



D1.2: Final report on EU policy recommendations
Task 1.1: Formulate policy recommendations and regulatory proposals for policy-makers
WP1: Societal actions for the reduction of chemical pollution

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ABSTRACT	<p>This report presents the policy engagement activities carried out under the iMERMAID project to promote the uptake of its policy recommendations within EU water and marine governance debates. The project developed three policy briefs addressing the European Water Resilience Strategy, the Urban Wastewater Treatment Directive, and the Marine Strategy Framework Directive. These briefs translated project outcomes into policy-relevant recommendations aligned with the EU Zero Pollution Action Plan and a source-to-sea approach. The report also highlights horizontal communication and policy outreach actions supporting their dissemination, including engagement through Water Europe and participation in EU policy events such as Ocean Week 2026.</p>

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Executive Summary

This report presents the policy engagement activities carried out under the iMERMAID project to disseminate the policy recommendations of the project. It aims to strengthen the uptake of project results in ongoing European policy discussions on water governance, chemical pollution, and marine protection.

iMERMAID adopted a structured project-to-policy approach based on three elements: the preparation of targeted policy outputs, alignment with the evolving European political agenda, and engagement with relevant stakeholders and decision-makers. This strategy was designed to connect project results with key European policy processes relevant to the European Zero Pollution Action Plan and the broader source-to-sea approach promoted by the project.

As foreseen in the Grant Agreement, three policy briefs were developed during the project. These focused on the European Water Resilience Strategy, the Urban Wastewater Treatment Directive, and the Marine Strategy Framework Directive. Each brief was designed to reflect the maturity of project outcomes and the timing of the relevant policy process. Together, they helped translate iMERMAID results into policy-relevant recommendations and strengthen the visibility of the project within the European policy landscape. The report also highlights the first impacts of these briefs.

The report also includes some horizontal policy actions taken to support the dissemination of the policy briefs and recommendations of iMERMAID. It includes the integration of project messages into Water Europe policy activities. The project also gained visibility through participation in events such as European Ocean Week 2026.

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ACRONYMS

ARLEM	Euro-Mediterranean Regional and Local Assembly
CCMI	Consultative Commission on Industrial Change
CoECs	Contaminants of Emerging Concern
CoR	Committee of Regions
EEB	European Environmental Bureau
EESC	European Economic and Social Committee
EU	European Union
M	Month
MSFD	Marine Strategy Framework
SEARICA Intergroup	Seas, Rivers, Islands and Coastal Areas Intergroup
SIWI	Stockholm International Water Institute
UWWTD	Urban Wastewater Treatment Directive
WFD	Water Framework Directive
WRS	Water Resilience Strategy

1.0 Introduction

The iMERMAID project aims to address chemical pollution in the Mediterranean Sea basin through a source-to-sea approach, focusing on the monitoring, prevention, and remediation of contaminants of emerging concern (CoECs). The project contributes to the European Union (EU)'s broader environmental objectives, particularly those outlined in the EU Zero Pollution Action Plan, by developing innovative technological and governance solutions to reduce chemical pollution across the water cycle.

In addition to research and innovation activities, iMERMAID has developed a policy engagement strategy to ensure that project results effectively inform EU policymaking. This strategy was implemented through the preparation and dissemination of three policy briefs, each addressing key EU legislative and policy developments taking place during the lifetime of the project.

The policy briefs focused on:

- The EU Water Resilience Strategy (WRS).
- The revision of the Urban Wastewater Treatment Directive (UWWTD).
- The revision of the Marine Strategy Framework Directive (MSFD).

These policy processes were particularly relevant as they were under development or revision during the project implementation period and are central to achieving the objectives of the EU Zero Pollution Strategy. Moreover, they directly connect to the broader EU water governance framework, including the Water Framework Directive (WFD), which together with the MSFD structure the EU's integrated approach to water protection from source to sea.

The development of these policy briefs enabled the project consortium to translate scientific and technological results into clear policy recommendations, supporting evidence-based policymaking at European level.

Beyond the publication of the briefs themselves, a wide range of dissemination and policy engagement activities were conducted to maximise their impact. These activities targeted key stakeholders including EU institutions, Members of the EU Parliament, regional authorities, expert groups, and the broader water policy community.

This report presents the policy engagement activities carried out in the framework of the iMERMAID project. It first explains the strategic approach adopted for the development of the three policy briefs. It then presents each of the briefs, including their scope, objectives, target audiences, and initial impacts. Finally, the report highlights additional horizontal dissemination and policy outreach actions undertaken to further strengthen the visibility and uptake of the project's results.

2.0 Strategic Approach adopted for the project4policy actions of iMERMAID

To maximise the policy relevance and uptake of its results, the iMERMAID project adopted a structured project-to-policy strategy aimed at translating scientific and technological outcomes into policy-relevant knowledge. This approach was designed to ensure that the project could contribute to ongoing EU policy discussions related to chemical pollution, marine protection, and water governance, particularly in the Mediterranean region.

The strategy combined three main components:

- The delivery of specific policy outputs, notably the preparation of policy briefs.
- The alignment of these outputs with the evolving EU political and legislative agenda.
- The targeted engagement of relevant stakeholders and policy actors to maximise the uptake of project results.

2.1 Key activities to deliver under iMERMAID

Within the iMERMAID project, policy engagement activities were primarily implemented through Work Package 1, three policy briefs were foreseen in the Grant Agreement, addressing key EU policy initiatives relevant to the project's objectives, including the implementation of the EU Zero Pollution Action Plan. These briefs aimed to synthesise project insights and provide recommendations for policymakers working on water and marine environmental governance. The first policy brief was planned for delivery in M 18, while the two remaining briefs were scheduled before Month 35.

In addition to the preparation of policy briefs, the project-to-policy strategy relied on communication and dissemination activities implemented in coordination with the project's communication work packages. These activities aimed to increase the visibility of the policy briefs and ensure their uptake among relevant stakeholders.

Key dissemination actions included:

- Promotion of policy briefs through project communication channels and social media platforms.
- Dissemination through Water Europe networks and policy platforms.
- Integration of project results into policy events and stakeholder discussions.
- Organisation and participation in events where iMERMAID outcomes could be presented to policymakers and stakeholders.

These activities ensured that the policy briefs were not only produced as standalone documents but were embedded in a broader policy communication strategy (cf. section 3). The communication approach was also aligned with the maturity of the project outcomes, allowing the strategy to evolve from general dissemination towards more policy-oriented exploitation activities.

2.2 Political landscape during the Project duration

During the project implementation period, several major legislative and strategic initiatives were under development or revision at EU level, creating opportunities for the project to contribute to policy discussions.

In particular, three policy processes were identified as especially relevant:

European Water Resilience Strategy (WRS)

The preparation of the EU WRS represented an opportunity to highlight the importance of addressing chemical pollution through a source-to-sea approach. The strategy aimed to strengthen the EU's long-term capacity to manage water resources while addressing emerging environmental challenges.

Revision of the Urban Wastewater Treatment Directive (UWWTD)

The revision of the UWWTD introduced stronger provisions related to micropollutants and CoECs, which are directly addressed by the technologies and monitoring approaches developed in iMERMAID.

Review of the Marine Strategy Framework Directive (MSFD)

The review of the MSFD provided the best opportunity to emphasise the outcomes of the iMERMAID project, and the need for stronger policy coordination between freshwater and marine governance frameworks, particularly in addressing chemical pollution reaching marine ecosystems.

Other policy developments were also monitored during the project. For example, the revision of the Bathing Water Directive initially appeared as a potential policy window for engagement. However, the legislative process was later postponed, limiting the opportunity for project contributions in this area.

In order to maximise the policy impact of iMERMAID, a range of institutional actors, policy networks, and stakeholder organisations were identified as relevant targets for engagement.

At the EU institutional level, key actors included:

- The EU Commission, including Commissioners responsible for water and Mediterranean policies
- The Committee of the Regions (CoR), given the strong territorial dimension of water management, including the Euro-Mediterranean Regional and Local Assembly (ARLEM), which plays a significant role in regional cooperation in the Mediterranean basin.
- The EU Economic and Social Committee (EESC), particularly through initiatives such as the EU Blue Deal and the work of the Consultative Commission on Industrial Change (CCMI)
- Within the EU Parliament, engagement focused on Members of the EU Parliament active on water, environmental, and marine policy issues, including members of the SEARICA Intergroup (Seas, Rivers, Islands and Coastal Areas).

At the Member State level, particular attention was given to countries with links to the case studies, meaning Cyprus, Spain, Italy, and Greece.

The project also identified a range of civil society organisations and policy networks active in marine and water policy discussions, including:

- Surfrider Foundation Europe
- WWF
- European Environmental Bureau (EEB)
- Wetlands International
- Stockholm International Water Institute (SIWI)
- Water Europe Community

2.3 Rationale of the actions taken during the Project

The policy engagement strategy of iMERMAID was designed to maximise the policy relevance and uptake of the project’s scientific and technological results. The approach aimed to ensure that project outcomes could effectively contribute to ongoing EU policy discussions on water quality, marine protection, and chemical pollution, while also supporting the objectives of the EU Zero Pollution Action Plan.

Three main considerations guided the actions implemented during the project:

- The policy briefs were strategically aligned with major EU legislative and strategic initiatives that were under development during the project duration. By linking the project outputs to key policy processes the project ensured that its recommendations could contribute to policy discussions at moments when evidence and technical input were most relevant. This alignment increased the likelihood that project insights could inform ongoing debates on water governance and pollution prevention.
- The strategy evolved from a traditional dissemination approach towards a stronger policy exploitation perspective. The three policy briefs were therefore designed with differentiated objectives, reflecting both the maturity of the project’s technical outcomes and the evolution of the EU political agenda. This allowed the project to progressively strengthen the policy relevance of its outputs and position iMERMAID results within ongoing EU policy debates.
- The strategy combined broad dissemination with more targeted stakeholder engagement. Communication activities aimed at raising general awareness of the project results were complemented by targeted outreach to policymakers, institutional stakeholders, and policy networks identified as relevant for the project. In this context, the communication channels and policy networks of both iMERMAID and Water Europe played an important role in amplifying the visibility of the project’s outputs.

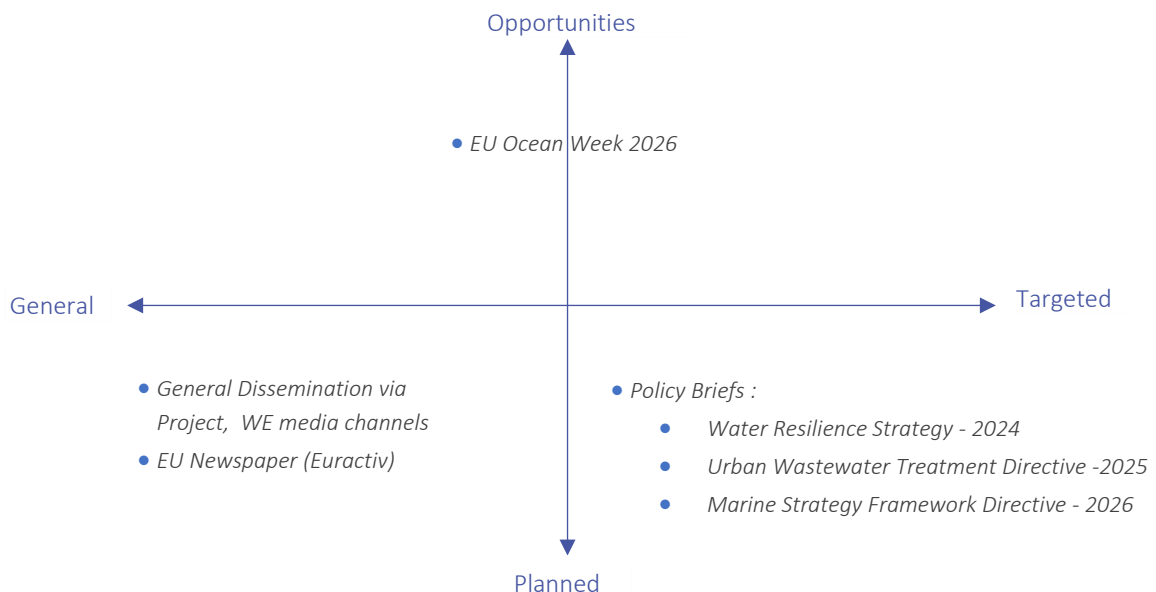


Figure 1: Matrix of the Communication opportunities identified for iMERMAID..

In practice, the policy briefs served multiple functions. They supported the project's contributions to public consultations launched by the EU Commission, provided recommendations on key EU policy initiatives, and facilitated the dissemination of iMERMAID results within relevant policy communities. At the same time, the broader communication tools of iMERMAID and Water Europe were used to ensure wider visibility of the policy messages developed within the project.

Finally, the project also took advantage of major policy and stakeholder events to further disseminate its results. In particular, the EU Ocean Week 2026 provided a strategic opportunity to present the three policy briefs and consolidate the recommendations developed by the project on water governance, chemical pollution, and marine environmental protection.

3.0 Policy Briefs Developed by the iMERMAID Project

The following subsections present the three policy briefs developed during the project, including their scope, objectives, and initial policy impact. Each brief was designed to contribute to ongoing EU policy discussions related to water governance, chemical pollution, and marine protection, while highlighting the relevance of the technological and monitoring solutions developed within the iMERMAID project.

3.1 *Policy Brief 1 – Contributing to the European Water Resilience Strategy*

The first policy brief developed within iMERMAID (cf. Annex 1) focuses on the EU WRS. The brief highlights the importance of addressing chemical pollution through a source-to-sea perspective, recognising the strong interconnections between freshwater systems, wastewater management, and marine ecosystems.

The main objectives of this policy brief were to:

- Contribute to policy discussions surrounding the preparation of the EU WRS.
- Increase the visibility of the iMERMAID project among stakeholders involved in the development of the strategy.

In addition, iMERMAID was highlighted for its digital tools in an Euractiv article discussing the EU WRS. This communication action, which brought together perspectives from different segments of the EU water community, provided an opportunity to reinforce the positioning of iMERMAID in the policy debate alongside other innovation projects such as AquaSPICE.

The analysis of the final EU WRS shows that several elements highlighted in the policy brief were reflected in the broader policy discussions. In particular, the strategy emphasises the potential benefits of digital tools and sensors for the water sector, and the source-to-sea approach is reflected in the strategy's references to the need for improved coordination between freshwater and marine policies, including the announced revision of the MSFD.

Regarding the monitoring and management of CoECs, discussions were ongoing in the context of the revision of the Environmental Quality Standards Directive and related parameters under the WFD and Groundwater Directive. The iMERMAID project did not actively engage in these specific legislative discussions, as the maturity of the project outcomes did not yet allow for substantial technical contributions.

3.2 *Policy Brief 2 – Addressing Micropollutants through the Urban Wastewater Treatment Directive*

The second policy brief (cf. Annex 2) focuses on the revision of the UWWTD, which represents a major legislative reform aimed at strengthening the EU's capacity to address pollution originating from urban wastewater systems.

The brief highlights the growing importance of addressing micropollutants and CoECs, which are increasingly recognised as significant environmental challenges for both freshwater and marine ecosystems.

As the public consultation on the revision of the directive took place prior to the official launch of the iMERMAID project, the project was not able to directly contribute to that consultation. Nevertheless, the policy brief aimed to:

- Increase the visibility of the iMERMAID project within policy discussions related to the UWWTD.
- Highlight the technological solutions developed within the project that could support the implementation of the directive.

The policy brief was disseminated through the communication channels of both iMERMAID and Water Europe, including newsletters, social media platforms, and policy networks, ensuring visibility among policymakers and stakeholders involved in water governance.

The brief also supported the project's contribution to policy discussions related to the OMNIBUS Environment initiative, particularly in relation to the implementation of recently adopted environmental legislation. In this context, iMERMAID emphasised the importance of ensuring the protection of freshwater systems up to the marine environment, in line with the project's source-to-sea perspective. The implementation of the Extended Producer Responsibility scheme introduced in the revised UWWTD is currently being challenged by stakeholders from the pharmaceutical and cosmetics sectors. These positions contrast with the approach supported by the iMERMAID project, which emphasises the importance of addressing CoECs at source.

One impact, the iMERMAID project is referenced in the Opinion of the CoR on the implementation of the EU WRS and the EU Water Acquis. The opinion highlights the relevance of the project's source-to-sea approach.

3.3 Policy Brief 3 – Strengthening the Marine Strategy Framework Directive to Address Chemical Pollution

The third policy brief (cf. Annex 3) focuses on the MSFD, which constitutes the main EU legislative framework for protecting marine ecosystems and achieving good environmental status of EU seas.

In this policy brief, iMERMAID adopted a different approach compared to the two previous briefs. Given the strong relevance of the MSFD for the project's objectives and the current outcomes of the project, the brief was developed with a stronger policy exploitation perspective. It provides recommendations for the recast of the directive and improving the management of chemical pollution in marine ecosystems.

In the writing process, an effort was done to ensure a stronger co-creation approach. The project cluster and related sister projects were mobilised to provide inputs. Moreover, all the consortium had the opportunity to review and provide inputs on the document. Lastly, an internal policy session was organised with key consortium partners and was used to align recommendations between different deliverables.

The policy brief was used to contribute to the call for evidence and the public consultation on the review of the MSFD, launched by the EU Commission in March 2026.

In addition to its contribution to the consultation process, the brief was disseminated through the communication channels of iMERMAID and Water Europe. It was also presented during EU Ocean Week 2026, where it was made available at the iMERMAID booth. This event provided a valuable opportunity to present the project's recommendations to policymakers, marine stakeholders, and the broader ocean governance community.

The policy brief is currently being disseminated to key policymakers. MEP Bajada and the CoR have already received the document, as both institutions have previously expressed interest in the project. Additional Members of the EU Parliament and Member States will be targeted following the different stages of the EU co-decision process related to the revision of the MSFD.

4.0 Horizontal Communication Actions Supporting the Impact of iMERMAID

In addition to the development of the three policy briefs, the iMERMAID project implemented a set of horizontal communication and policy engagement actions aimed at increasing the visibility and policy uptake of the project results. These actions complemented the policy briefs by ensuring that their recommendations reached relevant policy audiences and stakeholder communities. Three types of actions are developed.

4.1 *Dissemination through Project and Water Europe Communication Channels*

The policy briefs were disseminated through the communication channels of both iMERMAID and Water Europe, ensuring broad visibility within the EU water and marine policy communities. Dissemination actions included:

- Promotion through LinkedIn and social media channels.
- Distribution through Water Europe newsletters and communication platforms.
- Publication on the Water Europe website, where the policy briefs are accessible alongside other policy publications produced by the organisation.

These channels allowed the project to reach a wide audience including policymakers, researchers, industry stakeholders, and members of the EU water community.

In addition, Water Europe ensured that the project contributed each time it was relevant to a policy dossier that the association was working on and ensuring synergies between the project results and Water Europe policy activities. The results of iMERMAID were integrated into policy publication of Water Europe:

- The EU WRS position paper.
- The OMNIBUS environment position paper.
- Further references to the project are planned in upcoming Water Europe publications, including work related to PFAS pollution and the EU Digitalisation Action Plan for Water.

This approach ensured continuous visibility of iMERMAID within the EU water policy and innovation community.

4.2 *Media Outreach and Policy Visibility*

As previously mentioned, iMERMAID was also promoted through EU-level policy media, notably through an opinion article published in Euractiv, released by Water Europe.

Euractiv was selected as a strategic communication platform due to its strong readership among EU policymakers, institutional stakeholders, and policy experts. In addition, Euractiv collaborates with a network of national and regional media outlets, which allows content published on the platform to be potentially relayed through local newspapers across Europe.

This communication initiative provided an opportunity to highlight the project's perspective on water resilience, and the role of innovative monitoring technologies, thereby reinforcing the visibility of iMERMAID within the broader European policy debate.

4.3 Dissemination at European Policy Events

The project also took advantage of major European policy events to disseminate its results and policy recommendations.

In particular, the EU Ocean Week 2026 provided an important opportunity to present the policy briefs and, in that way, aggregating the recommendations developed within the project to a wide range of stakeholders involved in marine governance. Events such as EU Ocean Week facilitate exchanges between research projects, policymakers, civil society organisations, and industry stakeholders, creating opportunities for research outcomes to inform policy discussions.

In addition, Water Europe took care in its policy-related and collaboration-related activities to consider and disseminate both communication materials and iMERMAID policy briefs in its different events like Water Innovation Europe or Water Knowledge Europe. This approach provides a cyclic visibility to the iMERMAID into the EU Water community.

5.0 Conclusion

The iMERMAID project implemented a structured project-to-policy strategy aimed at ensuring that its scientific and technological outcomes could contribute to ongoing EU policy discussions on water governance, chemical pollution, and marine protection. By aligning its policy engagement activities with key EU legislative and strategic initiatives, the project was able to position its results within policy debates relevant to the implementation of the EU Zero Pollution Action Plan.

The development of three dedicated policy briefs allowed the project to address specific policy processes that were particularly relevant during the project duration, namely the EU WRS, the revision of the UWWTD, and the review of the MSFD. Through these policy briefs, the project translated technical and scientific knowledge into recommendations aimed at policymakers and stakeholders involved in water and marine governance and aligned with the needs of the political steps.

Beyond the preparation of these policy outputs, the project implemented a range of horizontal dissemination and policy engagement actions. Together, these actions helped ensure that the policy messages developed within iMERMAID reached a broad audience and contributed to discussions across the EU water and marine policy communities.

Overall, the policy engagement activities carried out under the iMERMAID project demonstrate how research and innovation projects can support evidence-based policymaking by providing concrete insights and technological perspectives to ongoing legislative and policy processes. The project's source-to-sea approach and focus on the monitoring and management of CoECs provide valuable contributions to the evolving EU framework for water and marine environmental protection.

ANNEX 1: Tackling pollution of CoECs - A source-to-sea approach from water to ocean.

The policy brief is available in its designed format on the following webpage: <https://imermaid.eu/storage/2024/11/iMERMAID-policy-brief.pdf>

Tackling pollution of CoECs - A source-to-sea approach from water to ocean.

Introduction

[iMERMAID](#) is an EU-funded project focused on protecting the Mediterranean Sea basin, its sensitive ecosystems and the ecosystem services it provides, which themselves play a crucial role in a variety of different socioeconomic activities. It aims to address the growing threats of chemical contamination and pollution caused by human activities, with a particular focus on contaminants of emerging concern. iMERMAID intends to integrate innovative strategies for prevention, monitoring, and remediation, particularly around the Mediterranean Sea. This project builds upon the research and innovation activities of 11 projects.

Bringing together [a consortium of 26 partners](#) from Europe and beyond, the project encourages collaborations to develop advanced sensor and remediation technologies, strengthen regulations to reduce contamination, enhance economic opportunities, and thereby improve the quality of life for EU residents.

Table 1: Objectives of the iMERMAID Project.

Objectives of the Project

- Mature and develop innovative, reproducible technologies to monitor pollution from chemicals.
- Prevent water pollution at its source through educational plans and digital innovation uses.
- Create contaminant-free waters by enabling Chemical Strategy's goals to become a practical reality.
- Expand the project outreach by calling for associated regions and stakeholders.
- Raise awareness of water-related challenges through school interventions.
- Develop relevant digital tools to prevent and tackle water pollution.
- Enhance multi-stakeholders cooperation.

Tackling Emerging Micropollutants in Three Steps

Today, 80% of the global urban wastewater is released to the sea untreated¹, increasing the risk of diffuse pollution and contamination of environment by toxic chemicals. The occurrence of emerging micropollutants (pharmaceuticals, pesticides, personal care products, industrial compounds, etc.) in the environment is considered a major threat to human health and aquatic eco-systems. This risk directly threatens 150 million people living by the coasts, a population that doubles during the summer season around the Mediterranean Sea. Moreover, it also threatens in multiple ways 2 million jobs in the blue economy in the EU Mediterranean member-states, with around €13 billion estimated only for the combined output of fisheries and aquaculture fields².

iMERMAID aims to protect the Mediterranean from the 100,000 types of anthropogenic chemicals available on the EU market. The majority of those chemicals have not been investigated thoroughly. It is unclear what effects they may have on the ecosystem; many have significant toxicity, long-range transport capacity persistence, and bioaccumulation potential.

iMERMAID strategy follows a three steps approach:

1. **Upstream: encourage a bold legislative framework regarding contaminants treatment for reused water and raise awareness regarding water-related issues through an educative programme.**
2. **At the Mediterranean doors: involving international stakeholders in assessing and developing pollutant-sensors to better separate contaminants from water.**
3. **Effectively remove micro-chemicals from the sea: honing existing tools and develop new innovative to better manage chemicals pollution from the Mediterranean.**

Benefits for the EU Legislation in a Source-to-Sea Approach

iMERMAID builds upon the Green Deal agenda. It will contribute to the main strategic plans such as the [Zero Pollution Action Plan](#), and the [EU Climate Target Plan](#) by helping to mature and develop innovative, reproducible technologies to monitor pollution from chemicals.

[iMERMAID White Paper](#) on upstream solutions stresses the importance of multi-stakeholder roadmap to tackle pollution from CoECs. It identifies the regulation as the main driver for change and boost the development of substituting with less hazardous compounds. Main conclusion includes three potential leveraging tools to be included in the EU policies:

- Fiscal incentives or financial support to enterprises, facilitating elements of the substitution process such as funding for research, taxes, or subsidies.
- Networks and partnerships development to disseminate information to stakeholders, including consumers, and fostering public-private collaborations for data and knowledge exchange.

¹ UNESCO, Wastewater : the untapped resource, 2017. https://www.unwater.org/sites/default/files/app/uploads/2018/10/WaterFacts_water_and_wastewater_sep2018.pdf

² According to the United Nations Environment Programme data basis out of the Mediterranean Action Plan from Barcelona Convention. See the link here: <https://www.unep.org/unepmap/resources/factsheets/blue-economy>.

- Demand stimulation to encourage environmentally benign product development in the nascent market, perhaps through public procurement policies or purchase subsidies.

Its *source-to-sea* approach will aim at developing a holistic approach through identifying synergies between different directives such as the [Bathing Water Directive](#), the [Drinking Water Directive](#), and the [Water Framework Directive](#)³. These directives are relevant for both freshwater and marine areas. In addition, tackling pollution at source will also feed into the debate on the [Sewage Sludge Directive](#).

As regard to the marine perspective, iMERMAID will also provide examples and best practices to reduce chemical pollution and hence contribute to the new objectives of the [Marine Strategy Framework Directive](#) in terms of quality status of the oceans and their litters.

Secondly, the monitoring of such contaminants will contribute to invest in *digital water*⁴ and create synergies with the other key priorities. Digitalisations constitute one of the key objectives of the EU, offering increased predictability and flexibility in water management to achieve a Water-Smart Society.

Thirdly, the project will also contribute by providing recommendations for the Water Resilience Strategy and the Ocean Pact, as announced in the new [Guidelines of the European Commission 2024-2029](#). By focusing on ecosystem remediation through monitoring and decontamination from chemical pollution, the project will strengthen Europe's water security and enhance the competitive and innovative edge of our water industry. Moreover, it will benefit the blue economy and its sustainability. Finally, the citizen involvement actions will provide valuable recommendations on governance and offer tools to raise awareness about the importance of water and oceans.

An opportunity for international cooperation in the context of the European Ocean Pact.

The iMERMAID project can contribute to international collaboration in the Mediterranean area, especially the case study in Tunisia which focuses on degrading over 95% of emerging pharmaceutical contaminants in industrial waste. This approach aims to cut pharmaceutical pollution at its source by more than 50%, aligning with EU standards.

Water management is one of the priorities of the [Euro-Mediterranean Regional and Local Assembly](#) (ARLEM) as well as for the [Union for the Mediterranean](#) (UfM). With its focus on the Mediterranean region, iMERMAID can easily suggest good practices to duplicate by other stakeholders in the region both through its [open calls](#) and its iMERMAID cluster as an integral component of the Mediterranean Sea basin lighthouse support facility.

At the Global level, iMERMAID's efforts will also be valuable in the context of cooperation between water-related stakeholders of the [UN World Water Quality Alliance](#) and the [Water4All](#) partnership. It will particularly demonstrate solutions for the implementation of the [Barcelona protocols](#).

³ Daughters directives are: the Floods Directive, the Groundwater Directive, and the Environmental Quality Standard Directive.

⁴ Digital Water: exploit the benefits of the extreme interconnectivity of people, devices and processes, and create capillary networks capable of monitoring the water system, starting at its multiple sources through to the individual end-user, thus generating continuous flows of valuable data for innovative decision-support systems at different governance levels. Water Europe, [the value of water](#), 2023.

The Barcelona Protocol

“Protocol on the Prevention of Pollution of the Mediterranean Sea “

The Barcelona Convention, also known as the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean is an important legislative tool whose contracting Parties go beyond the EU. It adopts seven implementing Protocols to the Barcelona Convention four of which are directly related to protection against contaminants of emerging concerns, namely:

- a. Protocol for the Prevention and Elimination of Pollution of the Mediterranean Sea by Dumping from Ships and Aircraft or Incineration at Sea
- b. Protocol for the Protection of the Mediterranean Sea against Pollution from Land-Based Sources and Activities
- c. Protocol for the Protection of the Mediterranean Sea against Pollution Resulting from Exploration and Exploitation of the Continental Shelf and the Seabed and its Subsoil
- d. Protocol on the Prevention of Pollution of the Mediterranean Sea by Transboundary Movements of Hazardous Wastes and their Disposal

ANNEX 2: Wastewater Management in the Mediterranean sea : Towards Resilient, Smart and Circular Water Systems

The policy brief is available in its designed format on the following webpage:
https://imermaid.eu/storage/2025/09/iMERMAID-policy-brief_2_Final.pdf

Wastewater Management in the Mediterranean sea : Towards Resilient, Smart and Circular Water Systems

[iMERMAID](#) is an EU-funded project focused on protecting the Mediterranean Sea basin, its sensitive ecosystems and the ecosystem services it provides, which play a crucial role in a variety of different socioeconomic activities. It aims to address the growing threats of chemical contamination and pollution caused by human activities, with a particular focus on contaminants of emerging concerns. iMERMAID intends to integrate innovative strategies for prevention, monitoring, and remediation, particularly around the Mediterranean Sea. This project builds upon the research and innovation activities of 11 projects. Bringing together [a consortium of 26 partners](#) from Europe and beyond, the project encourages collaborations to develop advanced sensor and remediation technologies, strengthen regulations to reduce contamination, enhance economic opportunities, and thereby improve the quality of life for EU residents.

iMERMAID aims to bridge technological development with regulatory advancement. This is particularly timely as the revised [Urban Wastewater Treatment Directive](#) (UWWTD) introduces new obligations for pollutant monitoring, Extended Producer Responsibility, and treated wastewater reuse. These reforms resonate with iMERMAID's five demonstration sites, which showcase modular treatment systems, real-time sensor networks, and smart reuse models tailored to Mediterranean challenges.

In parallel, the [European Water Resilience Strategy](#) (WRS) sets out a broader vision to modernise water infrastructure, combat persistent contaminants like PFAS and pharmaceuticals, and improve cross-sectoral water governance. To unlock the full potential of these innovations, regulatory alignment and integration across the water and marine acquis will be essential.

In this context, the upcoming revision of the [Marine Framework Strategy Directive](#) (MSFD) in 2027 provides an opportunity to strengthen synergies with the UWWTD, and the broader Zero Pollution objectives. iMERMAID offers testbeds for operationalising these objectives and accelerating the deployment of water-smart solutions across the Mediterranean region and beyond.

Recommendations

- Encourage the integration of electrochemical, in situ sensors into national and regional wastewater monitoring plans to fulfil new obligations under the UWWTD and MSFD.
- Promote Modular Remediation Units Adapted to Local Contaminants
- Promote Smart Reuse Schemes through Digital Monitoring and Standards
- Consider iMERMAID's digital architecture as a reference model for data integrity and real-time compliance monitoring in UWWTD and the MSFD

- Strengthen Source-to-Sea Coherence via MSFD Revision
- Create a Reference Framework for National Reuse and Monitoring Standards

Deploying innovation to implement the new Urban Wastewater Treatment Directive

Together, the following recommendations aim to operationalise the source-to-sea continuum, mainstream emerging pollutant monitoring, and unlock the potential of digital, modular, and reuse-ready solutions to implement the UWWTD.

Encourage the integration of electrochemical, in situ sensors into wastewater monitoring plans



Encourage the adoption of electrochemical, in situ sensors for real-time detection of PFAS, pharmaceuticals, and metals. iMERMAID deployed validated sensors in User Case (US) 2 (Tunisia), UC 3 (Italy), and UC 5 (Greece), enabling continuous monitoring of CoECs such as diclofenac, ibuprofen, BPA, Bentazone, and PFOA. These technologies are directly applicable to UWWTD Art. 10(1) and MSFD Art. 8(1)(b)⁵.

Weefiner's system and Heavy Metal Box installed in SMAT plant in Brandizzo (more info [here](#)).

Promote Modular Remediation Units Adapted to Local Contaminants

Support implementation of portable, decentralized treatment technologies through EPR and targeted Article 8(4) measures. iMERMAID provides cost-efficient and modular remediation systems that could be implemented by the utilities or industrial actors⁶ like:

- Microfluidic photocatalytic systems (UC 2, UC 5) for organic micropollutants.
- Pulse Discharge Plasma (UC 1) for pesticides and BPA.

⁵ iMERMAID. *Development and Deployment of Electrochemical Sensor Box for CoECs and Oil Monitoring*. Deliverable D2.1, Horizon Europe iMERMAID Project, 2024 ; iMERMAID. *Heavy Metal Monitoring Sensor Box: Design, Calibration, and Field Testing*. Deliverable D2.2, Horizon Europe iMERMAID Project, 2024 ; iMERMAID. *Policy Integration Strategy and Roadmap for Innovation Uptake*. Deliverable D6.2, Horizon Europe iMERMAID Project, 2024.

⁶ iMERMAID. *Bioaccumulation and Biomagnification of Contaminants of Emerging Concern in Marine Food Webs*. Deliverable D2.3, Horizon Europe iMERMAID Project, 2024 ; iMERMAID. *System Dynamics Modelling and Scalability Assessment of Water Innovation Solutions*. Deliverable D5.2, Horizon Europe iMERMAID Project, 2024.

- 4D Scavenger (UC 3) for heavy metals like Zn, Cu, and Al

Based on the “polluter pays” principle, these units match the new requirements for targeted treatment and align with Extended Producer Responsibility (UWWTD Art. 9). EU Member States should:

- Encourage industrial actors as well as relevant authorities to pilot and upscale modular treatment units adaptable to local contaminants and flow rates, particularly in industrial and rural facilities.
- Leverage co-benefits with the MSFD and its objective to monitor contaminants and pollution effects (art. 11 & annex III).

Promote Smart Reuse Schemes through Digital Monitoring and Standards

Currently, only 2.4% of wastewater is reused in the EU. The WRS encourages the expansion of treated wastewater reuse in agriculture, cities, and industry. iMERMAID tested RO with recycled membranes in UC 2 and validated safe reuse scenarios via monitoring in UC 5. These are actionable within UWWTD Art. 12 and WRS Water-Efficiency First Principle guidelines (Section 2.2)⁷.

Consider iMERMAID's digital architecture as a reference model for data integrity and real-time compliance monitoring in UWWTD and the MSFD



With the revised UWWTD and Water Resilience Strategy requiring better performance reporting and public transparency, iMERMAID’s blockchain-secured monitoring platform, cloud data integration, and visualization dashboard offer a template for interoperable EU-wide systems⁸.

By adopting iMERMAID’s digital architecture as a reference model for data integrity and real-time compliance monitoring in the UWWTD guidance document (Art. 25) as well as its promotion in the Water Sector Digitalisation Action Plan (section 3.1). This adoption should also be paired with the revision of the article 11 of the MSFD.

⁷ iMERMAID. *System Dynamics Modelling and Scalability Assessment of Water Innovation Solutions*, 2024 ; iMERMAID. *Policy Integration Strategy and Roadmap for Innovation Uptake*, 2024.

⁸ iMERMAID. *Regulatory and Policy Gap Analysis: Alignment of iMERMAID Solutions with the EU Legislative Framework*. Deliverable D6.1, Horizon Europe iMERMAID Project, 2024 ; iMERMAID. *System Dynamics Modelling and Scalability Assessment of Water Innovation Solutions*, 2024 ; iMERMAID. *Policy Integration Strategy and Roadmap for Innovation Uptake*, 2024.

CMMI (Cyprus Marine and Maritime Institute) buoy tested in Amathus, Limassol (more info [here](#)).

Strengthen Source-to-Sea Coherence via MSFD Revision

The revision of the MSFD, announced for 2027, presents an opportunity to reinforce legal and monitoring coherence across the UWWTD, WFD, and MSFD for pollutants of emerging concern. UC 4 (Cyprus) piloted a buoy-based sensor for oil, and heavy metals, and linked satellite data for marine water quality⁹. It both supports the objectives set in the MSFD, the UWWTD and the WFD.

Moreover, iMERMAID shows the need for joined-up policies to handle CoECs, reuse, and digital monitoring from inland to coastal waters. iMERMAID monitoring (UC 2, UC 3, UC 4) reveals their widespread presence in water, sediment, and seafood. Current MSFD descriptors (D8, D9, D10) under-represent these substances¹⁰.

Create a Reference Framework for National Reuse and Monitoring Standards

Drawing from UC 2, UC 5, and D6.2 policy analysis, iMERMAID showcases a data architecture that bridges local reuse, national reporting, and cross-border consistency¹¹. There is a need to promote interoperable national platforms, supported by digital tools and flexible standards tailored to regional conditions.

To Go Further

Somrani, A.; Shabani, M.; Mohamed, Z.; Abohelal, K.; Alsharari, S.S.; Hannachi, A.; Ghaffour, N.; Pontié, M. *Dual Repurposing of End-of-Life BWRO Membranes: Ultrafiltration Membranes for Advanced Wastewater Treatment and Cation Exchange Membranes for Fungal Microbial Fuel Cells*. *Membranes* 2025, 15, 5. <https://doi.org/10.3390/membranes15010005>

Arnaković, S., Vujić, Đ., & Brkić, B. (2024). Computational Multiscale Study of the Interaction Between the PDMS Polymer and Sunscreen-Related Pollutant Molecules. *Molecules*, 29(20), 4908. <https://doi.org/10.3390/molecules29204908>

Reynoso, E. C., Sfragano, P., González-Perea, M., Palchetti, I., & Torres, E. (2024). Aptasensors for the Detection of Environmental Contaminants of High Concern in Water Bodies: A Systematic Review. *Chemosensors*, 12(59), 25. <https://doi.org/10.3390/chemosensors12040059>

⁹ iMERMAID. *Site-Specific Baseline of Contaminants of Emerging Concern in Water and Sediments*. Deliverable D1.2, Horizon Europe iMERMAID Project, 2024 ; iMERMAID. *Policy Integration Strategy and Roadmap for Innovation Uptake*, 2024.

¹⁰ iMERMAID. *Site-Specific Baseline of Contaminants of Emerging Concern in Water and Sediments*, 2024 ; iMERMAID. *Development and Deployment of Electrochemical Sensor Box for CoECs and Oil Monitoring*, 2024 ; iMERMAID. *Bioaccumulation and Biomagnification of Contaminants of Emerging Concern in Marine Food Webs*. Deliverable D2.3, Horizon Europe iMERMAID Project, 2024 ; iMERMAID. *Benchmarking and Analysis of current aspects, requirements, specifications & conceptual architecture*, Deliverable 4.2, January 2024.

¹¹ iMERMAID. *System Dynamics Modelling and Scalability Assessment of Water Innovation Solutions*, 2024 ; iMERMAID. *Regulatory and Policy Gap Analysis: Alignment of iMERMAID Solutions with the EU Legislative Framework*, 2024 ; iMERMAID. *Policy Integration Strategy and Roadmap for Innovation Uptake*, 2024.

Laschi, S., Sfragano, P., TADINI-BUONINSEGNI, F., GUIGUES, N., & Palchetti, I. (2024). Development of a flow system for decentralized electrochemical analysis of heavy metals using screen-printed electrodes: the importance of sensor stability. <https://doi.org/10.1039/D4AN00616J>

Permann-Doubkova, M., Armengaud, E., Urošević, V., Pontie, M., Christoforou, E., Hadjioannou, L., Flourentzou, N., & Barletta, S. (2024). iMERMAID: SMART SYSTEM TO SAFEGUARD THE MEDITERRANEAN SEA. EPOSS Annual Forum 2024 (EPOSS), Cork, Ireland. Zenodo. <https://doi.org/10.5281/zenodo.13348171>

ANNEX 3: Strengthening the Marine Strategy Framework Directive to tackle chemical pollution

The policy brief is available in its designed format on the following webpage:
<https://imermaid.eu/storage/2026/03/iMERMAID-PB-Strengthening-the-Marine-Strategy-Framework-Directive-to-tackle-chemical-pollution-FINAL-1.pdf>

iMERMAID is an EU-funded project focused on protecting the Mediterranean Sea basin, its sensitive ecosystems and the ecosystem services it provides, which play a crucial role in different socioeconomic activities. It addresses the growing threats of chemical contamination and pollution caused by human activities, with a particular focus on contaminants of emerging concerns. iMERMAID integrates innovative

strategies for prevention, monitoring, and remediation technologies, particularly around the Mediterranean Sea. This project builds upon the research and innovation activities of 11 projects.

This third policy brief aims to present iMERMAID recommendations for the revision of the [Marine Strategy Framework Directive](#) (MSFD) as planned in the [Water Resilience Strategy](#) (WRS) and the [European Ocean Pact](#). iMERMAID aligned its recommendations to the water acquis - [Urban Waste Water Treatment Directive](#) (UWWTD), the [Nitrates Directive](#), and the [Water Framework Directive](#) (WFD), to reinforce a *source-to-sea* approach and the coherence of the EU regulatory framework for marine and inland water.

The MSFD serves as the cornerstone of the EU's marine environmental policy, aiming to achieve *Good Environmental Status (GES)* of EU marine waters. However, growing pressures from Contaminants of Emerging Concern (CoECs), microplastics, nutrient discharges, and hazardous substances continue to threaten marine ecosystems, calling for a more integrated, digital, and science-based revision of the Directive.

Recommendations

- Strengthen MSFD Descriptors on Contaminants
- Adopt Ecosystem-Based Risk Indicators
- Mainstream Real-Time Monitoring Technologies
- Promote Cross-Border and Regional Innovation

Towards a Water-Smart MSFD: What can iMERMAID Teach Us?

iMERMAID demonstrates the power of marine-focused innovation to fill long-standing regulatory and monitoring gaps under the MSFD. Integrating digital tools, bioaccumulation insights, and stakeholder collaboration can help transform the MSFD into a more resilient, future-proof, and health-protective directive. The findings from iMERMAID can be clustered in 5 sections:

Advanced Monitoring for CoECs and Metals

iMERMAID deployed sensor boxes capable of real-time, electrochemical detection of CoECs (e.g. PFAS, pharmaceuticals, bisphenol A) and heavy metals (Cd, Pb, Cu) in multiple Mediterranean coastal sites. The sensors enable spatially explicit pollution tracking.

Bioaccumulation & Ecosystem Risk

Bioaccumulation and biomagnification are yet under-assessed as marine pollution challenges. Trophic transfer assessments in the Saronikos Gulf confirmed that PFAS and mercury persist in demersal species, with 75% of PFAS concentration levels exceeding EFSA-proposed Environmental Quality Standard (EQS) thresholds, despite being below seafood safety limits.

Sediment Contamination

Measures against marine litter do not fully account for CoECs. Baseline analyses revealed persistent CoECs in marine sediments, an environmental compartment not yet systematically monitored under MSFD despite its ecological relevance.

Policy Fragmentation

Legal analysis identifies inconsistent EQS values, monitoring frameworks, and reporting frequencies across MSFD, WFD, UWWTD, and the Nitrates Directive, particularly for CoECs, PFAS, and nutrient loads. The WRS and the planned revision of the MSFD aims to overcome this incoherence.

Stakeholder Engagement & Governance

Regional engagement strategies demonstrated the need for multi-level marine governance and tailored communication across scientific, municipal, and industrial stakeholders.

Advancing EU Marine Policy: Recommendations for the MSFD Revision

In addition to facilitating advanced coherence among directives, particularly the UWWTD, WFD, and the Nitrates Directive (for example, through joint reporting on eutrophication trends), iMERMAID established a series of recommendations.

Strengthen MSFD Descriptors on Contaminants

The current MSFD Descriptors, which address *contaminants in the environment and seafood*, should be updated in line with recent scientific insights and technological advances to:

- Include PFAS (eg. TFA) and other CoECs under core contaminant monitoring
- Establish marine-specific EQS, harmonised across directives
- Extend monitoring scope to include sediment-bound pollutants
- Promote cost-effective remediation technologies

To strengthen pollution monitoring in marine areas, we recommend a revision of the MSFD as follows:

- **Descriptor D8: Add PFAS, pharmaceuticals, heavy metals**
- **Descriptor D9: Add Bioaccumulation of CoECs in seafood**
- **Annex I: Expand pollutant list to CoECs**
- **Article 13 : encourage the use of decentralised remediation technologies.¹²**
- **Annex V: Add sediment matrices**
- **Cross-directive EQS: Harmonise with WFD & UWWTD**

Adopt Ecosystem-Based Risk Indicators

¹² The microfluidic photocatalytic reactors offer a targeted, point-of-source removal method for such contaminants before they reach marine environments.

Traditional chemical monitoring focuses on concentration thresholds in water or sediment, often neglecting trophic transfer, species exposure variability, and cumulative effects across ecosystems. The MSFD lacks sufficient:

- Integration Bioaccumulation & Biomagnification Metrics in MSFD Monitoring
- Support for Marine Ecotoxicology Research for Risk-Based Assessment
- Consideration of latest findings and coherence into National MSFD Reporting Frameworks

To align with the Zero Pollution Action Plan (ZPAP)'s objective to *minimise health and ecosystem exposure* to hazardous chemicals, we recommend a revision of the MSFD as follows:

- **Monitoring Programmes: include multi-species contaminant data focusing on demersal vs pelagic species; commercial vs non-commercial species, for example**
- **Articles 8, 11, 17: include bioaccumulation trend indicators in**
- **Policy Coherence: Align with the ZPAP and WFD bioindicator tools**

Mainstream Real-Time Monitoring Technologies

The MSFD, in its current form, relies mainly on conventional and periodic sampling protocols, often producing data that is spatially and temporally sparse, delayed in availability, and costly to maintain. At the same time, other EU water policies are moving toward early-warning systems, smart sensors, and real-time surveillance monitoring, particularly in pollution-prone or high-risk areas. iMERMAID develops digital tools such as portable electrochemical sensors and cloud-connected dashboards that are ready for wider policy uptake to improve detection, prevention and response to pollution events in coastal and marine environments, as well as at the source of pollution (e.g. WWTP).

To modernise marine environmental monitoring with a *source-to-sea* approach, we recommend:

- **Article 11: Integrate Real-Time Sensors into MSFD Monitoring Framework especially for pollution hotspots, vulnerable marine protected areas and Transitional water bodies with known CoEC burdens.**
- **Policy Coherence: Foster Interoperability with UWWTD and WFD Monitoring Schemes through data exchange and dashboard integration particularly for coastal areas.**
- **Regional cooperation: Leverage regional marine partnerships (e.g. under MSFD Regional Sea Conventions) particularly to build local capacity for maintenance and interpretation.**

Promote Cross-Border and Regional Innovation Uptake

The Mediterranean Sea faces transboundary marine pollution challenges, particularly from persistent organic pollutants, PFAS, and heavy metals originating from urban discharges, port activities, and agricultural runoff. Better transboundary cooperation is needed, particularly in the Mediterranean Sea region.

To maximise the EU's return on marine R&I investment and advance a coherent implementation of the MSFD, Horizon Europe Mission Ocean, and the EU Blue Economy Strategy, we recommend:

- **Stimulate in the next Multiannual Financial Framework the upscaling of successful pilots (e.g., pharmaceuticals, PFAS removal)**

- Stimulate cooperation with regional marine governance platforms and regional stakeholders such as the Union for Mediterranean Sea and the Committee of Regions associations for the Mediterranean Sea (ARLEM)
- Facilitate integration of project outcomes in data repositories like EMODnet, WISE-Marine, and Copernicus Marine as well as exchange of best practices at regional levels.

To go Further

- iMERMAID, [D1.3: Toolkit for Social Impact](#), May 2024
- iMERMAID, [D2.3: Bioaccumulation and potential for biomagnification of CoEC in Mediterranean Sea Waters](#), May 2025
- iMERMAID, [D3.2: PDP pilot module for remediation of organic CoEC](#), May 2025
- iMERMAID, [D3.3: 4DS Pilot equipment for heavy metal removal from demonstration sites](#), May 2025
- iMERMAID, [D4.1: Requirements and Design of the Use Cases](#), June 2024
- iMERMAID, [D4.2: Benchmarking and Analysis of current aspects, requirements, specifications & conceptual architecture](#), January 2024
- iMERMAID, [D5.1: White paper on upstream solutions](#), May 2024
- iMERMAID, [D5.2: Modelled Scalability of Solutions](#), November 2024

The Mediterranean Sea and its surrounding regions support a diverse variety of essential socioeconomic activities. It is one of the highly exploited water ways and the influence of anthropogenic activities on its marine habitats and ecosystems has grown significantly since the industrial revolution. Because of this, the Mediterranean Sea basin is very vulnerable to chemical contamination and build-up. To safeguard the Mediterranean Sea basin from contaminants for emerging concerns (CoEC), iMERMAID will integrate, coordinate, and synergize innovative preventive, monitoring, and remediation solutions. iMERMAID will build an evidence-based multidimensional framework that will guide policymaking and transform societal perceptions to reduce CoEC usage, emissions, and pollution. Furthermore, next generation sensor and remediation solutions will be developed within iMERMAID to monitor and remove prioritized chemicals from its source while reducing upstream pollution. iMERMAID builds an ideal interdisciplinary team by bringing together prominent SMEs, researchers, regulators, and innovation professionals who have been essential in improving the knowledge and awareness of CoEC. Beyond state-of-the-art techniques, iMERMAID will strive to strengthen regulations against CoEC, expand economic possibilities and competitiveness, improve the standard of living for EU residents, while preventing the accumulation of chemical pollution in the Mediterranean Sea basin. iMERMAID will empower the efforts to create a zero pollution, contaminant free waters by enabling the Chemical Strategy's goals to become a practical reality.



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