highlights the diversity of the structures in place on national level to effectively implement MSFD and the different levels of maturity of a SPI to support MSFD implementation. In addition it can be concluded that whilst many stakeholders see a value for Knowledge Brokerage in a future SPI, this capacity is largely lacking (e.g. Croatia), or is already in place but could be enhanced to optimize the process (e.g. Belgium).

Conclusions for national MSFD SPI enhancement:

1. The development of a capacity dedicated to knowledge brokerage at national level would significantly enhance the effectiveness of MFSD implementation. This interaction should specifically aim at the inter-linkage between research performing institutes and governmental representatives, e.g. Ministries.
2. In-depth analysis could be carried out at national level to assess the possibility of implementing the SPI structure, albeit as a new capacity or whether it could be integrated as a distinct functionality into an existing body.
3. Establishing knowledge brokers at national level may require dedicated financing from multiple sources (e.g. national, regional and European) to develop an appropriate structure towards achieving more coherence across Member States.
4. Knowledge Brokers are required at national level to facilitate the dialogue between different actors and optimize the efficiency of MSFD implementation. Such knowledge brokers are required at both operational and a strategic levels and should have a mixed skills set of excellent communication skills and a trans-disciplinary background crossing the science and policy sectors.
5. Decentralisation of the MSFD implementation process at the marine sub-region level has been shown to

promote involvement by a wider stakeholder community, e.g. national and local experts, as well as the local authorities, local governmental representatives, local NGOs, civil society, etc.

6. The unique political situation of some countries (e.g. Belgium) results in a division of certain competencies for MSFD and wider environmental policy implementation. These need to be taken into account and mechanisms such as knowledge brokerage need to be put in place to maximize dialogue between competent authorities.

	Governance structure and Science-policy interface at national level to support MSFD implementation	Key Challenges	Recommendations & Solutions
France	MSFD Scientific and Technical Implementation in France is managed by dedicated experts at IFREMER and the Agency of Marine Protected Areas. Implementation process is decentralised at the marine sub-region level and there are multiple levels of decision making, which gives the opportunity to involve wider stakeholders across national and local scales to meet the scientific experts and to share issues and solutions.	<ul style="list-style-type: none"> • Financial constraints • Fragmentation of competencies for MSFD and across environmental policies 	<ul style="list-style-type: none"> • Funding specifically dedicated to SPI
Belgium	The Marine Environment Service (FPS Health, Food Chain Safety and Environment) is the competent authority for coordination and implementation of the MSFD. No specific committee or structure is in place but Marine Service Department does actively take up SPI role as a Knowledge Broker both top-down (responding to policy questions for MSFD) and (bottom-up: scanning the National research for relevance to MSFD).	<ul style="list-style-type: none"> • Transparent & trustful Communication • Lack of Human Resources • Division of competency due to unique political situation of Belgium 	<ul style="list-style-type: none"> • More human resources dedicated specifically to SPI with solid scientific experience and excellent communication skills
Croatia	The Ministry of Environmental and Nature Protection is competent body for implementation of MSFD. A National Committee appoints experts for implementation of the national Marine Strategy. A legal and governance framework is in place but the SPI is not very active at the present time.	<ul style="list-style-type: none"> • Lack of Human Capacity • Financial Restraints • Fragmentation of competencies 	<ul style="list-style-type: none"> • SPI Platform • Regional Consortium • MSFD specific capacity building e.g. education modules
Netherlands	Specialized multi-actor structure under development as a forum for main governmental bodies responsible for implementing MSFD to interact with major national science institutions.	<ul style="list-style-type: none"> • Competition between key MSFD actors 	<ul style="list-style-type: none"> • Stimulate key actors by common goal e.g. tender EU funding jointly

Table 3. Examples of national structures in place for supporting MSFD implementation. Summary results from the STAGES consultation on science-policy interfaces to support MSFD.

3.5 Exchange and align with other legislative requirements and agreed standards

Stakeholders have identified the need to align implementation of the MSFD with other EU policy areas including the Common Fisheries Policy, the Common Agricultural Policy, Freshwater and Biodiversity Policy in order to ensure coherent and cost-effective marine protection. The Science-Policy Interface should reflect this, promoting further integration with other Directives (Water Framework, Habitat, Bird and, where applicable (e.g. D5), Nitrate and Urban Wastewater). In some cases, many lessons and best practice can already be taken from related policies such as the Water Framework Directive (WFD). This was adopted eight years in advance of MSFD and presents a target for water managers, governments across Europe and wider society to achieve Good Ecological Status for all surface waters by 2015. Early on, the Directive identified a need for improvement of the information exchange and knowledge uptake in the process of designing measures and management approaches to support WFD implementation. In order to promote coherence across Europe, the implementation of the WFD is organized through a Common Implementation Strategy (CIS). Between 2010-2013 an ad-hoc activity on Water Science-Policy Interface was launched which included a dedicated SPI working group to assess ways to enhance the transfer and dissemination of knowledge in the context of WFD implementation. Through this, a SPI community was set up to contribute to the implementation of the various CIS-SPI tasks, in line with the mandate, and to contribute to demonstrating the applicability of SPI practices (European Union, 2013). The community consists of science-policy correspondents, identified from either the CIS groups or Member State representatives and the community also includes SPI-related projects and experts. In 2010 the European Commission funded a cluster of SPI-Water projects: STEP-WISE, STREAM and WaterDiss 2.0 to support and recommend strategies for the communication and dissemination of EU water-research project results through conferences and stakeholder discussion²⁰ (see Box above).

In December 2009, the Water Directors of the European Union established an ad-hoc Activity on Water Science—Policy Interface under the Common Implementation Strategy (CIS) of the WFD. Between 2010-2013 the 'CIS SPI Water' Cluster coordinated a series of European stakeholder conferences to discuss how to streamline knowledge to address WFD challenge and further support implementation of the WFD. The CIS SPI Water Cluster final conference (3-4 December 2012) produced a roadmap with recommendations for a better uptake of EU water research into policy:

- 1. Increase communication** efforts of EU water research projects to reach distinct targeted audience
- 2. Improve accessibility** to water research results and speed up their transfer
- 3. Strengthen the Water Science-Policy-Industry Interface** to become results-oriented

There is currently no further transversal SPI activity in place for the WFD across the different CIS working groups (as identified at the CIS SCG meeting, November 2013). However, it seems clear that during its three year mandate, the SPI activity for CIS-WFD promoted closer links between stakeholders and produced seven recommendations for a more strategic and operational transfer of knowledge and identification of knowledge gaps.

In addition to the WFD, other legislation of relevance includes The Habitats and Birds Directives (codified 2009), Common Fisheries Policy (reform became effective in January 2014), EU REACH Regulation (came into force 2007), Convention on Biological Diversity (came into force 1993). Some of these have specific relevance to MSFD descriptors, for example the EU REACH Regulation which aims to improve the intrinsic knowledge of chemical substances and their subsequent risk to human and environmental health are especially relevant to the contaminants descriptors (Baker, 2013). Other legislation, for example the CFP, are likely to have overlaps for all 11 descriptors. Whilst the MSFD is the focus of this study it is imperative that

²⁰ <http://www.stream-project.eu>

other legislation is considered, especially as the MSFD emphasizes the coordination of these approaches and use of best practice (*article 6, MSFD*).

Recommendations:

1. Create a framework for a MSFD Common Implementation Strategy (CIS) SPI activity that builds on recommendations from STAGES and other related projects/studies and takes into account recommendations and best practice from the ad-hoc activity on Water Science-Policy Interface (2010-2013). This could include a CIS-SPI Working Group with correspondents sourced from existing MSFD stakeholder representatives across sectors and geographical scales. Activities could include the development of a strategy for knowledge brokerage to support MSFD including an initial mapping exercise of knowledge brokerage capacity across the different entities and actors.
2. Promote dialogue between the MSFD and related policies e.g. WFD to recognise best practice and common standards and move towards a more coherent, integrated approach.

4. Key components, capacities and roles of the MSFD SPI

An architecture of an end-to-end SPI to support MSFD implementation is presented in Figure 9 (see also Figure 2 in the Executive summary). This has been informed by the analysis of SPI best practice and the results from the stakeholder consultation on views and expectations on creating an effective MSFD SPI platform. Other key sources of information on MSFD SPI developments include the minutes and reports from European MSFD MSCG and Working Groups and the CIS-MSFD work programme for 2014 and beyond (European Commission, 2014c).

Figure 2 identifies key components, actors and processes that are inter-linked to support knowledge-based decision making at each stage of the MSFD policy cycle. Blue boxes depict actors in the SPI process, namely the research community, research funding agencies, knowledge brokers and MSFD implementors. These will all interact with each other and the wider stakeholder community (e.g. industry, NGOs) spanning knowledge producers and knowledge users. The orange boxes depict the activities and processes related to each actor such as the research projects being conducted by the research community. Whilst many of these processes are already in place, this proposal identifies four key components where enhanced capacity and a sustained longer-term process is required to support a long-term strategic SPI:

- Harnessing MSFD-relevant scientific knowledge
- Scientific and technical advice
- Expert evaluation and synthesis
- Knowledge Brokerage

The first three components address steps in the knowledge chain, ultimately improving the availability and uptake of scientific knowledge in evidence-based decision making. These activities can operate across two parallel time-lines for improving the knowledge base available to support MSFD implementation:

1. Short-term: Harnessing existing knowledge and utilizing expert/advisory groups to provide scientific advice to support policy implementation in the short-term.
2. Long-term: Conducting scientific syntheses and reviews of existing knowledge to inform policy of the state-of-the-art in MSFD-relevant knowledge and to identify knowledge gaps that can be addressed by funding new research in the longer-term.

Cross-cutting and integral to the SPI is knowledge brokerage. This encompasses elements of knowledge transfer, exchange, communication and dissemination and is crucial to optimise the flow of information and stakeholder dialogue. Knowledge brokerage can be conducted by a variety of entities and actors but requires specialised skills spanning science, policy and communication. In Figure 9, grey boxes indicate where enhanced capacity in knowledge brokerage is particularly recommended to optimise the SPI process.

In sections 4.1-4.4. below, each of the key components of the MSFD SPI is explained in more detail with an indication of potential key actors, existing and planned initiatives and proposing new capacities. It is noted that many elements of the SPI are already largely in place but currently lack the coherence, coordination or recognition required for a long-term operational SPI. For example, the EurOcean Knowledge Gate has demonstrated its potential for harnessing MSFD-relevant knowledge. Other initiatives, such as the MSFD Competence Centre, are in the planning stages and are likely to play a key role in a future SPI. The proposal also includes emerging components such as Knowledge brokerage which currently lack recognition and where enhanced capacities are proposed. For each SPI component, a set of recommendations is also provided which aim to ultimately strengthen implementation of the MSFD into its second cycle and beyond.

In section 5 of this report, these recommendations are presented in the form of a road-map that could be implemented in a step-wise approach, building on existing infrastructures and initiatives.

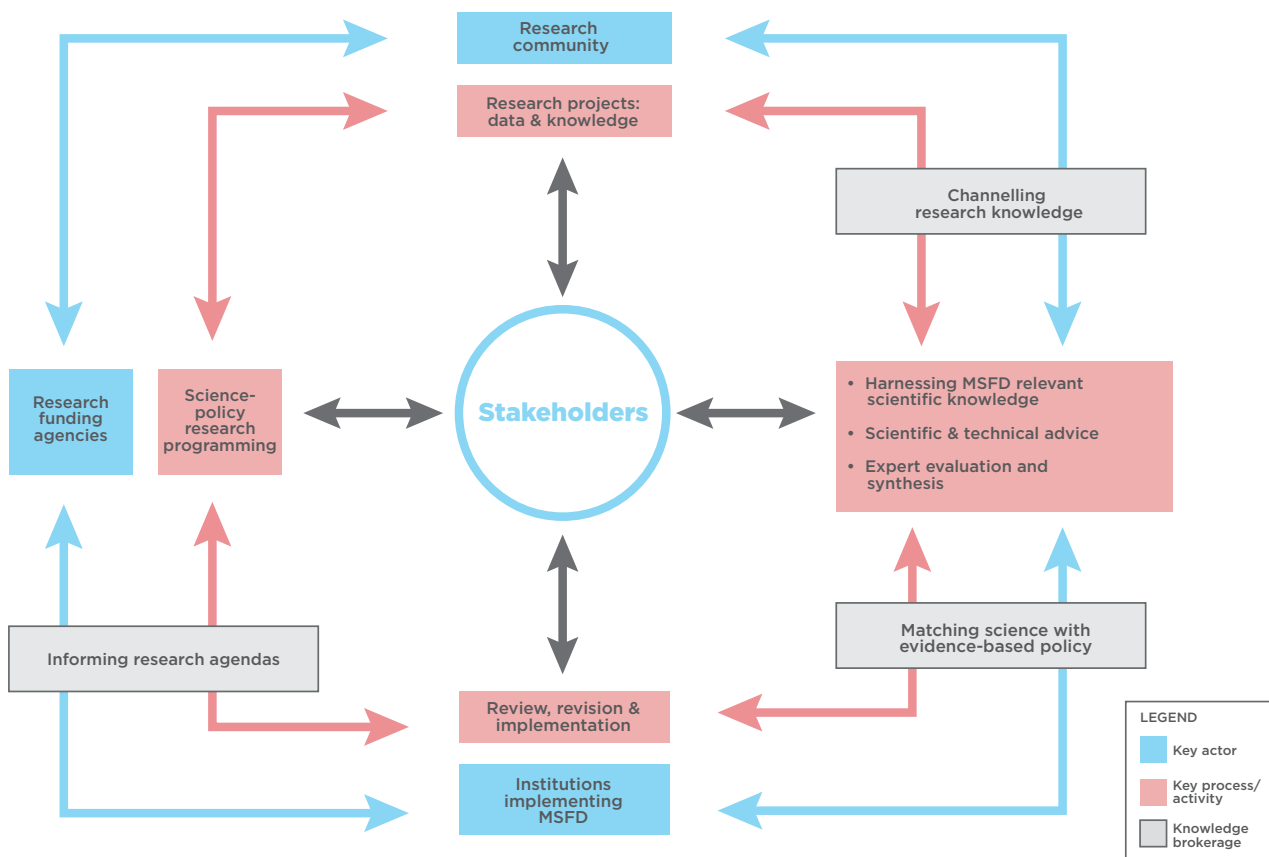


Figure 9. Architecture of the proposed Science-Policy Interface (SPI) to support MSFD implementation. This is presented as a vision that could be implemented in a step-wise approach, building on existing initiatives. Further detail on this figure and key components and actors is provided in section 4 (see also recommendations throughout this report and the Roadmap in section 5).

4.1 Harnessing MSFD-relevant knowledge

Scientific knowledge is crucial to the success of the Marine Strategy Framework Directive (MSFD), to define and track Good Environmental Status (GES), and to achieve successful monitoring and implementation. Such knowledge is also proving ever more vital to underpin ecosystem-based management decisions and provide a baseline knowledge for assessing good environmental status and to inform environmental impact assessments for emerging maritime activities activities such as ocean energy and seabed mining. Although a wealth of relevant research is being produced with

“Our current knowledge base [for MSFD] is fragmented: the information reported by EU Member States under the 2012 Initial Assessment cannot be considered a comprehensive representation of the marine and maritime knowledge base existing in Europe.”

Extract from Marine Messages (European Environment Agency, 2014)

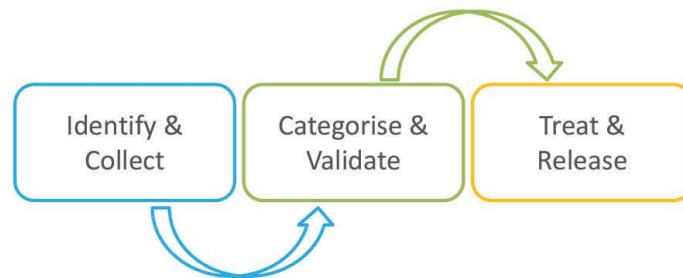


Figure 10. Major components of the knowledge harnessing process. Source: EurOcean

the potential to assist the MSFD, the accessibility and packaging of this knowledge is not optimized and the knowledge base utilized by policy makers in the MSFD implementation process is often fragmented. Improved communication and dissemination is crucial; between researchers, between researchers and end-users of the research, and between researchers, policy makers and implementing agencies (SPI).

Identifying, collecting, analysing and classifying MSFD-relevant knowledge is a vital task for maximizing the uptake of existing scientific knowledge into MSFD policy (figure 10). The harnessing of relevant research takes place in a step-wise approach which can be divided into 2 major steps: firstly, the focus is on marine research in general; secondly, within identified marine projects, the focus is placed on those with relevance to MSFD. Open access to identified research and its results or knowledge outputs with potential relevance to MSFD implementation is the result of the following process:

Marine Knowledge Gate: EurOcean²¹ is the manager of Marine Knowledge Gate, a permanent online repository of marine research in Europe that is continuously updated. The Marine Knowledge Gate contains a profile of each surveyed project and, where available, it also offers information on the specific results or “knowledge outputs” (KOs) from the research activities. Records can also be filtered by funding source (EU, national) and programme, start and end year, allocated funding, countries and institutions involved, as well as by type, potential end users, and sectors to benefit from corresponding KOs.

Demonstration of harnessing MSFD-relevant research: Building on previous projects, e.g. FP7 MarineTT, within the EU FP7 STAGES project, EurOcean conducted a demonstration of harnessing MSFD-relevant research (see Figure 12 which outlines key

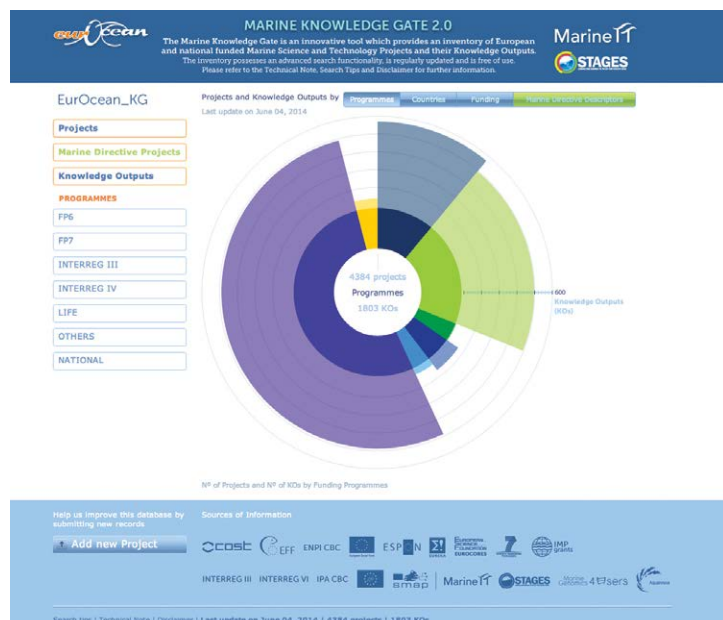


Figure 11. Marine Knowledge Gate 2.0 homepage showing validated MSFD relevant projects by GES Descriptor

²¹ <http://www.eurocean.org>

steps). This activity surveyed marine public research with EU and national funding across Europe in order to develop an inventory of MSFD relevant projects and results, hosted in the Marine Knowledge Gate. This included an online survey aimed at research projects and further validation of information provided by project coordinators. The information was visualized in a dedicated MSFD-targeted portal with relevant knowledge outputs from European and national research projects. Integral to this is an online search engine with knowledge clustered by MSFD marine region and by GES descriptors. Through this process, knowledge from marine research with relevance to MSFD implementation is made available/accessible to a wide range of stakeholders that are, or might be, involved in the MSFD process.

Iterative process: The infrastructure for this activity is in place and allows project coordinators to include MSFD related information about their projects at any time. This facility will continue beyond the life of the STAGES project. In this way, MSFD relevant projects may be continuously updated.

WISE-Marine as an open access management tool for Data, information and Knowledge for MSFD

“As part of the implementation process of the MSFD, the EU Commission and the EEA, together with the Regional Sea Conventions and EU Member States, are putting in place a streamlined and efficient management system of data, information and knowledge. This public system will be called WISE-Marine and will be shared between all stakeholders. The INSPIRE Directive will deliver an infrastructure for spatial information in Europe. This infrastructure will be crucial for supporting environmental policy and management, including of our seas.”

Extract from Marine Messages (European Environment Agency, 2014)

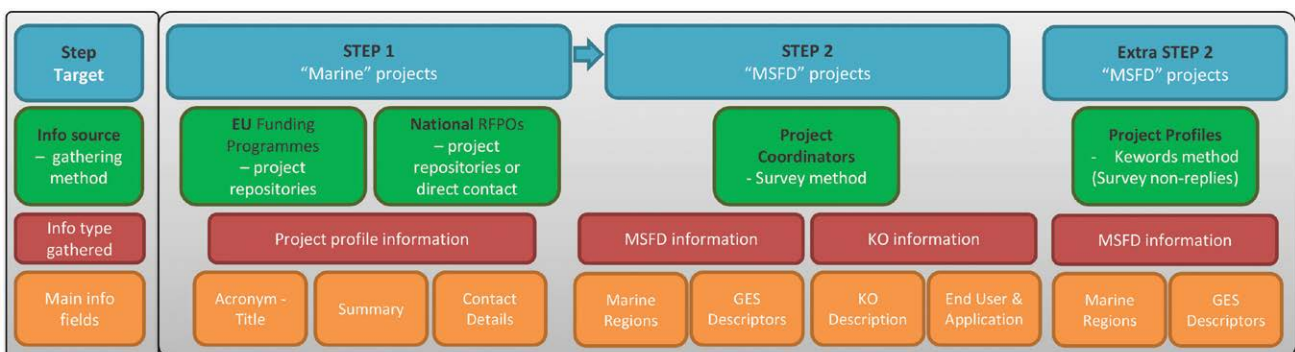


Figure 12. Schematic for harnessing research with potential MSFD relevance. Source: EurOcean

Data, information and knowledge systems

To foster open access and information sharing, the European Commission created the internet-based platform, "CIRCABC" ("Communication and Information Resource Centre for Administrations, Businesses and Citizens"). A component of "CIRCABC" is dedicated to MSFD with open access to European MSFD Working Group documents. However, the wealth of knowledge produced by research projects across Europe is often poorly accessible.

To improve accessibility of knowledge to support implementation of the Water Framework Directive and other (European) water related policies, a WISE (Water Information System for Europe) RTD Knowledge Portal²² was also launched for stakeholders and user groups hosting information on policy, data and products,

²² <http://www.wise-rtd.info/en>

modeling and research project information. The open access web portal serves as a dissemination tool, linking diverse EC Water Framework Directive policy aspects to FP RTD (and LIFE) results and enabling user groups to conduct targeted searches for knowledge and products from water related research, technology and development. Plans are currently underway to extend WISE to serve as a common reporting platform for the Data, Information and Knowledge Exchange Working Group on the marine environment (WISE-Marine). Some stakeholders proposed an enhanced coordinating role for RSCs in knowledge management and data exchange. This currently varies greatly between regions ranging from facilitating knowledge production, to data storage, online data portals (accessible to Contracting Parties) and facilitating regional assessments including regional scientific synthesis.

Harnessing MSFD-relevant scientific knowledge: Recommendations

- Improving the accessibility, awareness and uptake of MSFD-relevant scientific knowledge.
- Recognizing the wide stakeholder community of knowledge producers including the academic research community, industry, etc., and optimising ways to harness such knowledge.

Research project life-cycle:

- Fostering co-design of research through bottom-up and top-down approaches by a multi-stakeholder community.
- Iterative Knowledge Management Plan: Research funders (National – Regional – European), could include a ‘Knowledge Management Plan’ as a prerequisite for project funding that details the types of Knowledge Outputs and channels/tools for dissemination.
- Impact Monitoring to optimise uptake of MSFD-relevant knowledge.

Towards a culture of responsibility and results oriented research

- Promoting Knowledge Outputs (Kos) as a key output.

Knowledge Management: Identification of MSFD-relevant knowledge

- Enhancing conduits for the transfer of national research results into the MSFD SPI (e.g. JPI-Oceans in the longer-term).
- Promoting MSFD relevance and reporting to be part of project reporting schemes and repository categories.
- Enhanced coordinating role for RSCs in knowledge management, linking data and information exchange with EEA and WISE-Marine.

Online platforms for MSFD-relevant knowledge:

- Supporting online repositories of marine knowledge and applications for MSFD-focused harnessing e.g. Marine Knowledge Gate (EurOcean) and centralised National online repositories.
- Support the extension of WISE to serve as a common reporting platform for the Data, Information and Knowledge Exchange on the marine environment (WISE-Marine). – Linking with planned knowledge portals e.g. JRC Competence Centre and European Commission information portal on marine research projects.

A potential new capacity is identified to further harness knowledge at regional and/or sub-national/national levels. This could build on the STAGES ‘Knowledge Gate’ model, providing an online repository of MSFD-relevant research that is updated on a regular basis in-line with the MSFD time-line and enables users to conduct systematic searches of knowledge e.g. by MSFD Theme, MSFD region etc.

4.2 Scientific and Technical Advice

Systematic scientific and technical advice is crucial to achieve a rigorous, evidence-based implementation of MSFD. Such advice is vital to help improve coordination and coherence across marine regions and at member state level as a channel to address challenges and obstacles identified across geographical scales.

A more flexible, ad hoc approach to scientific and technical advice could help to address the increasing need for knowledge and advice to inform MSFD policy across different temporal and spatial scales.

73.5% of Stakeholders responding to the STAGES Consultation rated expert advice from the research community as a high priority and 14.2% considered expert advice from industry and other marine users to be useful but currently under-utilized as a source of knowledge.

Source: Larkin *et al.*, 2014

Scientific advice is not just about carrying out the highest quality science. It is about collecting the evidence from many different sources (quantitative and qualitative), maintaining a dialogue with policy makers and communicating the best available and robust advice. **The scientific research community is highly rated by MSFD stakeholders as a credible source of knowledge and advice that is unbiased and based on the best available science.** Input from other stakeholders such as industry working in front-line research was also noted as a potentially important and yet under-utilized source. However, it is also noted that the experts providing advice should, in addition to in-depth

knowledge of the scientific state-of-the-art, have knowledge of the policy question being addressed so the advice produced is relevant for user needs. This is reflected by the ICES strategy of administering their science and advice pillars through separate mechanisms, although it is noted that significant interaction and dialogue should be required between these two processes (ICES 2013).

Addressing the need for timely, targeted scientific and technical advice: The science advisory process should also cater for different levels of urgency and detail of information required. For example, a fast-response “help-desk” approach could be offered as a service to policy makers whereby a policy maker with a specific scientific or technical question can find the answer through an online portal or network of experts over a short time-scale. There is also a potential need for a repository of information on key activities and actors in the MSFD process and facilitating the sharing of best practice to support MSFD implementation. This could be provided by the Competence Centre or by other initiatives. In addition (and in contrast), the science advisory process should have in place a structure for more detailed scientific advice, responding to a policy requirement for an in-depth review, e.g. review of the Commission Decision on criteria and methodological standards on good environmental status of marine waters (European Commission, 2010) being conducted jointly by the JRC and ICES.

Towards a Competence Centre to support MSFD implementation: JRC, as the scientific arm of the European Commission, already provides advice and acts as a forum for European scientists on a range of issues. ICES has, since the 1960s, provided advice to European governments, the European Commission, OSPAR, HELCOM, NASCO and NEAFC on fisheries, the marine environment and sustainable exploitation of seas around the North Atlantic. Its network of over 4000 scientists has proved itself to be an effective resource for the provision of science to advice policy developers. Both JRC and ICES facilitated the scientific advice underpinning the initiation of the 2008 directive and the operational advice for the 2010 decision. This included leading Task Groups and scientific and technical assessments to support the development of criteria and methodological standards and other scientific and advisory services of relevance to the MSFD (ICES, 2013). The JRC, together with ICES, is establishing a Marine Competence Centre to build on previous scientific and technical support for MSFD implementation (see Box).

MSFD Competence Centre:

The JRC is establishing a Competence Centre to scientifically and technically support MSFD implementation. The Competence Centre will provide expertise in responding to specific scientific, policy-related and applied issues in the frame of MSFD and the broader IMP, at the request of the Commission and the Member States. JRC, in partnership with ICES, will have a Scientific Advisory Role, managing flexible expert networks that respond to needs and requests of Member States identified through the CIS. The ad hoc expert groups will work on predefined subjects e.g. by MSFD descriptor, with deliverables feeding directly to the implementation of the MSFD. The JRC team will work in close collaboration with the Commission, Member State and RSC representatives and with existing activities, working groups and institutions.

Short-term goals of the Competence Centre

- A dedicated website and portal (hosted at the JRC-IES server), ultimately aimed at being a “one stop shop” for Commission Services and Member States for information on MSFD and other related marine policies.
- Facilitating and hosting the work of the related expert groups and maintaining ownership of much of the relevant documentation.
- Developing and maintaining a “glossary” of MSFD-related terminology.

MSFD Competence Centre:

Developing a repository of a) curated information addressing the implementation requirements of GES in the MSFD, including associated products; and b) a repository for the outcomes of MSFD relevant research projects.

The plans for a MSFD Competence Centre include the short-term goal to facilitate and host flexible expert networks to respond to policy needs regarding MSFD with the aim to produce predefined deliverables feeding directly to the implementation of the MSFD.

Sourcing of experts for the MSFD science advisory process: There are a number of mechanisms through which experts could be sourced. Firstly, the JRC and ICES have a clearly identified role through the future MSFD Competence Centre. In addition, experts could be nominated through official MSFD channels e.g. European MSFD Working Groups. To ensure expert networks are truly pan-European, including third countries, it could be important to engage with other networks and European projects to supplement the expert and knowledge base as required, for example in under-represented marine regions such as the Mediterranean and Black Sea. At the European HOPE Conference (3–4 March 2014), European funding under the new LIFE instrument for the period 2014–2020 was also identified as a potential mechanism for sourcing experts with its focus on fostering innovative initiatives with a view to developing knowledge, networks of experts and experiences. A diversity of sources would also ensure the expert networks are ‘living’, so that new experts can be sourced and invited to respond to particular needs.

In addition, **the wider stakeholder community e.g. industry, could play a key, as yet under-utilized role**, for providing MSFD-relevant scientific advice and technical know-how and giving feedback on MSFD implementation from the perspective of marine and maritime user groups. Engagement of wider stakeholders in the MSFD scientific advisory process could include membership, where appropriate, of industry representatives in flexible expert or through targeted thematic workshops, forums and conferences. Such events could build on the success of "International Conference on Prevention and Management of

Marine Litter in European Seas”, 10-12 April 2013, Berlin²³. Forums and workshops can also be a way to disseminate and exchange MSFD-related knowledge to policymakers, which could be coordinated externally by established networks e.g. European Marine Board and consultancies²⁴.

The EEA has also been engaged from the start of the MSFD process and is positioned closer to the policy developers. Through its Topic Centres, it contributes to the understanding of environmental concerns of the European society as a whole. **The EEA is tasked to establish a marine component to the water information system for Europe (WISE-Marine).** This will have multiple elements, but includes establishing a data exchange with Regional Sea Conventions in relation to defining relevant MSFD indicators for the Commission Decision²⁵ (see *Harnessing MSFD-relevant scientific knowledge for further information, section 4.1*).

A **validation process for scientific advice and outputs** (e.g. technical reports) is also required to endorse relevant scientific and technical advice for MSFD policy. This endorsement process could be done through European MSFD WGs and the Project Coordination Group (PCG). It could also utilize the extensive network of experts e.g. at regional and national levels for independent review to inform the validation and decision making process.

SPI mechanisms and infrastructure: Scientific and technical advice could be provided in a variety of ways. In the STAGES Stakeholder Consultation, online information portals were one of highest rated mechanisms for providing access to MSFD-relevant knowledge and advice. The European Commission "CIRCA" (*Communication Information Resource Centre Administrator*) software tool, developed under the EC IDA programme, has already been applied to the MSFD, with an area of CIRCA dedicated to MSFD with open access to European MSFD Working Group documents. In addition, the JRC is establishing a Marine Competence Centre to support MSFD implementation. A central component of this will be an online portal that will ultimately become a “one-stop-shop for policy makers on MSFD”. The demand for more detailed and strategic scientific and/or technical advice on specific MSFD themes/topics could be addressed through expert working groups producing technical reports and dedicated workshops, such as those being organized by ICES in summer/autumn 2014 for descriptors 3 (commercial fisheries), 4 (food webs) and 6 (sea floor integrity) as part of the review of the Commission Decision. Public stakeholder consultations at Member State or RSC level have also been noted by wider stakeholders as useful mechanisms for wider stakeholders e.g. NGOs to feed in views on aspects of MSFD implementation, ensuring that the definition of GES and environmental targets at the national or regional level is ambitious and adequate and that implementation is rigorous and accurate.

²³ <http://www.marine-litter-conference-berlin.info>

²⁴ e.g. *Climate-ADAPT science/policy forum: workshop for the dissemination and exchange of adaptation-related knowledge to policymakers in May 2014*

²⁵ see *EUMSFD WG DIKE Meeting Minutes* e.g. July 2013.

Scientific and Technical advice for MSFD: Recommendations

Provide relevant and timely scientific and technical advice to support policy decisions and foster the wider exchange of scientific, policy and technical information to support the MSFD implementation process.

- **Flexible, *ad hoc* networks of scientific experts** e.g. ICES-JRC networks. Such networks should be **pan-European, engaging experts through other channels e.g. scientific projects, networks and funding mechanisms** to ensure representation from all marine regions, third countries and wider stakeholders where appropriate.
- **The Academic scientific community will play a key role as experts involved in the MSFD science and technical advisory process.** Experts should be sourced from the academic scientific community (bottom-up) but expertise from wider stakeholder community involved in research relevant to MSFD could also be harnessed.
- **European CIS MSFD Working Groups:** Working Groups e.g. GES could act as a platform for identifying experts across Member States, RSCs and wider stakeholders.
- **Targeted approach to scientific and technical advice utilizing a range of mechanisms for knowledge exchange** e.g. Online portals, technical reports, thematic conferences, workshops, consultation.
- Online knowledge portal providing scientific and technical advice for policy makers and potentially wider stakeholders (e.g. JRC MSFD Competence Centre)
- Support the development of Regional science advice e.g. through RSC Science Agendas.
- **A more systematic approach to Stakeholder participation** at Regional Sea and sub-regional sea level could help optimize the scientific and technical advice for policy.

4.3 Expert evaluation and synthesis, including identification of scientific knowledge gaps and research needs

Foresight activities are a crucial component of a SPI, supporting the evaluation of the current state-of-the-art of MSFD-relevant knowledge and facilitating the identification knowledge gaps and research needs. The first phase of implementation of the MSFD has displayed a lack of coherence across the Union, with many Member States noting a lack of data preventing full reporting in the initial assessment (European Commission 2014a, 2014d). MSFD implementation will continue to identify knowledge gaps and the SPI should include a mechanism to summarize this information by marine region and/or MSFD descriptor/theme to inform policy. However, there also needs to be a longer-term strategic process for bottom-up scientific

synthesis and evaluation. Here the scientific community could play a key role, conducting syntheses of knowledge e.g. by MSFD Theme. Such reports could have a dual purpose, informing policy of the state-of-the-art in MSFD-relevant knowledge and identifying knowledge gaps that could inform research funding organizations and ultimately research agendas at the national, regional and European levels.

The STAGES project conducted a number of activities to further demonstrate the potential mechanisms for identifying knowledge gaps and corresponding research needs. This included the production of state-of-the-art reports on MSFD-relevant knowledge (per MSFD Theme) and a series of three workshops to identify knowledge gaps and research needs in the areas of implementation of monitoring programmes, pressures and their impacts on marine ecosystems and socio-economic analysis²⁶. The STAGES activities have informed a step-wise approach to the MSFD foresight process to identify, validate and maximise uptake of research needs into future research agendas:

- Top-down policy question or request for summary of MSFD-relevant state-of-the art. This could also be a regular activity as part of an iterative process to inform next stages of the MSFD cycle.
- Experts (multi-disciplinary group sourced from flexible expert networks) conduct syntheses of existing MSFD-relevant knowledge at national, regional and European levels. In the European framework programme this was initiated through dedicated synthesis projects, e.g. FP7 project CLAMER²⁷. The FP7 STAGES project also demonstrated the methodology for conducting state-of-the-art reports per MSFD theme. This highlighted the labour-intensive process and the need for a dedicated human capability of experts to assess the current state-of-the-art.
- Experts utilise state-of-the-art syntheses e.g. EU project knowledge outputs, RSC reports, joint regional reports, related information reported under other EU instruments (e.g. WFD, Habitats Directive) to identify research gaps and needs possibly through a workshop. This should be achieved through bottom-up (scientific experts) and top-down (policy experts) processes or a combined workshop.
- Engage wider Stakeholder input on identification of research needs and co-design of research agendas where appropriate.
- Validation of research needs and priorities e.g. through European MSFD CIS groups e.g. PCG, or utilizing existing channels external through networks of research funding organisations (RFOs) e.g. JPI-Oceans, EMB, RSCs.
- Co-design of research agendas at national, regional, European levels, making informed decisions based on available information on MSFD research needs and priorities and utilizing knowledge brokerage to enhance the process of communication and dialogue between multiple stakeholder groups.

Key actors for identifying knowledge gaps and addressing research needs

RCSs: Working at the regional scale, RCSs could build on the existing regional assessment work and developing science agendas to conduct regional syntheses and develop coordinated actions for identifying gaps in existing knowledge and criteria for priority setting to help inform future national, regional and European research funding programmes²⁸. This would also help to further identify solutions to coherence issues at regional and sub-regional levels.

²⁶ Further detail on these activities is presented in related STAGES project deliverables, available on the STAGES website www.stagesproject.eu

²⁷ FP7 project, April 2010 – September 2011. *Climate Change and European Ecosystem Research*. <http://www.clamer.eu/>

²⁸ OSPAR Commission science agenda (adopted by the OSPAR Commission, 27 June 2014) <http://www.clamer.eu>

JPI-Oceans: In the short-term, JPI-Oceans could act in a coordinating role for research funding agencies, to disseminate research needs and knowledge gaps as identified through the SPI.

EC DG Research and Innovation: Building on the MSFD-relevant research funded within FP7 and Horizon2020, DG R&I could target funds for new research based on research needs and knowledge gaps identified through the SPI.

National funding agencies: Through European networks e.g. JPI-Oceans, national funding agencies could take forward information on MSFD knowledge gaps to inform national research agendas and to form coherent approaches to addressing MSFD research needs.

New capacity: A potential new capacity is identified for conducting systematic, regular syntheses of MSFD-relevant knowledge. For instance, knowledge syntheses were conducted by the STAGES project (by MSFD Theme).

Future work could be taken forward in two parallel actions:

- a) Short-term: Engaging organizations to conduct syntheses/reviews of scientific knowledge, using online portals/repositories e.g. EurOcean 'Knowledge Gate' and the JRC Competence Centre
- b) Long-term: Funding European projects (e.g. through DG Research & Innovation) for scientific experts to conduct targeted syntheses/reviews of existing MSFD-relevant research e.g. by MSFD theme. Resulting syntheses could feed into summary reports such as the RSC quality status reports (or equivalent across marine regions. A similar synthesis activity could also be taken up at the national level by Member States to periodically assess state-of-the-art knowledge to assist MSFD assessments. Examples of national summary reports already in operation include the UK Marine Climate Change Impacts Partnership (MCCIP) Annual Report Card and planned special report card on GES²⁹ and comprehensive multi-annual reports including Charting Progress 2³⁰.

Expert evaluation and synthesis of scientific knowledge: Recommendations for the MSFD foresight process

This is a longer-term process designed to address the need to take stock of what knowledge exists (through scientific synthesis, review and evaluation) and, from this, identify research gaps and needs. This should be conducted through both bottom-up (science-driven) and top-down (policy-driven) processes, together with wider stakeholder input where relevant, so that knowledge gaps and priorities can be assessed to inform future research agendas.

- **Enhancing bottom-up (science-driven) and top-down (policy-driven) synthesis and evaluation processes towards a strategic, regular process to inform and support MSFD policy decisions and implementation.**
- **Engaging wider stakeholders where relevant** in the identification of MSFD-relevant research needs and gaps and in the co-design of research agendas.
- **Promoting dedicated funding for scientific synthesis across geographical scales** e.g. Horizon 2020, building on examples from the FP7 CLAMER and FP7 STAGES projects; Regional and National syntheses are also vital.

²⁹ <http://www.mccip.org.uk/annual-report-card.aspx>

³⁰ <http://chartingprogress.defra.gov.uk>

4.4 Knowledge brokerage: optimising information exchange and dialogue

Channelling research knowledge for MSFD

Currently, research projects engage in knowledge transfer and outreach activities to disseminate results and knowledge outputs to the wider stakeholder community and general public. Indeed this has become an integral part of research projects as part of enhancing the impact and in some cases as a pre-requisite to future funding. However, there is currently less emphasis on identifying the policy-relevant knowledge and channeling this to support evidence-based policy decisions. An effective science-policy interface will support a process to extract relevant scientific and technical information from an extensive “universe” of source material and to synthesise and summarise specific knowledge at the right level of detail to address targeted policy questions (see Figure 13).

The research community could play an enhanced role in channelling relevant knowledge for MSFD. This could include a more active role in the identification and dissemination of MSFD-relevant knowledge throughout the research cycle, producing syntheses and summaries of relevant knowledge and acting as experts for providing scientific and technical advice (see Sections 4.1-4.3 for more detail).

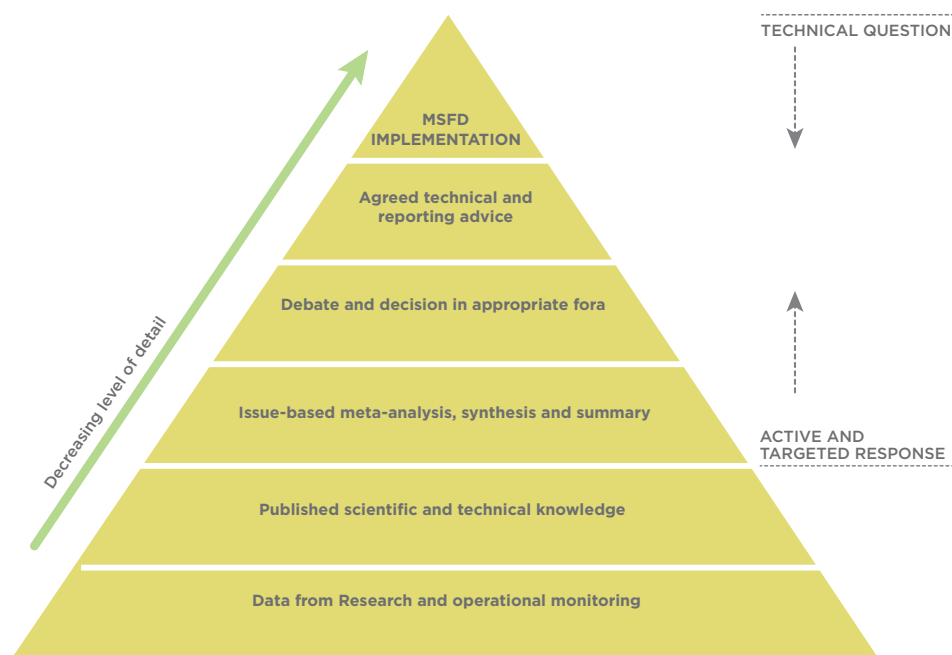


Figure 13. Channelling scientific and technical knowledge for environmental policy. An effective science-policy interface will support a process to extract relevant scientific and technical information from an extensive “universe” of source material and to synthesise and summarise specific knowledge to address targeted policy questions. (Adapted from Figure by David Connor, DG ENV, Source: WG DIKE, July 2013)

In addition, experts in communication and information synthesis are essential to support the research community and catalyse the dissemination, dialogue and uptake of relevant knowledge (see Figures 2 and 9). In the longer-term the active role of the research community in the MSFD SPI could be enhanced by **developing a culture of multi- and trans-disciplinary approach to knowledge production and use for environmental policy.** In addition to supporting current processes, this could include training scientists and policy makers to enhance MSFD implementation into the future.

Recognising knowledge brokerage in an active SPI

The STAGES SPI consultation recommended the enhanced use of knowledge brokerage (see box for definition) to promote a more active and iterative dialogue between the science and policy arenas. It also concluded the importance of recognising knowledge brokerage as a specific role that requires specialized and trans-disciplinary skills spanning science, policy and communication. These findings are also supported by results from the *ad hoc experimental* CIS-SPI activity for the WFD (2010-2013) which stated that “Knowledge Brokering has to be recognized and rewarded to promote the emergence of skilled experts.” (European Commission and ONEMA, 2013. See Recommendation 1 therein).

Knowledge brokerage is an active, participatory process that enhances connectivity, communication and exchange of knowledge between key stakeholders to improve decision-making and promote integrated adaptive management.

(Definition based on outcomes of the FP7 project AWARE and SPI-Water cluster project www.spi-water.eu).

Stakeholder responses also expressed the need for the knowledge brokerage to be transparent and impartial, allowing for trust-building between key actors. This recommendation calls for knowledge brokers with a specific mandate to actively ‘bridge the gap’ between science and policy. Stakeholders, particularly those at the national level, found that transparency and trust are essential to optimize this interaction. This helps to achieve transparency in governance, procedures and communication, scientifically substantiated policy choices, responsibility in the scientific argumentation, and clear communication regarding uncertainties in the scientific information. This could involve an individual or organization acting as independent mediators, or with specific roles embedded within MSFD knowledge producing or implementing organizations. Crucially, knowledge brokers should work at the interface between MSFD actors, with expertise spanning communication, science and policy. European marine networks could act as a channel for uptake of marine research and for communicating knowledge gaps to funding agencies (including at national level).

In the proposed Architecture for a SPI (Figures 3 and 9), knowledge brokerage is identified as a key cross-cutting activity that currently lacks recognition and support. It is proposed that wherever the flow of information is currently limited, there is a potential need for a more active knowledge brokerage role. In particular, enhanced capacities for knowledge brokerage are identified to support the harnessing and synthesis of MSFD-relevant knowledge and provision of expert advice to support policy decisions (see grey boxes in Figures 3 and 9). Knowledge brokerage is also specifically identified to help match science and policy needs, supporting the dialogue between MSFD implementors and Research Funding Agencies. This is vital to communicate MSFD research gaps and needs and inform future research agendas and to effectively communicate and facilitate understanding on the dynamics and uncertainty inherent to scientific knowledge and align these with policy to support decision making.

Knowledge brokerage to enhance MSFD implementation: current status and next steps

Many organisations are already conducting ‘knowledge brokerage’ in marine science. However, a more systematic approach is recommended where knowledge brokers underpin a rigorous and credible scientific advisory, evaluation and synthesis process to respond to policy needs and to feed into more detailed syntheses and evaluations of knowledge and identification of research needs in the short-, mid- and longer-term. This should promote staff appointments that are dedicated solely to MSFD knowledge brokering activities. Experts are required with knowledge spanning marine science and the MSFD (and other related policies). This mixed skills set is seen to be vital to help clarify both the specific policy requirements and the scientific questions to be answered. It is also important to promote knowledge broker networks, bringing together key stakeholders to facilitate dialogue and exchange. In the first instance, these recommendations could be presented and discussed by the MSFD Project Coordination Committee and Marine Directors and a mapping exercise could

be conducted to assess the existing capabilities and identify steps to implement knowledge brokerage at different geographical levels.

Key potential actors in knowledge brokerage:

European/International level: MSFD knowledge brokering could be conducted by existing organizations/networks working in the marine science-policy interface e.g. JRC, ICES, JPI-Oceans, European Marine Board. However, revisions to mandates/roles may be required to ensure the activity is sufficiently funded and recognized as a dedicated MSFD knowledge brokering task.

Regional level: Regional Sea Conventions could play a more active role in fostering knowledge brokerage at the regional and sub-regional levels. This could include new appointments in the RSC Secretariats dedicated to facilitate MSFD regional coherence and knowledge exchange. It is noted this may require an extension of the RSC mandate which would need to be agreed and endorsed by contracting parties.

National: Further Knowledge Brokerage appointments are required at Member State level, dedicated to MSFD knowledge exchange. These could build on a model already in place in some Member States e.g. the UK (NERC) Water Security Knowledge Exchange Programme (WSKEP)³¹. In addition, Member States could form clusters/networks of key stakeholders at national and sub-regional level to promote knowledge brokerage. This could be modelled on a structure currently being developed in the Netherlands to group the main governmental bodies responsible for implementing MSFD together with major national science institutions.

Knowledge brokerage: Recommendations

To bridge the gap between science, policy and the wider stakeholder community through independent, transparent and credible activities in the areas of communication, packaging and knowledge exchange between stakeholder groups by individuals, organizations and wider networks.

New capacities in knowledge brokerage are required to optimize the SPI in two key areas:

1. Knowledge management

An enhanced capacity and more strategic approach is recommended to foster exchange and uptake of MSFD-relevant knowledge across the wide and diverse MSFD stakeholder community. Knowledge brokers should support the research community in the process of harnessing, communicating and disseminating MSFD-relevant knowledge outputs throughout the research life cycle and facilitating the effective packaging of information between research, policy and wider stakeholders.

2. Matching science and policy needs

An enhanced capacity is required for Knowledge Brokers to support the dialogue between MSFD implementors and research funding agencies. This is vital to communicate MSFD research gaps and needs to inform future research agendas. Specialists with a science background are also needed to effectively communicate and facilitate understanding on the dynamics and uncertainty inherent to scientific knowledge and align these with policy.

In the longer-term this could be enhanced by developing a culture of multi- and trans-disciplinary approach to knowledge production and use for environmental policy. In addition to supporting current processes, this could include training scientists and policy makers to enhance MSFD implementation into the future.

³¹ <http://www.wskep.net/about.php>

5. A roadmap for a MSFD SPI Platform

This paper sets out a proposal for an effective MSFD SPI Platform with recommendations to enhance key components, building on existing infrastructure and proposing new capacities such as knowledge brokerage. The SPI architecture shown in Figure 9 (see also Executive Summary, Figure 2) represents a vision for how this SPI should look. However, many steps must be taken and many actors must support this process before this vision can be realised. Figure 14 presents a roadmap for achieving an effective SPI in a step-wise approach for each of the 4 key components. These proposed actions are further explained together with additional proposals in the roadmap recommendations text below. Firstly, a number of short-term steps are identified which are considered highly achievable (i.e. components already in development and/or significant new funding is not required). It is proposed that implementing these in the short-term (here, 2014-2016), will provide a sound platform to progress to the medium-term (2016-2020) with the longer-term (beyond 2020) vision to establish an active SPI with mature, self-sustaining processes in place for each of the four key SPI components.

This is set in the context of the MSFD policy stages and key milestones and targets in the MSFD policy cycle. It also takes into account the work conducted by the STAGES FP7 project which consulted a wider selection of MSFD stakeholders and demonstrated activities and methodologies in MSFD knowledge management and foresight activities, which could form an integral part of a future long-term SPI.

Roadmap recommendations for building an effective, long-term SPI to support MSFD implementation:

Short-term (by 2016)

- **Support initiatives for harnessing MSFD-relevant knowledge:** Knowledge Gate 2.0 online repository has developed a tool for MSFD specific searches on MSFD-relevant Knowledge Outputs (demonstrated through FP7 STAGES). **The infrastructure is in place but requires operational support and a long-term strategy.**
- The European Commission plan an **information platform on marine research** at the European and national levels (by December 2015). Interactions between Knowledge Gate, other existing portals e.g. EmodNet and planned online portals (e.g. WISE-Marine and the MSFD Competence Centre) will be crucial going forward.
- **Activate the MSFD Competence Centre flexible expert networks and online portal as a first step towards a strategic European MSFD science advisory process.** For example, through the JRC-led MSFD Competence Centre, the scientific and technical advisory process is already being trialed for the revision to the COM decision on GES being undertaken in 2014. It could also be activated to inform the programme of measures being developed until 2015. This should be complimentary and developed in dialogue with science agenda and advisory processes currently in development at regional level. Policy makers should first inform this process with questions they need to be answered and a network of scientific experts can then provide scientific and technical advice through mechanisms such as virtual fora, technical working groups and reports, workshops and consultations.
- **Assess the needs for a strategic interregional working group for Regional Sea Conventions** (in addition to the PCG) to share best practice and develop regional coherence.

- **Fund (e.g. through Horizon 2020) scientific synthesis support actions** to assess the state-of-the-art for existing MSFD-relevant research (e.g. to include knowledge produced in the first MSFD cycle). Synthesis activities are also recommended at regional and national scales.
- **Communicate recommendations for Knowledge Brokers** at national, regional and European level and commission a mapping exercise to assess the full requirements and benefits of knowledge brokers supporting MSFD and to develop a strategy for knowledge brokerage supporting MSFD implementation. A study could include a cost-benefit analysis and specification of key 'nodes' where such knowledge brokers could make the most added value.
- **Develop a strategy for stakeholder interactions with MSFD** e.g. through Virtual Knowledge Centres (VKC) (e.g. proposed VKC on marine and maritime affairs in the Mediterranean) and through Technology and Industry Alliances (e.g. a future Blue Growth/Marine KIC).

Mid-term (2016-2020)

- Mechanisms in place to achieve **iterative and long-term operations for harnessing of MSFD-relevant knowledge**.
- **Active MSFD foresight activities in place**, utilising knowledge e.g. scientific synthesis reports to identify knowledge gaps and inform research agendas with knowledge.
- **Develop mechanisms to enhance the sub-regional cooperation** e.g. through European projects funded through Interreg, LIFE+ and through Regional Sea Conventions.
- **Implementation of a knowledge brokerage strategy** including dedicated human capacity for knowledge brokers should be in place in strategic positions in key 'nodes' of the MSFD SPI e.g. in Regional Sea Conventions, European Commission, JRC Competence Centre, Member State Ministries, Research Funding Organizations.
- **Develop the MSFD Competence Centre online portal** as a repository of curated information addressing the implementation requirements of GES in the MSFD and linkages with other environmental policies. Ultimately the MSFD Competence Centre aims to become a "one-stop-shop" for Commission Services and Member States for information on marine policies and GES.

Long-term (beyond 2020)

- Establish an **active SPI across all four key components**, with mechanisms in place for the SPI to be iterative and responsive to policy needs, supporting MSFD implementation across European, Regional, Sub-regional and National scales to achieve and maintain GES by 2020 and beyond.

Roadmap for SPI to support MSFD

MSFD Policy Timeline

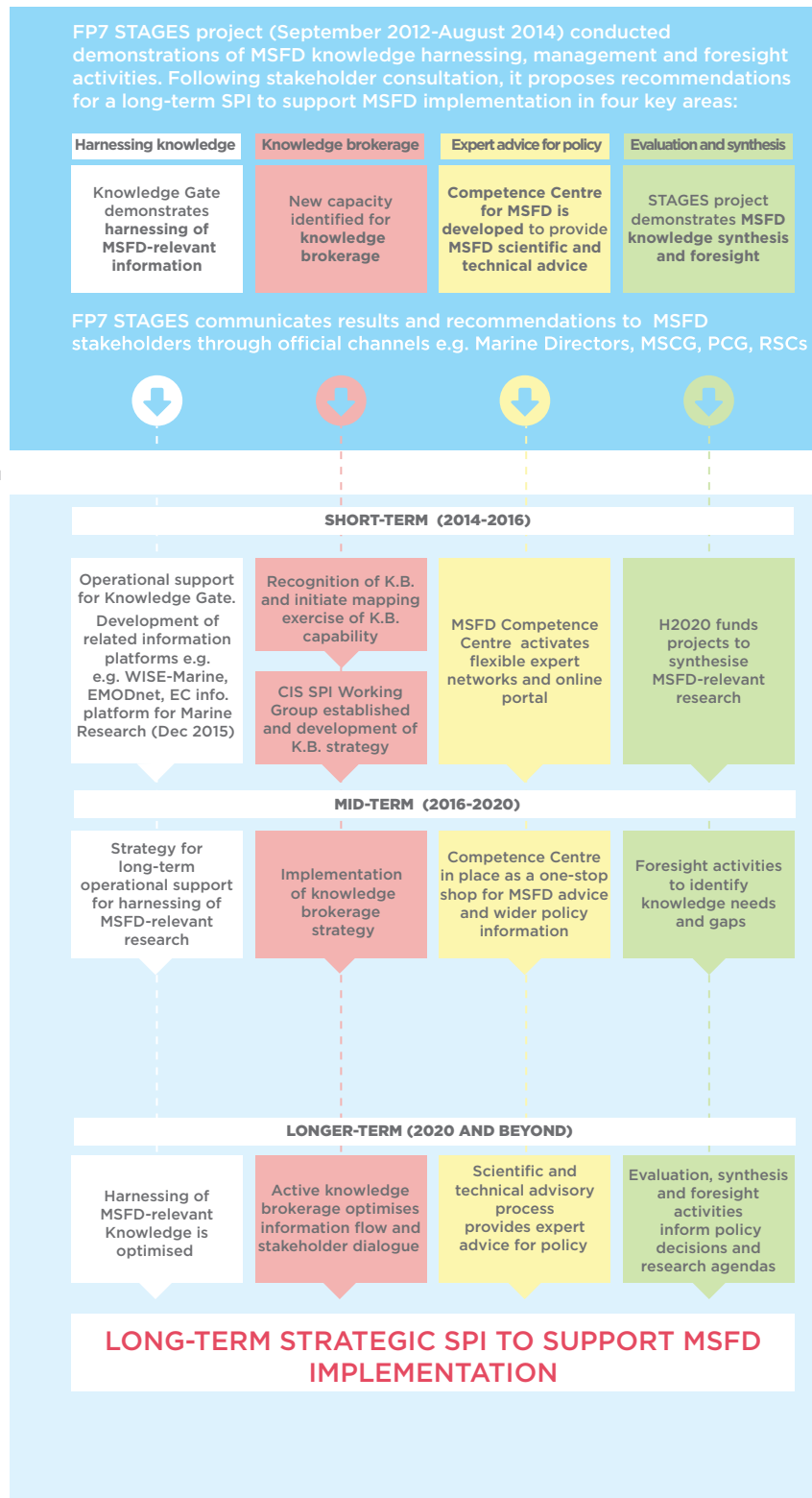
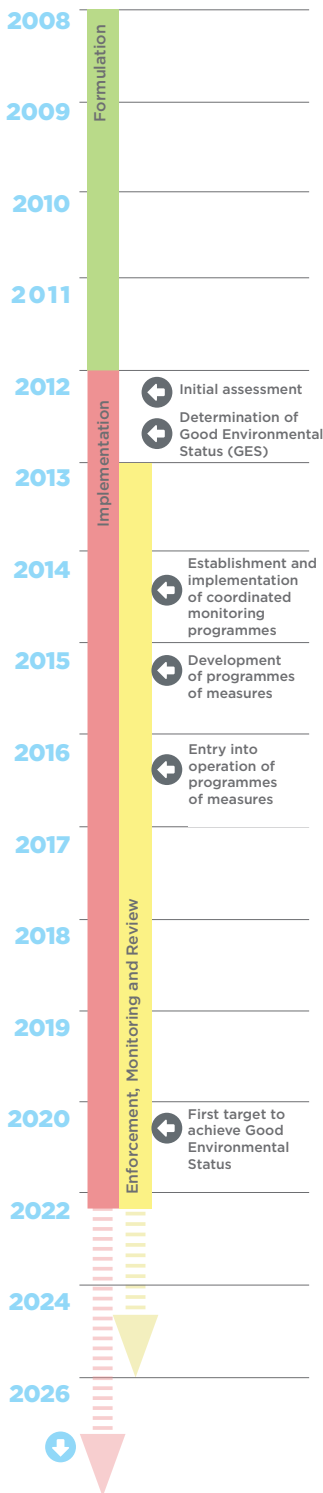


Figure 14. Roadmap for a science-policy interface to support MSFD implementation. Actions for a step-wise implementation are presented in the context of the MSFD policy stages and key milestones in the first MSFD cycle and beyond. (See also Section 5 text and Figure 9).

6. Glossary of Terms

CIS: Common Implementation Strategy

EC: European Commission

EEA: European Environment Agency

EMB: European Marine Board

ICES: International Council for the Exploration of the Sea

IMP: Integrated Maritime Policy

JPI-Oceans: Joint Programming Initiative Healthy and Productive Seas and Oceans

JRC: Joint Research Centre, European Commission (<http://ec.europa.eu/dgs/jrc/index.cfm>)

KB: Knowledge Brokerage

MS: Member State

MSCG: Marine Strategy Coordination Group

MSFD: Marine Strategy Framework Directive

PCG: Project Coordination Group

RSC: Regional Sea Convention

SPI: Science-Policy Interface

STAGES: Scientific and Technology Advancing Governance on Good Environmental Status

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PROJECT PARTNERSHIP

The **STAGES** partnership has been constructed to ensure effective delivery of the ambitious project objectives. It comprises European and international organisations such as ICES and JRC, who were fundamental in developing MSFD Scientific Task Groups, as well as national organisations (IMR, IFREMER, CETMAR) that are responsible for supporting research and providing advice on MSFD implementation at Member State level. The partnership also includes AquaTT and EurOcean, both very experienced in marine science information management and knowledge transfer, and the European Marine Board as a primary marine science-policy think tank in Europe.



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Centro Tecnológico del Mar –
Fundación (CETMAR)

European Center for Information
on Marine Science and
Technology (EurOcean)

Institut français de recherche pour
l'exploitation de la mer (Ifremer)

AquaTT UETP Ltd (AQUATT)

International Council of the
Exploration of the Sea (ICES)

Joint Research Centre (JRC)

European Marine Board (EMB)

Institute of Marine Research (IMR)

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