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COMMISSION STAFF WORKING DOCUMENT

on a Commission ex-ante analysis on the relevance of a new Knowledge and Innovation Community of the European Institute of Innovation and Technology on Water, Marine and Maritime Sectors and Ecosystems and confirming its launch in 2026

DISCLAIMER

The manuscript was completed on 27 May 2024.

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GLOSSARY

AI	Artificial Intelligence
BBNJ	Biological diversity of areas Beyond National Jurisdiction
C4T	Cohesion for Transitions
CEF	Connecting Europe Facility
CER	Critical Entities Resilience
CRISPR	Clustered Regularly Interspaced Short Palindromic Repeats
CSRD	Corporate Sustainability Reporting Directive
EC	European Commission
EEA	European Environmental Agency
EFAS	European Flood Awareness System
EIB	European Investment Bank
EIT	European Institute of Innovation and Technology
EMFAF	European Maritime, Fisheries and Aquaculture Fund
EMFF	European Maritime and Fisheries Fund
ERDF	European Regional Development Fund
ESC	European Solidarity Corps
EU	European Union
EUCRA	EU-wide Climate Risk Assessment
FORENV	EU Foresight System for the identification of emerging environmental issues and related opportunities and risks
GBF	Global Biodiversity Framework
GFM	Global Flood Monitoring
GloFAS	Global Flood Awareness System
GVA	Gross Value Added
ILVO	Institute for Agriculture, Fisheries and Food
IOG	International Ocean Governance
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IPCC	Intergovernmental Panel on Climate Change
IPOS	Intergovernmental Panel on Ocean Sustainability
JRC	Joint Research Centre
KIC	Knowledge and Innovation Community
KSO	Koster Seafloor Observatory
MPA	Marine Protection Area
MSCA	Marie Skłodowska-Curie Actions
MSFD	Marine Strategy Framework Directive
NGO	Non-governmental organisation
OECD	Organisation for Economic Co-operation and Development
OSPAR	Protection of the Marine Environment of the North-East Atlantic

PRIMA	Partnership for Research and Innovation in the Mediterranean Area
R&I	Research and Innovation
S3	Smart Specialisation Strategies
SDG	Sustainable Development Goal
SFDR	Sustainable Finance Disclosures Regulation
SIA	Strategic Innovation Agenda
SME	Small and Medium-sized Enterprise
STOA	Panel for the Future of Science and Technology of the European Parliament
SWD	Staff Working Document
UCPM	Union Civil Protection Mechanism
UN	United Nations
UNCLOS	United Nations Convention on the Law of the Sea
UNECE	United Nations Economic Commission for Europe
WEFE	Water-Energy-Food Ecosystem
WFD	Water Framework Directive
WMM	Water, Marine and Maritime

1. INTRODUCTION

1.1. Rationale and Purpose of the Staff Working Document

The legal basis of the European Institute of Innovation and Technology (EIT), the EIT Regulation¹ and the EIT Strategic Innovation Agenda (SIA) 2021-2027², provides for the setting up of a new Knowledge and Innovation Community (KIC) in the field of Water, Marine and Maritime (WMM) Sectors and Ecosystems.

The decision of the co-legislators to create this new WMM KIC³ is based on an extensive analysis contained in the impact assessment⁴ accompanying the Commission proposal for the EIT Regulation⁵ and the SIA⁶. The co-legislators subsequently supported the creation of a new WMM KIC in the EIT Regulation and the SIA. The challenges in the WMM field that the new KIC should tackle are described in detail in a factsheet featuring as Appendix 2 to the SIA (SIA factsheet).

The SIA factsheet describes the three macro-challenges to which WMM sectors and ecosystems are exposed, namely (1) Water scarcity, drought and floods; (2) Marine and freshwater ecosystem degradation; and (3) the circular and sustainable blue economy. The factsheet also elaborates on the relevance and impact of a future WMM KIC, as well as on synergies and complementarities with existing initiatives.

Given the time lapse between the adoption of the legal text in 2021 and the foreseen launch of the WMM KIC in 2026, the SIA stipulates that the Commission “with the assistance of independent external experts, shall carry out an ex-ante analysis by 2024 to evaluate the relevance of the WMM field”.

Against this background, the purpose of this Staff Working Document (SWD) is to carry out a Commission ex-ante analysis on the relevance of a new KIC on WMM Sectors and Ecosystems and to confirm the launch of the new WMM KIC in 2026.

In line with the provisions of the SIA, the present ex-ante analysis considers recent developments in scientific, technological and socio-economic trends and ensures full alignment

¹ Regulation (EU) 2021/819 of the European Parliament and of the Council of 20 May 2021 on the European Institute of Innovation and Technology (recast) PE/8/2021/REV/1 (OJ L 189, 28.5.2021, p. 61–90), <http://data.europa.eu/eli/reg/2021/819/oj>.

² Decision (EU) 2021/820 of the European Parliament and of the Council of 20 May 2021 on the Strategic Innovation Agenda of the European Institute of Innovation and Technology (EIT) 2021-2027: Boosting the Innovation Talent and Capacity of Europe and repealing Decision No 1312/2013/EU, PE/9/2021/REV/1 (OJ L 189, 28.5.2021, p. 91–118), <http://data.europa.eu/eli/dec/2021/820/oj>.

³ Working title.

⁴ SWD (2019) 330 final/2 – Commission Staff Working Document – Impact Assessment accompanying the document ‘Proposal for a Regulation of the European Parliament and of the Council on the European Institute of Innovation and Technology (recast)’ and ‘Proposal for a Decision of the European Parliament and of the Council on the Strategic Innovation Agenda of the European Institute of Innovation and Technology (EIT) 2021-27: Boosting the Innovation Talent and Capacity of Europe’.

⁵ Proposal for a Regulation of the European Parliament and of the Council on the European Institute of Innovation and Technology (recast), COM/2019/331 final, <https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=COM:2019:331:FIN>.

⁶ Proposal for a Decision of the European Parliament and of the Council on the Strategic Innovation Agenda of the European Institute of Innovation and Technology (EIT) 2021-2027: Boosting the Innovation Talent and Capacity of Europe COM/2019/330 final, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52019PC0330>.

with Horizon Europe (Strategic Plan, European Partnerships and their criteria, Missions) and coherence with other relevant initiatives which have been adopted since 2019.

In case of a positive assessment, the legal basis foresees that the EIT will organise a call for proposals in 2025 and launch the new KIC in 2026.

The results of the ex-ante analysis are also reflected in the Horizon Europe Strategic Plan 2025-2027⁷, which contains all new European Partnerships.

1.2. Policy Context

The ocean, seas and inland waters are essential for sustaining all life on Earth. They play a significant role in the Earth's climate and biodiversity. They are crucial for health, wellbeing and prosperity. They are also a vital source of food and renewable energy production, and a key driver of the global economy including for trade and transport.

Over the past century, freshwater and marine ecosystems have been under considerable stress due to the overuse and mismanagement of natural resources and changing land-sea uses. Global water resources are further impacted by climate change and pollution.

The European Union (EU) water-related⁸ policy rules protect water resources and ecosystems and ensure that drinking and bathing water is safe and clean. The **Water Framework Directive**⁹ (WFD) provides the overarching policy instrument for water policy in Europe. It protects inland surface water, transitional water, coastal water and groundwater and aims at preventing and reducing pollution, while ensuring a good environmental status for all water sources in the EU. Many targeted directives support the WFD, such as the Groundwater Directive¹⁰, the Environmental Quality Standard Directive¹¹, the Floods Directive¹², the Drinking Water Directive¹³, the Bathing Water Directive¹⁴, the Nitrates Directive¹⁵ and the Urban Waste-Water

⁷ https://managenergy.ec.europa.eu/publications/horizon-europe-strategic-plan-2025-2027_en.

⁸ Unless further specified (e.g., “freshwater”, “inland water” or “water” used in conjunction with established concepts and processes such as water scarcity or wastewater treatment), in the present Staff Working Document the term “water” is intended as encompassing fresh- and saltwater. The document nevertheless respects the original terminology on water from referenced and quoted initiatives, projects, policies, including the EIT legal basis.

⁹ Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (OJ L 327, 22.12.2000, p. 1–73), <https://eur-lex.europa.eu/eli/dir/2000/60/oj>.

¹⁰ Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration (OJ L 372, 27.12.2006, p. 19–31), <https://eur-lex.europa.eu/eli/dir/2006/118/oj>.

¹¹ Directive 2008/105/EC of the European Parliament and of the Council of 16 December 2008 on environmental quality standards in the field of water policy, amending and subsequently repealing Council Directives 82/176/EEC, 83/513/EEC, 84/156/EEC, 84/491/EEC, 86/280/EEC and amending Directive 2000/60/EC of the European Parliament and of the Council, (OJ L 348, 24.12.2008, p. 84–97), <https://eur-lex.europa.eu/eli/dir/2008/105/oj>.

¹² Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks (OJ L 288, 6.11.2007, p. 27–34), <http://data.europa.eu/eli/dir/2007/60/oj>.

¹³ Directive (EU) 2020/2184 of the European Parliament and of the Council of 16 December 2020 on the quality of water intended for human consumption (OJ L 435, 23.12.2020, p. 1–62), <https://eur-lex.europa.eu/eli/dir/2020/2184/oj>.

¹⁴ Directive 2006/7/EC of the European Parliament and of the Council of 15 February 2006 concerning the management of bathing water quality and repealing Directive 76/160/EEC (OJ L 64, 4.3.2006, p. 37–51), <http://data.europa.eu/eli/dir/2006/7/oj>.

¹⁵ Council Directive 91/676/EEC of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources (OJ L 375, 31.12.1991, p. 1–8), <http://data.europa.eu/eli/dir/1991/676/oj>.

Treatment Directive¹⁶. Furthermore, the **Marine Strategy Framework Directive**¹⁷ (MSFD) aims at protecting the marine ecosystem and biodiversity.

All these initiatives must be seen against the backdrop of the **European Green Deal**¹⁸, the flagship initiative of the European Union, aiming at making the EU's economy sustainable by turning climate and environmental challenges into opportunities across all policy areas. The water, marine, and maritime sectors and ecosystems play a critical role in various policies covered by the Green Deal, such as climate resilience, biodiversity conservation, circular and blue economy. As such, the WMM sector is fundamental for several initiatives including the EU Biodiversity Strategy for 2030¹⁹, the proposed Nature Restoration Law²⁰, the Farm to Fork Strategy²¹ and the Zero Pollution action plan²². The EU Common Fisheries Policy²³, the EU Maritime Policy²⁴ and related initiatives in the context of the broader Green Deal – the Sustainable Blue Economy Communication²⁵ and others²⁶ – aim at ensuring that the ocean resources are used sustainably, that coastal communities and the fishing sector have a prosperous future, and that policies stimulate a sustainable blue economy, both inside the EU and beyond.

¹⁶ Council Directive 91/271/EEC of 21 May 1991 concerning urban waste-water treatment (OJ L 135, 30.5.1991, p. 40-52), <http://data.europa.eu/eli/dir/1991/271/oj>.

¹⁷ Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (OJ L 164, 25.6.2008, p. 19–40), <https://eur-lex.europa.eu/eli/dir/2008/56/oj>.

¹⁸ Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions - The European Green Deal, COM/2019/640 final, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52019DC0640>.

¹⁹ Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - EU Biodiversity Strategy for 2030 - Bringing nature back into our lives, COM/2020/380 final, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52020DC0380>.

²⁰ Proposal for a Regulation of the European Parliament and of the Council on nature restoration, COM/2022/304 final, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52022PC0304>.

²¹ Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - A Farm to Fork Strategy for a fair, healthy and environmentally-friendly food system, COM/2020/381 final, <https://eur-lex.europa.eu/legal-content/AUTO/?uri=CELEX:52020DC0381&qid=1712312844574&rid=3>.

²² Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - Pathway to a Healthy Planet for All EU Action Plan: 'Towards Zero Pollution for Air, Water and Soil', COM/2021/400 final, <https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=COM%3A2021%3A400%3AFIN>.

²³ Communication from the Commission to the European Parliament and the Council - The common fisheries policy today and tomorrow: a Fisheries and Oceans Pact towards sustainable, science-based, innovative and inclusive fisheries management, COM/2023/103 final, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52023DC0103>.

²⁴ Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - Developing the international dimension of the Integrated Maritime Policy of the European Union, COM/2009/0536 final, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52009DC0536>.

²⁵ Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on a new approach for a sustainable blue economy in the EU Transforming the EU's Blue Economy for a Sustainable Future, COM/2021/240 final, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2021:240:FIN>.

²⁶ In particular, Directive 2014/89/EU of the European Parliament and of the Council of 23 July 2014 establishing a framework for maritime spatial planning (OJ L 257, 28.8.2014, p. 135); Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – Towards a Strong and Sustainable EU Algae Sector, COM 2022/592 final, <https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=COM:2022:592:FIN>; Communication from the Commission to the European Parliament and the Council - The common fisheries policy today and tomorrow: a Fisheries and Oceans Pact towards sustainable, science-based, innovative and inclusive fisheries management, COM/2023/103 final, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52023DC0103>; Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the Energy Transition of the EU Fisheries and Aquaculture sector, COM/2023/100 final, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52023DC0100>; Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – EU Action Plan: Protecting and restoring marine ecosystems for sustainable and resilient fisheries, COM/2023/102 final, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52023DC0102>; European Parliament Report on the implementation of the Common Market Organisation (CMO) Regulation in fisheries and aquaculture – Regulation (EU) 1379/2013 (2023/2049(INI)); European Parliament resolution of 16 January 2018 on international ocean governance: an agenda for the future of our oceans in the context of the 2030 SDGs (2017/2055(INI)).

Research and innovation (R&I) play a key role in enabling the Green Deal transformation by developing new knowledge and innovative solutions to optimise water use so that we protect, restore and sustainably manage marine, inland and coastal ecosystems and prevent pollution. Investing in marine and maritime research and innovation is not only essential for understanding the marine environment, and its role in the Earth system, but also creates the blue economy of the future. It is also key to achieving Europe's ambition of becoming the first climate-neutral continent in the world by 2050, including through renewable energy (e.g., offshore renewables, hydropower).

The European Union has been supporting collaborative research and innovation projects in the area of marine and freshwater via its framework programmes for research and innovation – currently through **Horizon Europe** (2021-2027). Under Horizon 2020, the EU Framework Programme for Research and Innovation for 2014-2020, a total amount of approximately EUR 1 350 million was committed for research and innovation projects in the field of freshwater and EUR 2.5 billion for projects on marine and maritime.

Notably, the EU contributes to the preservation, restoration and sustainable use of aquatic resources through key initiatives under Horizon Europe, such as **Missions, Partnerships and Clusters**. The EU Mission Restore our Ocean and Waters²⁷ protects and restores the health of our ocean, seas and waters by connecting people and places, where the transitions need to happen, with the necessary knowledge and tried-and-tested solutions for restoration measures. The EU Mission A Soil Deal for Europe²⁸ contributes, among other things, to the provision and storage of clean water by developing and promoting innovative solutions for sustainable soil management. Relevant European partnerships include the Sustainable Blue Economy Partnership²⁹ to boost the transformation towards a climate-neutral, sustainable, productive and competitive blue economy, the Biodiversity Partnership³⁰ to contribute to the goals of the EU Biodiversity Strategy for 2030, the Water Security for the Planet (Water4All) Partnership³¹ to advance scientific research in freshwater, the Partnership for Research and Innovation in the Mediterranean Area (PRIMA)³² to consider the Water-Energy-Food-Ecosystem (WEFE) Nexus in the Mediterranean area, or the Zero-Emission Waterborne Transport Partnership³³ to eliminate harmful environmental emissions from maritime and inland waterborne transport. Finally, Cluster 6 (Food, Bioeconomy, Natural Resources, Agriculture and Environment), the European Research Council, Marie Skłodowska-Curie Actions (MSCA) and the European Innovation Council also address water-related issues through their various actions and projects.

²⁷ European Commission. EU Mission: Restore our Ocean and Waters. https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/eu-missions-horizon-europe/restore-our-ocean-and-waters_en.

²⁸ European Commission. EU Mission: A Soil Deal for Europe. Retrieved from: https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/eu-missions-horizon-europe/soil-deal-europe_en.

²⁹ <https://bluepartnership.eu/>.

³⁰ <https://www.biodiversa.eu/>.

³¹ <https://www.water4all-partnership.eu/>.

³² https://research-and-innovation.ec.europa.eu/research-area/environment/prima_en#what-is-prima.

³³ <https://www.waterborne.eu/partnership/partnership>.

Other EU funding instruments also contribute to implementing EU policies in the field of water, marine and maritime ecosystems, such as the Cohesion Fund, the European Regional Development Fund (ERDF), the European Maritime, Fisheries and Aquaculture Fund (EMFAF), LIFE 2027 (Programme for the Environment and Climate Action), the Connecting Europe Facility (CEF), the Erasmus+ programme and the European Solidarity Corps (ESC).

The increasing importance of the field of water is further underlined by the fact that the 2023 edition of the **EU Strategic Foresight Report**³⁴ mentions water as one of the strategic sectors in which the EU and its Member States ought to develop tools to assess future dependencies and work to achieve economic security. As the Report underlines, “large-scale action is needed to strengthen EU’s water-resilience, by addressing pollution and the increasing demands by agriculture, energy production, industry, or households. Measures to improve the governance of water (including appropriate pricing and allocation mechanisms), its efficient use, the development of sustainable alternative sources, the elimination of water pollution, and ensuring equal access are key”³⁵.

Finally, the EU’s 2022 **Communication for a strategy for the outermost regions**³⁶ recommends capitalising on their assets, such as their extensive maritime economic zones³⁷ as well as their exceptionally high biodiversity value and expertise in marine science and technologies, while also promoting research and innovation in sustainable blue economy.

1.3. The innovation model of the European Institute of Innovation and Technology (EIT)

The European Institute of Innovation and Technology (EIT) was created in 2008. Its mission is to contribute to sustainable economic growth and competitiveness by reinforcing the innovation capacity of the Member States and the Union in order to address major challenges faced by society. Since 2021, the EIT has been part of Horizon Europe Pillar III “Innovative Europe”.

The EIT implements its mission through Knowledge and Innovation Communities (KICs). They are large-scale partnerships bringing together education institutions, research organisations and companies from across Europe, integrating the so-called “knowledge triangle”. Each KIC works in a specific sector addressing a specific societal challenge. The topics and the timing of the launch of new KICs are identified in the EIT legal basis. KICs are selected on the basis of open, transparent and competitive calls managed by the EIT.

³⁴ Communication from the Commission to the European Parliament and the Council - 2023 Strategic Foresight Report Sustainability and people's wellbeing at the heart of Europe's Open Strategic Autonomy, COM/2023/376 final, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2023%3A376%3AFIN>.

³⁵ Ibid, under point 4. Supporting shifts in production and consumption towards sustainability, pages 15 and 16.

³⁶ Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions Putting people first, securing sustainable and inclusive growth, unlocking the potential of the EU’s outermost regions, COM/2022/198 final, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2022:198:FIN>.

³⁷ The combined exclusive economic zones of the outermost regions account for over half of such zones in the EU.

KICs are institutionalised Horizon Europe partnerships. They are autonomous and have their own legal entities and governance systems. They work on the basis of their Strategic Agendas and annual Business Plans. The EIT's annual financial contributions to the KICs are performance-based. The performance of the KICs is assessed and supervised by the EIT Governing Board where the Commission is represented as an observer. The Commission has no right to vote in the Governing Board, however, the agreement of the Commission is needed for certain strategic decisions of the Governing Board.

The KICs have a long-term, 15-year partnership with the EIT. After 15 years of EIT funding, the KICs should become financially sustainable. To this end, each KIC develops and implements a revenue-generating strategy to maintain its innovation ecosystem and activities beyond the 15-year funding period. At the end of the partnership agreements, a KIC can sign a Memorandum of Cooperation with the EIT to keep its ties with the EIT Community.

Each KIC has a vast portfolio of activities with the ultimate goal to create a strong pan-European innovation ecosystem in its respective field of operations. KICs follow a place-based approach and have a network of offices across Europe, considering the capacity gaps between different regions. They offer education programmes for master and doctoral students with a strong entrepreneurial dimension to train the innovators of the future as well as short-term training programmes for professionals. They fund innovation-driven research projects, and they offer business creation and acceleration services to start-ups and scale-ups to deploy innovative solutions and bring new innovative products and services to the market.

The EIT also makes sure that KICs cooperate with each other. EIT Community activities involve all KICs, for instance on international strategic outreach activities³⁸, on cross-cutting topics such as artificial intelligence (AI), the New European Bauhaus or on horizontal priorities such as women entrepreneurship and leadership. Another example of such activities is the EIT Regional Innovation Scheme, a joint KIC effort to reduce the innovation divide in Europe, including in remote and outermost regions³⁹.

2. COMMISSION EX-ANTE ANALYSIS

2.1. Scope of the ex-ante analysis

The present ex-ante analysis focuses on developments since 2019⁴⁰ in scientific, technological and socio-economic trends within the WMM field in order to 1) assess its relevance for a KIC and 2) the suitability of the EIT model for the specific field as well as the 3) potential of a WMM

³⁸ [Global Outreach | EIT \(europa.eu\)](https://eit.europa.eu/global-outreach).

³⁹ EIT (2024). An EIT Strategy to boost engagement with the EU Outermost Regions. <https://eit.europa.eu/sites/default/files/2024-02/EIT%20Strategy%20for%20the%20EU%20Outermost%20Regions%20%2B%20Annexes%20%28Final%29.pdf>.

⁴⁰ Cut-off date in the preparation of the impact assessment for the SIA and the EIT Regulation.

KIC to address the current major societal challenges, in synergy and complementarity with other relevant initiatives.

The factsheet on the WMM KIC in Appendix 2 to the SIA, as well as the underlying findings of the Commission impact assessment preceding the SIA, served as a starting point of the analysis.

In this context, it is important to underline that the co-legislators did not mandate the Commission to perform a fully-fledged impact assessment on the relevance of a KIC in the WMM field but rather to carry out a well targeted ex-ante analysis as described above.

2.2. Independent Study

In line with the provisions of the legal basis, the independent study⁴¹ (hereinafter referred to as “the study”), performed by an external contractor under the Commission Framework contract CINEA/2021/OP/001, is an important part of the Commission ex-ante analysis. Its key findings and conclusions are considered as a basis for the present SWD. The full study is also publicly available⁴².

The study was kicked off in June 2023 and finalised in February 2024. The Commission followed and monitored closely the contractor’s delivery on the study. The study methodology⁴³ used for collecting and assessing data is based on a combination of desk research and stakeholder interviews.

The desk research involved an extensive review of scientific documents (peer-reviewed journals, academic publications, conference proceedings, etc), policy documents (EU legislation, initiatives, guidelines, etc.) and grey literature (reports, white papers, etc.).

The objective of the stakeholder interviews was to gain insights from experts and practitioners in the WMM field. The choice of the interviewed stakeholders ensured a balance in terms of types of stakeholders, fields of expertise and geographical coverage. The interviews were semi-structured, allowing for flexibility in exploring key themes. The contractor compared the themes and patterns emerging from the interviews with their desk research findings to validate and complement them, to address knowledge and data gaps as well as to ensure the overall reliability and coherence of the study.

2.3. Assessment

This chapter is split into **three subchapters** which mirror the key issues at stake, as identified in the SIA factsheet:

⁴¹ European Commission (2024). Study on the relevance of the proposed future EIT KIC - Water, Marine and Maritime Sectors and Ecosystems (WMM), Under the Framework Contract CINEA/2021/OP/0011, Lot 2: Sustainable Blue economy and ocean affairs. Luxembourg: Publications Office of the European Union. <https://data.europa.eu/doi/10.2766/831555>.

⁴² Ibid.

⁴³ For more details we refer to the independent study.

- the analysis of the challenges faced by the WMM field (2.3.1),
- the analysis of the potential relevance and impact of a WMM KIC (2.3.2)
- and the synergies and complementarities with existing initiatives (2.3.3).

Each subchapter starts with a presentation of the respective issue, as described in the **SIA factsheet**. Against this baseline scenario, the assessment then outlines the **key findings of the study**, as summarised by the Commission in virtue of their illustrative nature and with the intent to present the main findings of the study. However, this summary does not present a complete picture. The Commission refers to the full study for a thorough and more in-depth analysis.

In addition, **the Commission provides further considerations** as complementary supporting elements for each subchapter and presents its **conclusions** on the specific matter.

At the end of the document, the Commission provides its **overall conclusions**.

2.3.1 Challenges faced by water, marine and maritime sectors and ecosystems

2.3.1.1. First challenge: Water scarcity, drought and floods

The SIA Factsheet

The SIA factsheet underlines that “continued climate change and over-extraction of fresh water are increasing the severity and frequency of water scarcity and droughts. Without innovative methods and technologies to gather, predict, prepare and disseminate information and solutions about waterbody safety, potential threats and mitigation of risks, the Union is exposed to severe economic and social harm. Water scarcity accompanies the pressure on land driven by the need to increase biomass production, carbon sequestration and wilderness to achieve decarbonisation and biodiversity targets. The Commission’s [SIA] impact assessment indicates that shifting protein production to non-fed aquaculture and to integrated multi-trophic aquaculture and aquaponics, could relieve pressure on land and freshwater.”

Key findings from the study

Scientific developments

According to the study, scientific developments since 2019 have shown that research is increasingly focusing on understanding the **influence of human activities on water-related risks**, with a growing number of researchers analysing, for example, the interplay between human activities and the dynamics of drought⁴⁴. The study also underlines that research is growingly analysing the relationship between **climate change and water-related disasters**, such as droughts and floods. For instance, the EU project PESETA IV⁴⁵ uses climate modelling

⁴⁴ Savelli, E., Rusca, M., Cloke, H. and Di Baldassarre, G. (2022). Drought and society: Scientific progress, blind spots, and future prospects. Volume 13 Issue 3. Retrieved from <https://wires.onlinelibrary.wiley.com/doi/full/10.1002/wcc.761>.

⁴⁵ https://joint-research-centre.ec.europa.eu/peseta-projects/jrc-peseta-iv_en.

tools to get an overview of current and future climate conditions as well as provide valuable data on the outlook for water resources.

Technological developments

Based on a review of the available literature, the study highlights that recent technological developments since 2019 have served **two main objectives**: (1) the transition to a water-efficient and water-saving economy relating to water scarcity and droughts, and (2) the improvement of the EU's prevention, preparedness, and overall resilience regarding water-related disasters in connection to droughts and floods.

Regarding the **(1) first objective on the transition to a water-efficient and water-saving economy relating to water scarcity and droughts**, the study elaborates on various recent trends towards a water-efficient and water-saving economy.

First, it refers to circular water technologies. The SIA impact assessment singled out **water supply and wastewater treatment** as the sector with the most significant market potential for water-related technologies in the EU. According to the study, this remains relevant and applicable today, as indicated by the Global Cleantech Report covering the years 2019 to 2023⁴⁶.

Second, the study underlines that **digital solutions for water management** have gained momentum from 2020 onwards, spurred by the COVID-19 crisis. This drive for digitalisation aligns closely with the EU's Digital Decade⁴⁷, which aims to use digital technologies for enhanced sustainability, efficiency, and resilience across industries, including for water management. The study highlights, in particular, several Horizon 2020 projects, which apply technologies such as low-cost sensors, big data analytics, consumer applications, or innovative leak detection⁴⁸. These projects are part of the ICT4WATER cluster⁴⁹, which serves as a central hub for EU-funded research and innovation endeavours in the field, all of which underscore the need for digital transformation in advancing the water sector. Moreover, the study mentions progress in digitalisation in agriculture specifically, the primary water consumer in the EU, with cutting-edge technologies like the Internet of Things, AI, cloud computing, and edge computing to enhance land productivity and irrigation efficiency⁵⁰. However, the study also acknowledges that the digital transformation is causing an increased vulnerability to cyberattack. Idrica's report on Water Technology Trends 2023⁵¹ indicates that, in recent years, water utility providers

⁴⁶ Cleantech Group (2023). 2023 Global Cleantech 100 Report. Retrieved from <https://tech2.cleantech.com/2023-global-cleantech-100-download-final-0-0>.

⁴⁷ European Commission. Europe's Digital Decade, <https://digital-strategy.ec.europa.eu/en/policies/europes-digital-decade>.

⁴⁸ They promise more efficient water monitoring and usage (SIM4NEXUS), and treatment (SMART-Plant, INNOQUA, INCOVER), while also addressing pollution (INTCATCH), resource recovery and water loss reduction (SWAMP).

⁴⁹ See its vision and showcases at European Commission (2021). ICT4WATER cluster – Vision and showcases. Retrieved from <https://op.europa.eu/en/publication-detail/-/publication/3ff7b5db-91c7-11eb-b85c-01aa75ed71a1/language-en/format-PDF/source-199680009>.

⁵⁰ Water News Europe. (2023). Smart irrigation saves water with state-of-the-art technology. Retrieved from <https://www.waternewseurope.com/smart-irrigation-saves-water-with-state-of-the-art-technology/>.

⁵¹ <https://www.idrica.com/resources/water-technology-trends-2023/>.

have been following a trend seen in other sectors like banking and energy and have begun to invest more resources into strengthening their cybersecurity measures.

Third, the study underlines that there has been a significant focus on exploring **novel and unconventional sources of water**. **Desalination**, the process of converting saltwater into drinking water, in particular, has become a key technology. Traditionally, desalination used to be prevalent in arid regions, but global concerns about water scarcity have prompted interest in this technology even in milder climates in Northern Europe⁵². The study highlights the fact that desalination technologies come with high costs and high energy consumption⁵³, referring to projects that address these challenges, in particular the EU projects Water2Water⁵⁴ and SonixED⁵⁵.

Finally, under this first objective of technological developments, the study recognises the great potential of the **water-energy nexus** for industrial applications⁵⁶ as shown by the United Nations World Water Development Report 2023⁵⁷. For instance, the study mentions harnessing solar energy to extract drinking water from the atmosphere⁵⁸, as well as floating solar panels on hydroelectric reservoirs⁵⁹. The study also recognises the importance of an extended Water-Energy-Food-Ecosystem nexus, highlighting for instance the work under PRIMA.

As for technological developments for the **(2) second objective on the improvement of the EU's prevention, preparedness and overall resilience regarding water-related disasters in connection to droughts and floods**, the study highlights three developments.

Firstly, it refers to the importance of technologies related to **drought and flood forecasting**. In particular, the study mentions the Global Flood Monitoring (GFM) tool as a pivotal component of the European and Global Flood Awareness Systems (EFAS & GloFAS)⁶⁰, introduced by the Commission's Joint Research Centre (JRC) in 2021.

Secondly, the study observes a notable focus on enhancing the technologies that are at the heart of EU tools for water-related **disaster prevention and preparedness**. This has led to

⁵² Cassauwers, T. (2022). Fresh-water scarcity prompts hunt for more from the air and sea. *Horizon: The EU Research & Innovation Magazine*. Retrieved from <https://ec.europa.eu/research-and-innovation/en/horizon-magazine/fresh-water-scarcity-prompts-hunt-more-air-and-sea>.

⁵³ In addition, the Commission highlights that the sustainability of the technology is a critical issue also due to the impact of the brines produced through the process with very high salinity and chemicals. New trends show interest in exploiting the brines as a source of minerals which is addressed in projects like Water-Mining, SEA4VALUE or SEARcularMINE.

⁵⁴ <https://cordis.europa.eu/project/id/873854>.

⁵⁵ <https://cordis.europa.eu/project/id/969116>.

⁵⁶ The Commission highlights, in this context, the importance of sustainable hydropower. The role and relevance of hydropower is explained, for instance, in the Directive (EU) 2018/2021 on the promotion of the use of energy from renewable sources. Relevant R&I projects are funded under Horizon Europe, for example the project Hydro4U on sustainable small-scale hydropower in Central Asia.

⁵⁷ United Nations (2023). UN World Water Development Report. Retrieved from <https://www.unwater.org/publications/un-world-water-development-report-2023#:~:text=As%20the%20UN%20system's%20principal,are%20essential%20to%20accelerating%20progress>.

⁵⁸ Lord, J., et al. (2021). Global potential for harvesting drinking water from air using solar energy. *Nature*, 598 p.611–617. Retrieved from <https://www.nature.com/articles/s41586-021-03900-w>.

⁵⁹ Mentioning, for instance, the following publication: Joint Research Centre. (2021). Floating solar panels on African hydropower reservoirs. Retrieved from https://joint-research-centre.ec.europa.eu/jrc-news-and-updates/floating-solar-panels-african-hydropower-reservoirs-2021-02-26_en.

⁶⁰ The European and Global Flood Awareness Systems (EFAS & GloFAS) provide a wide range of flood forecasting products to support authorities and international organisations in better preparing for floods. Both systems are fully operational as part of the Copernicus Emergency Management Service (<https://emergency.copernicus.eu/>). Retrieved from <https://european-flood.emergency.copernicus.eu> and <https://global-flood.emergency.copernicus.eu/>.

breakthroughs like the European Coastal Flood Awareness System⁶¹, the Risk Data Hub⁶² and the European Drought Observatory⁶³, with the latter being currently upgraded in the framework of the EU project EDORA⁶⁴.

Thirdly, the study underlines the importance of **drought-tolerant crops**. Given the projected increase in drought-related challenges, the study says that the development of drought-resistant crops is eagerly awaited. According to the study, new genomic techniques have emerged as a promising area of research and innovation for crop enhancement, in line with the Commission's proposal for resilient plants amid climate change⁶⁵. In addition, in the last three years, research papers exploring methods such as Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR) to modify drought-tolerant genes have proliferated⁶⁶.

Socio-economic developments

Regarding the socio-economic developments, the study focuses on three trends.

Firstly, it refers to **dietary shifts** that can help reduce water scarcity as plant-based food has a lower water footprint compared to animal-based products. Sales of plant-based food are on the rise in Europe, with a 21% growth since 2020. According to a recent report by the Good Food Institute⁶⁷ in 2022, plant-based food accounted for 6% of the pre-packaged meat market in 13 European countries, with a growing trend, and plant-based seafood and cheese have shown a remarkable double-digit growth between 2020 and 2022⁶⁸.

Secondly, the study underlines the potential of a **stronger social acceptance** of water recycling and wastewater reuse, which has often been perceived as a challenge for large-scale water recycling projects and which, according to recent surveys, seems to become less controversial⁶⁹.

Thirdly, the study highlights the potential impact of **citizen science** in supporting drought and flood risk reduction. It mentions the importance of a participative approach and of awareness raising campaigns, which can improve transparency, foster trust and strengthen the credibility of water resource management practices. For example, public engagement in addressing the link between water and climate change is actively encouraged through the EU Climate Pact⁷⁰, which

⁶¹ <https://www.ecfas.eu/products-and-dataset/the-ecfas-platform/>.

⁶² [DRMKC Risk Data Hub \(europa.eu\)](#).

⁶³ <https://edo.jrc.ec.europa.eu/edov2/php/index.php?id=1000>.

⁶⁴ <https://edo.jrc.ec.europa.eu/edora/php/index.php?id=201>.

⁶⁵ European Commission (2023). Q&A: Addressing Water Scarcity and Droughts in the EU. Retrieved from https://ec.europa.eu/commission/presscorner/detail/en/qanda_23_3568.

⁶⁶ Rai, G. K., et al. (2023). Enhancing Crop Resilience to Drought Stress through CRISPR-Cas9 Genome Editing. *Plants*, 12(12), 2306. <https://doi.org/10.3390/plants12122306>.

⁶⁷ GFI Europe (2023). Plant-based sales boast 21% growth since 2020. Retrieved from <https://gfieurope.org/blog/plant-based-sales-in-europe-22-growth/>.

⁶⁸ *ibid.*

⁶⁹ Water Reuse Europe (2021). New surveys reveal that social acceptance of water reuse isn't biggest challenge. Retrieved from <https://www.water-reuse-europe.org/new-surveys-reveal-that-social-acceptance-of-water-reuse-isnt-biggest-challenge/#page-content>.

⁷⁰ Retrieved from https://climate-pact.europa.eu/index_en.

has recently initiated a water awareness campaign⁷¹. These are also powerful tools for encouraging behavioural changes. In this context, the study gives some recent and promising examples of citizen observatories⁷², such as the Citizen Observatory on Drought⁷³.

In addition, the study refers to the fact that the **economic value** of ecosystem services⁷⁴ in relation to drought and flood impacts is not adequately quantified. While the study underlines ongoing efforts to measure the costs of inaction⁷⁵, it also highlights that it is crucial to conduct research that estimates the economic losses associated with the disruption or degradation of ecosystem services accurately during drought and flood events. The discussion also revolves around the broader issue of water management. Thus, the study underscores the need for integrated, cross-disciplinary, and cross-sectoral approaches, which could potentially have implications for water pricing policies in the future. This information can guide decision-making processes and facilitate the inclusion of ecosystem values in policy frameworks.

To conclude on this challenge, while it is premature to reliably quantify the impact of the recent scientific, technological and socio-economic developments and solutions, the study refers to further cross-cutting considerations on the challenge of water scarcity, drought and floods. For example, the study says that **further research and innovation** on this challenge are needed, as it is expected to persist and grow. In this context, the study elaborates on several research needs (e.g., the impact of water scarcity and droughts on water quality) as well as on the long-term ecological consequences of extreme events like droughts that can lead to shifts in species composition, changes in habitat structures, and alterations in ecosystems.

2.3.1.2. Second challenge: Marine and freshwater ecosystem degradation

The SIA Factsheet

The SIA factsheet stresses that “coastal, marine and freshwater ecosystems are subject to pressure from direct human activity and accelerating climate change. The damage includes the loss of biodiversity, the depletion of fish stocks, damage to the sea floor, including from the use of harmful devices such as fishing gear, obstruction of rivers, eutrophication pollution, and the accumulation of marine litter including a high level of fishing gear and microplastics that are discarded in the ocean. Poor ecological health not only compromises biodiversity targets but also harms those communities and businesses that depend on clean water and healthy ecosystems.

⁷¹ United Nations. (n.d.). EU Climate Pact Ambassadors raising awareness of the linkages between water and climate. UN Sustainable Development Goals - Partnerships for the Goals. Retrieved from <https://sdgs.un.org/partnerships/eu-climate-pact-ambassadors-raising-awareness-linkages-between-water-and-climate>.

⁷² <https://eu-citizen.science/project/285>.

⁷³ <https://www.creaf.cat/citizen-observatory-drought>.

⁷⁴ Ecosystem services are services that an ecosystem supplies, on which humans depend and from which they benefit. Ecosystem services from which humans' benefit are often categorised as follows: provisioning services such as food, water, wood, fibre and genetic resources; regulating services such as climate, floods and disease regulations and water quality; cultural services such as recreation and ecotourism; supporting services such as soil formation, pollination and nutrient cycling. Retrieved from [Ecosystem services - EUR-Lex \(europa.eu\)](https://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&code=sdg13.1.1).

⁷⁵ Joint Research Centre. (2022). Adapting to rising river flood risk in the EU under climate change. PESETA IV Task 5: River Floods - Final Report. Retrieved from https://joint-research-centre.ec.europa.eu/document/download/f4019433-4776-4366-994a-7f4955d6815d_en?filename=pesetaiv_task_5_river_floods_final_report.pdf.

The global market for goods and services for measuring and mitigating that degradation is growing and is highly competitive. Innovation that can enhance, restore and recover marine, coastal and freshwater capital and innovation into sustainable fishing gear and methods is key for the competitiveness of Union businesses and to supporting jobs and growth across the Union.”

Key findings from the study

According to the study, the problems around marine and freshwater ecosystem degradation mentioned in the SIA factsheet have been long-standing and, in recent years, there have been increased attempts to tackle them.

Scientific developments

The study reports that a significant contribution to recent scientific developments in the field of marine and freshwater ecosystem degradation comes from the **EU Mission Restore our Ocean and Waters**⁷⁶. The Mission supports, in particular, the restoration of ocean and water health through the development, demonstration and deployment of research and innovation solutions to protect and restore ecosystems and biodiversity, prevent and eliminate pollution and make the blue economy climate-neutral and circular. A portfolio analysis of 16 EU programmes published in June 2023⁷⁷ has identified over 800 EU-funded projects contributing to the objectives of the Mission.

The study finds that, in recent years, research has been focusing on understanding **long-term degradation processes** that impact marine and freshwater ecosystems. For example, research initiatives have been initiated to tackle the rising levels of **marine litter**, including plastic pollution, and to assess their potential impact on ecosystems and human health⁷⁸. According to the study, scientific research warns about the threat of **eutrophication**⁷⁹ from agricultural practices, as well as different forms of pollution affecting marine environment thus emphasising the need for a comprehensive ecosystem management⁸⁰. Pollution from **nutrients and chemicals** is still at the core of water management challenges that put European water bodies most at risk of not achieving key environmental objectives, as illustrated in a current overview report of the European Environmental Agency (EEA)⁸¹. Moreover, the study also mentions **noise**

⁷⁶ This EU Mission addresses also the other two challenges mentioned in this ex-ante analysis but is mentioned here because restoring water ecosystems is at its core.

⁷⁷ European Commission (2023). New report analysing the contribution of over 800 EU-funded projects to the Mission “Restore our Ocean and Waters” published. Retrieved from https://research-and-innovation.ec.europa.eu/news/all-research-and-innovation-news/new-report-analysing-contribution-over-800-eu-funded-projects-mission-restore-our-ocean-and-waters-2023-06-01_en.

⁷⁸ Maes, T., Perry, J., Alliji, K., Clarke, C., and Birchenough, S. N. R. (2019). Shades of grey: Marine litter research developments in Europe. *Marine Pollution Bulletin*, p.146.

⁷⁹ Eutrophication is commonly caused by a surplus of nutrients from agricultural practices and known to affect the marine environment creating dead zones.

⁸⁰ Kothawala, D. N., Kellerman, A. M., Catalán, N., and Tranvik, L. J. (2021). Organic matter degradation across ecosystem boundaries: The need for a unified conceptualization. *Trends in Ecology & Evolution*, 36(2), p.113-122.

⁸¹ European Environment Agency (2021). Drivers of and pressures arising from selected key water management challenges — A European overview, 69 pp. Retrieved from <https://www.eea.europa.eu/publications/drivers-of-and-pressure-arising>.

pollution in the context of the 2022 Zero Pollution Outlook report⁸². However, it does not address it further due to the unavailability of data. Thus, noise pollution, including underwater noise pollution, requires further research and data collection.

The study also mentions developments on the **way research is designed and conducted**, for example in the project BiodivRestore⁸³, which promotes coordinated international research on conservation and restoration of degraded ecosystems and their biodiversity, with a focus on aquatic systems. In this context also the INDECOSTAB⁸⁴ project is mentioned. It develops new ways of predicting upcoming large ecological changes in coral reefs, using a model that has previously been used for terrestrial systems only.

Technological developments

On the technological side of developments, the study underlines that, in recent years, many new tools, devices, and technologies have been developed that aim to find solutions to the challenges at hand.

The **European Digital Twin of the Ocean**⁸⁵ initiative, developed under the EU Mission Restore our Ocean and Waters, aims at making ocean knowledge readily available to citizens, entrepreneurs, scientists and policymakers. It provides them with an innovative set of user-driven, interactive visualisation tools that supports them in their decision making, allowing them to assess the impacts of their decisions, in terms of sustainability, efficiency, effectiveness and durability, under different possible future scenarios (climate change, ecosystems adaption, anthropogenic pressures, etc.).

The study also highlights that developments on marine **litter, including (micro- and nano-) plastics** have gained attention over the past few years⁸⁶. It refers to several EU-funded projects that tackle this problem. For example, the LABPLAS project⁸⁷ develops new techniques and models for the quantification of micro- and nano-plastics, while the REMEDIES⁸⁸ project aims to restore our seas and rivers through deploying (micro)plastic litter valorisation and prevention pathways. The study mentions that the JRC has developed a modelling tool to identify the distribution and accumulation of floating marine litter⁸⁹. It also includes litter-related EU-funded

⁸² European Commission. Zero Pollution Outlook 2022. Retrieved from https://joint-research-centre.ec.europa.eu/scientific-activities-z/zero-pollution-outlook-2022_en.

⁸³ <https://www.era-learn.eu/network-information/networks/biodivrestore>.

⁸⁴ <http://indecostab.eu/>.

⁸⁵ The Digital Twin of the Ocean project is a main element of the Digital Ocean Knowledge System under the EU Mission Restore our Ocean and Waters.

⁸⁶ The Commission furthermore highlights that beyond the mentioned micro- and nano-plastics, it is important to consider the wider context of emerging pollutants, including Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS) and pesticides. These challenges also have a market potential both in terms of de-pollution and of development of safer alternatives.

⁸⁷ <https://labplas.eu/>.

⁸⁸ <https://remedies-for-ocean.eu/>.

⁸⁹ Joint Research Centre. (2020). New Modelling Tool to Identify Distribution and Accumulation of Floating Marine Litter. Retrieved from https://joint-research-centre.ec.europa.eu/jrc-news-and-updates/new-modelling-tool-identify-distribution-and-accumulation-floating-marine-litter-2020-04-07_en.

projects focusing on freshwater. For instance, the BMReX project⁹⁰ is developing a biocatalyst-based membrane reactor technology to remove micro- and nano-plastics from household and industrial wastewater effluents. The GREENER⁹¹ project looks into bioremediation, a technology which uses microbes like bacteria and fungi to break down toxic pollutants into harmless substances, while at the same time producing electricity. The study also mentions the SEDIPLASTIC⁹² project, which explores the effects of microplastics on freshwater sediments and develops a predictive model. Moreover, the LimnoPlast⁹³ project aims to find the poorly understood freshwater sources of microplastics and to identify solutions for the overarching problem of microplastics with environmentally friendly polymers. In addition, the INSPIRE⁹⁴ project tries to contribute to the reduction of litter, macro- and microplastics in European rivers in a holistic approach, by bringing together 20 different technologies and actions.

The study also underlines that another pressure threatening the species composition of the sea is **by-catch**, the unintentional capture of non-targeted species in fisheries. Several EU-funded technology projects focus on reducing by-catches. The study refers to various projects in this regard: the CIBBRiNA LIFE project⁹⁵, which aims to establish regional monitoring programmes for by-catch of sensitive species and implement mitigation measures; the NETTAG+ project⁹⁶, which tries to prevent, avoid and mitigate the harmful impact of fishing gears; the SEARCULAR project⁹⁷, whose goal it is to introduce circular economy practices within the value chain of the fishing sector thus reducing the amount of litter and plastics; and the CetAMBICion project⁹⁸, which seeks to reduce cetacean by-catch in EU fisheries, in particular in the Bay of Biscay and on the Iberian Coast.

Finally, the study notes that **remote-sensing technologies** are developing quickly to support biodiversity monitoring, conservation and management. It says that several EU-funded projects are developing regional and pan-European approaches in this regard, such as EuropaBON⁹⁹ and MarBioME¹⁰⁰, which aim to improve biodiversity monitoring. Several examples of new solutions to improve seafloor mapping and monitoring have been tested in EU waters: for instance, marine gravimetry is used to estimate seafloor topography¹⁰¹ and a toolbox, developed under the EU-funded OBAMA-NEXT project¹⁰², will integrate advanced technologies and traditional methods to enhance the accuracy of marine ecosystem observations. Technological

⁹⁰ <https://www.bmrex-project.eu/>.

⁹¹ <https://www.greener-h2020.eu/en/normal/home>.

⁹² <https://cordis.europa.eu/project/id/101062785>.

⁹³ <https://www.limnoplast-itn.eu/>.

⁹⁴ <https://cordis.europa.eu/project/id/101112879>.

⁹⁵ <https://www.nsrac.org/projects/life-eu-bycatch-project-cibbrina/>.

⁹⁶ <https://cordis.europa.eu/project/id/101112812>.

⁹⁷ <https://cordis.europa.eu/project/id/101112852>.

⁹⁸ <https://www.cetambicion-project.eu/>.

⁹⁹ Vito Remote Sensing. (2020). A new pan-European project for joint biodiversity monitoring. Retrieved from <https://remotesensing.vito.be/new-pan-european-project-joint-biodiversity-monitoring>.

¹⁰⁰ <https://www.aircentre.org/projects/marbiome/>.

¹⁰¹ Lu, B., Xu, C., Li, J., Zhong, B., and van der Meijde, M. (2022). Marine Gravimetry and Its Improvements to Seafloor Topography Estimation in the Southwestern Coastal Area of the Baltic Sea. *Remote Sensing*, 14(16), p. 3921.

¹⁰² <https://cordis.europa.eu/project/id/101081642>.

advances are likely to reduce the current data gaps and may raise public awareness of the problems related to habitat degradation.

Socio-economic developments

From a socio-economic point of view, the study highlights that efforts are undertaken to raise awareness, promote ocean literacy, and engage coastal communities in sustainable practices.

Concerns expressed by the general public have translated into **citizen science** projects that support the accessibility of marine biodiversity information, such as the Koster Seafloor Observatory (KSO)¹⁰³, which combines citizen science and machine learning for an automated analysis of subsea footage to identify species and habitats.

Improvement of **ocean literacy**¹⁰⁴ among the general public also has the potential of increasing people's awareness and understanding of the ocean and its biodiversity. An example of an EU-funded project is ProBlue¹⁰⁵ which supports and expands the Network of European Blue Schools¹⁰⁶.

Several projects build on **citizen's knowledge**. The OneAquaHealth project¹⁰⁷, for instance, showcases the importance of marine and freshwater ecosystems for human mental and physical health while also providing a novel AI-based environmental surveillance system to monitor and protect them. The EcoAdvance project¹⁰⁸ takes the perspective of the people who master freshwater ecosystem restoration. It will provide guidance to current leaders by identifying and showcasing successful solutions from personal experiences.

Furthermore, the study refers to several projects that acknowledge the **role coastal communities can play** in sustainable transitions. The project EmpowerUs¹⁰⁹ develops a network of transition labs across EU coastal regions promoting new methodologies for inclusive policymaking, and REST-COAST¹¹⁰ aims to increase the commitment of citizens, stakeholders and policymakers to assess ecosystem services.

Finally, under socio-economic developments, there is general support for more **marine protection areas (MPAs)** and better protection of marine habitats, including seabed ecosystems. The study also underlines that MPAs, beyond the clear benefit of preserving biodiversity, have

¹⁰³ <https://eu-citizen.science/project/334>.

¹⁰⁴ For more information on ocean literacy, see: UNESCO. Sharing the World's Ocean Knowledge: Ocean Literacy, <https://oceanliteracy.unesco.org/?post-types=all&sort=popular>.

¹⁰⁵ <https://cordis.europa.eu/project/id/101113001>.

¹⁰⁶ For more information, see: <https://maritime-forum.ec.europa.eu/de/frontpage/1485>.

¹⁰⁷ <https://www.oneaquahealth.eu/>.

¹⁰⁸ <https://ecoadvance.eu/>.

¹⁰⁹ <https://empowerus-project.eu/>.

¹¹⁰ <https://rest-coast.eu/>.

the potential to attract bio-tourism and thus generate revenues and job opportunities for local communities¹¹¹.

To conclude the analysis of the challenge of marine and freshwater ecosystem degradation, the study finds that experts that have analysed the **costs and benefits** of ecosystem services and ecosystem restoration have proven that benefits outweigh costs for coral reefs, mangroves, saltmarsh, seagrass¹¹² and deep-sea¹¹³ ecosystems. The EEA has calculated¹¹⁴ that general investment in nature restoration provides a return of between EUR 8 and EUR 38 for every EUR 1 spent, owing to the broader benefits of ecosystem services that include climate mitigation and adaptation.

2.3.1.3. Third challenge: Circular and sustainable blue economy

The SIA Factsheet

The SIA factsheet highlights that “the circular economy path not only safeguards human health and resource efficiency but is also an engine of sustainable growth. The planned unprecedented growth in offshore wind energy and other innovative ocean energy technologies, which must not undermine environmental protection, offer opportunities both for the enhancement of biodiversity (such as artificial reefs and oyster beds) and for new activities that make use of the space and renewable electricity such as aquaculture and hydrogen electrolysis. Non-fed aquaculture is able to recycle the excess nutrients that would otherwise cause eutrophication. New targets for emissions reduction and renewable fuel in maritime transport require innovation in propulsion and logistics. The reuse of wastewater prevents shortages that may be exacerbated by a changing climate.”

Key findings from the study

Scientific developments

According to the study, the European **research base** linked to this challenge is considered as strategically crucial and has been targeted by programmes and initiatives since 2019. The study mentions, in particular, that oceanography, the deep sea, marine equipment, marine renewable energy, biotechnology and decarbonisation, are among the research fields where a link with market uptake and the development of a sustainable blue economy is clearly recognised¹¹⁵.

¹¹¹ Pham, T. T. T. (2020). Tourism in marine protected areas: Can it be considered as an alternative livelihood for local communities? *Marine Policy*, 115.

¹¹² Stewart-Sinclair, P.J., Purandare, J., Bayraktarov, E., Waltham, N., Reeves, S., Statton, J., Sinclair, E.A., Brown, B.M., Shribman, Z.I. and Lovelock, C.E. (2020). Blue restoration—building confidence and overcoming barriers *Front. Mar. Sci.*, 7 (2020), p. 748.

¹¹³ Chen, W., Wallhead, P., Hynes, S., Groeneveld, R., O'Connor, E., Gambi, C., Danovaro, R., Tinch, R., Papadopoulou, N. and Smith, C. (2022). Ecosystem service benefits and costs of deep-sea ecosystem restoration, *Journal of Environmental Management*, Volume 303.

¹¹⁴ European Environment Agency (2023). Briefing: The importance of restoring nature in Europe. Retrieved from <https://www.eea.europa.eu/publications/importance-of-restoring-nature/the-importance-of-restoring-nature>.

¹¹⁵ European Commission. (2023). The EU Blue Economy Report 2023, <https://op.europa.eu/en/publication-detail/-/publication/9a345396-f9e9-11ed-a05c-01aa75ed71a1>.

The study highlights that the growth of **marine renewable energy**, mainly driven by offshore wind, is currently an established trend, which has been reinforced by strategic energy supply and security measures adopted since 2019. It states that environmental protection in the energy sector remains a priority. Even though the knowledge base has expanded in areas where plants are already in operation, namely in Northern Europe and particularly for offshore wind, more data and research are needed to assess pressures and impact.

As for **offshore wind energy**, the SIA impact assessment forecast a growth between 10 and 50 times the 2018 capacity by 2050. According to the findings of the study, the EU's 2020 Strategy for offshore renewable energy¹¹⁶ foresees an increase of approximately 30 times, which is thus in line with the forecast. In October 2023, this target was confirmed by the EU Wind Power Package^{117, 118}. The study concludes that offshore wind energy is likely to continue growing globally. It also states that European capacity growth in this sector has been supported by additional policy tools, such as the REPowerEU Plan¹¹⁹ in 2022 and the Green Deal Industrial Plan for the Net-Zero Age¹²⁰ in 2023. Notably, to increase the production of clean energy and diversify supply, REPowerEU - the Joint European action for more affordable, secure, and sustainable energy - also strives to accelerate the energy transition in neighbouring partner countries.

Technological developments

As far as ocean energy technologies are concerned, the SIA impact assessment forecast a shift from demonstration to production of **tidal and wave energy** by 2050. The study considers this projection to be still realistic. It underlines promising developments especially for tidal technologies, but also says that an overall EU market does not yet exist and that the sector needs significant cost reduction to play a role in the energy mix. The study therefore highlights the need for further EU support, such as through the Green Deal Industrial Plan.

The research carried out for the study confirms that a progressive shift towards **offshore aquaculture** can be foreseen, also supported by increased production of shellfish and algae. At the same time, a tenfold expansion of the whole sector in the EU by 2050, as projected in the SIA impact assessment, seems unlikely. The study has lower expectations and shows an

¹¹⁶ Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - An EU Strategy to harness the potential of offshore renewable energy for a climate neutral future, COM/2020/741 final, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2020%3A741%3AFIN>.

¹¹⁷ European Wind Power Action Plan COM (2023) 669 final, <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=COM:2023:669:FIN>.

¹¹⁸ Currently, at EU level, the 2020 Strategy for offshore renewable energy deems the objective to reach an offshore wind installed capacity of 300 GW by 2050 realistic and achievable. The EU Wind Power Package raised the ambition to an installed capacity of 111 GW across all EU sea basins by 2030 (as opposed to the 2020 Strategy setting it at 60 GW minimum).

¹¹⁹ Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions - REPowerEU Plan, COM/2022/230 final, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2022%3A230%3AFIN>.

¹²⁰ Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions Green Deal Industrial Plan for the Net-Zero Age, COM/2023/62 final, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023DC0062>.

aggregated growth at EU level to be at around 25%¹²¹, with peaks not exceeding a fourfold increase at Member State level by 2050¹²², which is in line with global trends¹²³. This trend already includes upgraded approaches and technologies such as multi-trophic and non-fed aquaculture. According to the study, the development of offshore farming locations takes advantage of the opposition to pollution, lack of space in coastal areas (harbouring potential conflicts with other sectors like tourism and fisheries), improved self-cleaning of production sites, and, potentially, fish health¹²⁴. Nevertheless, the study underlines that some challenges exist for designing infrastructures with increased resistance to storms and effective remote management systems. Consequently, offshore structures are significantly more costly than coastal ones and limit the investment potential to larger companies¹²⁵.

In addition, despite recent developments and progress¹²⁶, the study emphasises the persistent need for innovation in **fishing gear and methods**, which are seen as a priority in the context of healthy and productive marine ecosystems.

Finally, atmospheric pollution is another key point confirmed by the study. The need to use alternative, low-carbon, sustainable fuels in **maritime transport** with low or zero direct greenhouse gas emissions is widely recognised¹²⁷ and is part of broader roadmaps for decarbonisation¹²⁸. The study underlines that innovation in propulsion and logistics is central to this transition, along with other optimisation processes regarding, for instance, ship design, route and fleet planning, speed profiling, and port logistics¹²⁹. All these factors have to be combined with improvements in the overall energy and operational efficiency of vessels, supported also by enhanced digitalisation.

¹²¹ Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions REPowerEU Plan, COM/2022/230 final, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2022%3A230%3AFIN>; Fritsche, U., Brunori, G., Chiaramonti, D., Galanakis, C., Matthews, R. and Panoutsou, C., Future transitions for the Bioeconomy towards Sustainable Development and a Climate-Neutral Economy - Foresight Scenarios for the EU bioeconomy in 2050, Borzacchiello, M. T., Stoermer, E. and Avraamides, M. editor(s), Publications Office of the European Union, Luxembourg, 2021, ISBN 978-92-76-28413-0, doi:10.2760/763277, JRC123532.

¹²² Froehlich, H.E., Couture, J., Falconer, L., Krause, G., Morris, J.A., Perez, M., Stentiford, G.D., Vehviläinen, H., and Halpern, B.S. (2021). Mind the Gap between ICES Nations' Future Seafood Consumption and Aquaculture Production. *ICES Journal of Marine Science* 78(1), p. 468–77. Retrieved from <https://doi.org/10.1093/icesjms/fsaa066>.

¹²³ FAO. (2022). The State of World Fisheries and Aquaculture 2022. Retrieved from <https://doi.org/10.4060/cc0461en>.

¹²⁴ FAO. (2022). Regional Review on Status and Trends in Aquaculture Development in Europe – 2020. Retrieved from <https://doi.org/10.4060/cb7809en>.

¹²⁵ *ibid.*

¹²⁶ International Council for the Exploration of the Sea (ICES). (2023). EU request on review of innovative gears for potential use in EU waters and their impacts. In: Report of the ICES Advisory Committee, 2023. ICES Advice 2023, sr.2023.13. Retrieved from <https://doi.org/10.17895/ices.advice.24212694>.

¹²⁷ De Oliveira, N., Aguilar, M., Szklo, A., and Alves Castelo Branco, D. (2022). Implementation of Maritime Transport Mitigation Measures According to Their Marginal Abatement Costs and Their Mitigation Potentials'. *Energy Policy* 160. Retrieved from <https://doi.org/10.1016/j.enpol.2021.112699>.

¹²⁸ European Parliament. (2023). Press Release: Fit for 55: deal on the new EU rules for cleaner maritime fuels. Retrieved from <https://www.europarl.europa.eu/news/en/press-room/20230320IPR77909/fit-for-55-deal-on-new-eu-rules-for-cleaner-maritime-fuels>.

¹²⁹ Tillig, F., Ringsberg, J.W., Psarafitis, H.N., and Zis, T. (2020). Reduced Environmental Impact of Marine Transport through Speed Reduction and Wind Assisted Propulsion. *Transportation Research Part D: Transport and Environment* 83. Retrieved from <https://doi.org/10.1016/j.trd.2020.102380>.

Socio-economic developments¹³⁰

The study furthermore reports that a wide range of economic activities is associated with **blue bioeconomy**, including blue biotechnology, with the algae sector supported by the EU Algae Initiative¹³¹ being one of the most dynamic ones. The study also mentions other economic activities associated with the use of renewable aquatic biological biomass, including food additives, animal feed, pharmaceuticals, cosmetics, as well as innovative commercial uses such as biomaterials, and bioremediation. Nevertheless, due to their emerging nature, the study concludes that more data on these sectors is needed.

2.3.1.4. Further considerations from the Commission

The findings of the study on the above challenges show that water, marine and maritime sectors and ecosystems are intrinsically intertwined. The initiatives mentioned here below cover and confirm the relevance of the main challenges identified in the SIA factsheet and the present ex-ante analysis.

Initiatives at EU level

The issue of **water security and water resilience** has emerged strongly as a key challenge for the future of the Union. Water resilience is indeed a key priority of the Commission under the **European Green Deal** for 2024 and the Commission is currently taking a comprehensive stock of water challenges. In January 2023, the European Parliament and the Council adopted the **Critical Entities Resilience (CER) Directive**¹³², which identifies drinking and wastewater as crucial sectors in the provision of essential services using key infrastructure across the Union. The Directive creates an overarching framework that addresses the resilience of critical entities in respect of all hazards, whether natural or man-made, accidental or intentional. The implementation of the Directive is supported directly by research results from the security cluster in Pillar II of Horizon Europe.

Furthermore, relevant developments in data centres, intensive farming (and irrigation) and hydrogen production are increasing the water demand and consequently the **water scarcity**. Water scarcity accompanies the pressure on land driven by the need to increase biomass production, carbon sequestration and wilderness to achieve decarbonisation and biodiversity targets.

Water resilience is closely linked to two wider initiatives on identifying and assessing how best to manage climate change risks across EU policy areas: the EU-wide **Climate Risk Assessment**

¹³⁰ To avoid duplications, this sub-chapter focuses mainly on the challenges identified in the factsheet from a scientific and technological point of view, while a wider socio-economic analysis of the Blue Economy sectors will be the starting point and scene setter for the chapter on the relevance of a KIC in the WMM field.

¹³¹ <https://www.eesc.europa.eu/en/news-media/press-summaries/eu-algae-initiative>.

¹³² Directive (EU) 2022/2557 of the European Parliament and of the Council of 14 December 2022 on the resilience of critical entities and repealing Council Directive 2008/114/EC. (OJ L 333, 27.12.2022, p. 164–198), <https://eur-lex.europa.eu/eli/dir/2022/2557/oj>.

(EUCRA)¹³³ and the **Commission Communication on managing climate risks**¹³⁴. They stress the need for risk owners to actively manage the increasing climate risks, which can compound with other risk drivers and cascade across societal systems. They also underline the need to work across policies in an all-hazards and whole-society approach. Furthermore, the **Report on preventing and managing disaster risk in Europe**¹³⁵ found that climate-related disasters like floods remain high on the risk management agenda across Europe, and that drought and water scarcity are those risks for which concern has increased the most across Europe since 2015. The **Union Disaster Resilience Goals** adopted in 2023¹³⁶ defines flagship actions, also for resilience to water-related risks.

This confirms the importance of **risk awareness**. In this context, to support the implementation of the Floods Directive, the Commission has developed the **Flood Risk Areas Viewer**¹³⁷, with the support of the EEA. Another tool is the **Drought Risk Atlas**¹³⁸, which helps to better understand, estimate and map drought risks in the EU. It attempts to show how drought hazard, exposure and vulnerability drivers interact and affect different systems, such as agriculture, public water supply, energy, river transport as well as terrestrial and freshwater ecosystems. The Drought Risk Atlas also provides insights into how risks may change in relation to different projected climate conditions.

In this context, it is salient to note that nature-based solutions can help build resilience to extreme weather events. For example, **forests** have a large potential for water retention. This, in turn, reduces damage from flooding and helps mitigate the effects of droughts.

In addition, addressing soil sealing and promoting appropriate **soil management** practices in agriculture are critical steps toward building resilience to water-related challenges such as floods, droughts, and water scarcity (as indicated in both the EU Soil Strategy¹³⁹ and the Proposal for Soil Monitoring and Resilience Directive¹⁴⁰). These strategies not only help

¹³³ European Environmental Agency (2024). European Climate Risk Assessment. Luxembourg: Publications Office of the European Union. <https://www.eea.europa.eu/publications/european-climate-risk-assessment>.

¹³⁴ Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - Managing climate risks - protecting people and prosperity, COM/2024/91 final, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2024%3A91%3AFIN&qid=1710403105471>.

¹³⁵ Report from the Commission to the European Parliament and the Council on progress on implementation of article 6 of the Union Civil Protection Mechanism (Decision No 1313/2013/EU) Preventing and managing disaster risk in Europe, COM/2024/130 final, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2024%3A130%3AFIN>.

¹³⁶ Commission Recommendation of 8 February 2023 on Union disaster resilience goals, 2023/c 56/01, [https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32023H0215\(01\)](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32023H0215(01)).

¹³⁷ <https://discomap.eea.europa.eu/floodviewer/>.

¹³⁸ Rossi, L., Wens, M., De Moel, H., Cotti, D., Sabino Siemons, A., Toreti, A., Maetens, W., Masante, D., Van Loon, A., Hagenlocher, M., Rudari, R., Naumann, G., Meroni, M., Avanzi, F., Isabellon, M., and Barbosa, P. (2023). European Drought Risk Atlas, Publications Office of the European Union, Luxembourg, doi:10.2760/608737, JRC135215.

¹³⁹ Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - EU Soil Strategy for 2030 Reaping the benefits of healthy soils for people, food, nature and climate, COM/2021/699 final, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021DC0699>.

¹⁴⁰ Proposal for a Directive of the European Parliament and of the Council on Soil Monitoring and Resilience (Soil Monitoring Law), COM/2023/416 final, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023PC0416&BqId=1706624227744>.

mitigate the impacts of extreme weather events but also contribute to sustainable land management and ecosystem health.¹⁴¹

Under **Pillar II of the Horizon Europe programme**, the EU-funded DIRECTED¹⁴² project fosters communication, knowledge sharing and interoperability between different actors to help mitigate the impacts of extreme weather events. Regarding the long-term ecological consequences of extreme events that can lead to shifts in species composition, changes in habitat structures, and alterations in ecosystems, the civil security cluster under Pillar II of Horizon Europe funds research and innovation projects aimed at bolstering disaster resilient societies and the resilience of critical infrastructures.

The **Earth Observation data from the Copernicus programme** also have the potential to increase situational awareness and the early warning capacity of Member States for water extremes, including floods and droughts. The Copernicus programme offers several other services, such as the Copernicus Marine Environment Monitoring Service¹⁴³ or the Copernicus Land Monitoring Service¹⁴⁴. They provide marine data and services or geographical information that help monitor the condition of the water ecosystems. In 2023, the Copernicus Arctic¹⁴⁵ and Coastal Hubs¹⁴⁶ were launched with the aim of supporting the EU with the implementation of several policies, including the MFSD¹⁴⁷ and the Maritime Spatial Planning Directive¹⁴⁸.

Likewise, several EU-level processes coordinate Member States' actions in risk awareness and provide reporting frameworks on various risks including water-related risks (e.g., CER, EU Civil Protection Mechanism (UCPM)¹⁴⁹, Energy Union Governance¹⁵⁰). They provide information on the respective national approaches.

Risk awareness goes hand in hand with **risk foresight**. In this respect, important insights can come from the **EU Foresight System** for the identification of emerging environmental issues and related opportunities and risks (FORENV)¹⁵¹. This is an early foresight exercise, which aims to better anticipate potential risks and opportunities and to improve the quality of policy development. FORENV publishes annual thematic reports. Moreover, regarding water-related

¹⁴¹ Managing and mitigating soil sealing involve measures to preserve permeable surfaces and green spaces, such as green roofs, permeable pavements, and urban green areas. By allowing water to infiltrate into the soil, these practices help reduce flood peaks and mitigate the impact of heavy rainfalls. Furthermore, to avoid soil compaction in agriculture, it is essential to minimise heavy machinery use, implement controlled traffic farming and improve soil organic matter.

¹⁴² <https://directedproject.eu/>.

¹⁴³ <https://marine.copernicus.eu/>.

¹⁴⁴ <https://land.copernicus.eu/en>.

¹⁴⁵ <https://www.arctic.hub.copernicus.eu/>.

¹⁴⁶ <https://www.coastal.hub.copernicus.eu/>.

¹⁴⁷ Directive (EC) 2008/56 of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive) (OJ L 164, 25.6.2008, p. 19-40), <http://data.europa.eu/eli/dir/2008/56/oj>.

¹⁴⁸ Directive (EU) 2014/89 of the European Parliament and of the Council of 23 July 2014 establishing a framework for maritime spatial planning (OJ L 257, 28.8.2014, p. 135-145), <http://data.europa.eu/eli/dir/2014/89/oj>.

¹⁴⁹ https://civil-protection-humanitarian-aid.ec.europa.eu/what/civil-protection/eu-civil-protection-mechanism_en.

¹⁵⁰ https://climate.ec.europa.eu/eu-action/climate-strategies-targets/governance-energy-union-and-climate-action_en.

¹⁵¹ European Commission. Research and innovation. Retrieved from https://environment.ec.europa.eu/research-and-innovation_en.

disaster prevention and preparedness, the Horizon 2020 project ANYWHERE¹⁵² and Horizon Europe Pillar II (Cluster 3) projects offer impact forecasting research.

For what concerns **ocean health**, the Commission presented several initiatives in 2023, including the Action Plan for protecting and restoring marine ecosystems for sustainable and resilient fisheries¹⁵³, the Proposal for a Regulation on preventing pellet losses¹⁵⁴ to reduce microplastic pollution and the Assessment of EU Missions¹⁵⁵.

In this context, more comprehensive scientific research and data acquisition, including the development and implementation of new monitoring technologies and methodologies, are needed to address long-term ecosystem degradation processes, including underwater noise pollution. Better understanding and addressing the impacts of underwater noise pollution on water, marine and maritime sectors and ecosystems could be a potential area for future research and data collection.

Other EU institutions have also been working on specific initiatives in the field of water, marine and maritime sectors and ecosystems. The European Council, European Parliament and European Economic and Social Committee have all voiced their concern and called for a more strategic approach to water at EU level.

More specifically, in October 2023, in a joint letter¹⁵⁶ with the European Economic and Social Committee, the Members of the **European Parliament Water Group** called on EU Heads of State and Government to support an **EU Blue Deal** as part of the Commission's upcoming mandate. The letter stresses the urgency of fostering innovation, responsible consumption, and the equitable distribution of water. It calls for the nomination of an EU Vice-President in charge of the water dimension and aims for a water-smart legislation in Europe to achieve a fully functioning Water-Smart-Society¹⁵⁷.

In parallel, the **European Economic and Social Committee** selected the topic of water as its cross-cutting initiative in 2023. In July 2023, it adopted a series of opinions as part of the Blue Deal package¹⁵⁸, including on access to water, sustainable and resilient water infrastructures and

¹⁵² <http://anywhere-h2020.eu/>.

¹⁵³ Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions EU Action Plan: Protecting and restoring marine ecosystems for sustainable and resilient fisheries, COM/2023/102; <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52023DC0102>.

¹⁵⁴ Proposal for a Regulation of the European Parliament and of the Council on preventing plastic pellet losses to reduce microplastic pollution (COM/2023/645 final), <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52023PC0645>.

¹⁵⁵ Commission Staff Working Document 'EU Missions two years on: An assessment of progress in shaping the future we want and reporting on the review of Mission Areas and areas for institutionalised partnerships based on Articles 185 and 187 TFEU', accompanying the document 'Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions 'EU missions two years on: assessment of progress and way forward', COM(2023) 457 final).

¹⁵⁶ European Parliament and European Economic and Social Committee (2023). Joint Letter to EU Heads of State and Government: Call to Adopt an Ambitious EU Blue Deal. Retrieved from https://www.eesc.europa.eu/sites/default/files/files/joint_call_for_an_eu_blue_deal_strategy.pdf.

¹⁵⁷ Defined in the letter as a society in which 'the value of water is recognised and understood to ensure water security, sustainability, and resilience; all available water sources are managed so that water scarcity and pollution are avoided; water and resource loops are largely closed to foster a circular economy and optimal resource efficiency; the water system is resilient against the impact of climate and demographic change; and all relevant stakeholders are engaged in guaranteeing sustainable water governance'.

¹⁵⁸ REX/570 - Water Politics: Between Desertification and Securitization - Time for a Blue Diplomacy (not yet published in OJ). Opinion of the European Economic and Social Committee on 'Access to water: tackling water poverty and its implications for social policy' (Own-initiative

distribution networks, the economics of an EU Blue deal, water-intensive industries, water-efficient technologies, sustainable water management as well as water-efficient consumption.¹⁵⁹

In October 2023, still as part of the Blue Deal Package, the European Economic and Social Committee adopted the umbrella opinion A call for an EU Blue Deal¹⁶⁰, where it advocates for a comprehensive EU Water Policy and water governance at EU level. The umbrella opinion covers topics that are also addressed in the present Commission ex-ante analysis, including water scarcity and preservation of freshwater resources, sustainable water management, as well as economics of water. It also addresses geopolitics of water, calling for a “blue diplomacy” in the EU, which could tackle the strategic security-related aspects of water. The Blue Deal umbrella opinion was accompanied by a Declaration for an EU Blue Deal, proposing guiding principles and actions¹⁶¹.

The EU Blue Deal highlights an aspect that is also identified in the independent study: giving water the appropriate economic value and considering it as an asset that generates functions and services for human wellbeing. Discussions on water economics have just begun, including through initiatives such as the **Global Commission on the Economics of Water**¹⁶², which is facilitated by the Organisation for Economic Co-operation and Development (OECD), and which aims to redefine the way we value and govern water as a common good.

In April 2024, a group of Members of the European Parliament, former Commissioners, Ministers, and ocean experts launched the **Manifesto for a European Ocean Pact**¹⁶³ calling on the EU to adopt a coherent political strategy to address environmental challenges and seize the economic opportunities that the ocean offers to the European continent. It calls for an integrated holistic approach to the ocean and waters and presents a set of proposals for strengthening the blue economy, protecting and restoring ecosystems, addressing pollution, fostering citizen engagement and improving ocean governance.

opinion) (2023/C 349/10), OJ C 349, 29.9.2023, p. 60; Opinion of the European Economic and Social Committee on ‘Sustainable water management and climate emergency: circular and other solutions for the EU agri-food system in a future “Blue Deal”’ (own-initiative opinion) (2023/C 349/13) OJ C 349, 29.9.2023, p. 80; Opinion of the European Economic and Social Committee on ‘Sustainable and resilient water infrastructure and distribution networks’ (own-initiative opinion) (2023/C 349/14) OJ C 349, 29.9.2023, p. 87; Opinion of the European Economic and Social Committee on ‘Water efficient consumption and consumer awareness about their water footprint’ (own-initiative opinion) (2023/C 349/04) OJ C 349, 29.9.2023, p. 18; Opinion of the European Economic and Social Committee on ‘Water-intensive industries and water-efficient technologies’ (Own-initiative opinion) (2023/C 349/12) OJ C 349, 29.9.2023, p. 74; Opinion of the European Economic and Social Committee on the economics of an ‘EU Blue Deal’ — water-related investment needs in the EU (own-initiative opinion) (2023/C 349/09) OJ C 349, 29.9.2023, p. 50; Opinion of the European Economic and Social Committee on the proposal for a Directive of the European Parliament and of the Council concerning urban wastewater treatment (COM (2022) 541 final — 2022/0345 (COD)) (2023/C 146/06) OJ C 146, 27.04.2023, p. 35; Opinion of the European Economic and Social Committee on the proposal for a Directive of the European Parliament and of the Council amending Directive 2000/60/EC establishing a framework for Community action in the field of water policy, Directive 2006/118/EC on the protection of groundwater against pollution and deterioration and Directive 2008/105/EC on environmental quality standards in the field of water policy (COM(2022) 540 final — 2022/0344 (COD)) (2023/C 146/07) OJ C 146, 27.04.2023, p. 41.

¹⁵⁹ European Economic and Social Committee. (2023). EESC puts water on the EU agenda with first concrete Blue Deal Proposals. Retrieved from <https://www.eesc.europa.eu/en/news-media/press-releases/eesc-puts-water-eu-agenda-first-concrete-blue-deal-proposals>.

¹⁶⁰ European Economic and Social Committee. (2023). Umbrella Opinion “A call for an EU Blue Deal” (CCMI/209-EESC-2023). Retrieved from <https://www.eesc.europa.eu/en/our-work/opinions-information-reports/opinions/umbrella-opinion-call-eu-blue-deal>.

¹⁶¹ European Economic and Social Committee. (2023). Declaration for an EU Blue Deal. Retrieved from https://www.eesc.europa.eu/sites/default/files/files/declaration_for_an_eu_blue_deal_en.pdf.

¹⁶² Global Commission on the Economics of Water. Turning the Tide: A Call to Collective Action. Retrieved from <https://watercommission.org/>.

¹⁶³ European Ocean Pact stakeholder group (2024). Manifesto for a European Ocean Pact. https://www.oceanenergy-europe.eu/wp-content/uploads/2024/04/Manifesto-for-a-European-Ocean-Pact_digital.pdf.

Furthermore, in a 2022 **Resolution on the consequences of drought, fire, and other extreme weather phenomena**¹⁶⁴, the European Parliament called on the Commission to rapidly develop guidelines on the management of transnational shared river basins and to ensure a balanced prioritisation between water uses. Several other recent Resolutions of the European Parliament address ocean and water-related challenges, for instance the impact of fisheries on marine litter¹⁶⁵, a sustainable blue economy in the EU¹⁶⁶ and water scarcity¹⁶⁷.

Moreover, on 27 February 2024, the European Parliament approved the **proposal for a Nature Restoration Law**¹⁶⁸. The draft is still subject to approval by the Council. The Nature Restoration Law sets a target for the EU to restore at least 20% of the EU's land and sea areas by 2030 and all ecosystems in need of restoration by 2050.

In November 2023, the Panel for the Future of Science and Technology (STOA) of the European Parliament published the contribution “What if Europe ran out of water?”¹⁶⁹ under the series “At a Glance”. A more ample **STOA study** on the future WMM KIC is expected to be published. It will look at the role of technology and innovation in the field of waters and ocean, with the aim to confirm and qualify the need to create a KIC¹⁷⁰.

Initiatives at international level

The continued relevance of ocean and water-related fields is also confirmed by other recent and important initiatives at international and global level.

In 2022, the EU updated its **International Ocean Governance (IOG) Agenda**, confirming its commitment to strengthen the implementation of the UN 2030 Agenda and the Sustainable Development Goal (SDG) number 14 on “Life below water” as well as to deliver on the blue part of the European Green Deal. The updated IOG Agenda sets out actions to achieve the overall objective of securing a safe, secure, clean, healthy and sustainably managed ocean.

The adoption of the Agreement under the United Nations Convention on the Law of the Sea¹⁷¹ (UNCLOS) on the Conservation and Sustainable Use of Marine Biological Diversity of Areas

¹⁶⁴ European Parliament Resolution of 15 September 2022 on the Consequences of drought, fire, and other extreme weather phenomena: increasing EU's efforts to fight climate change (2022/2829(RSP)). Retrieved from https://www.europarl.europa.eu/doceo/document/TA-9-2022-0330_EN.html.

¹⁶⁵ European Parliament Resolution of 25 March 2021 on the impact on fisheries of marine litter (2019/2160(INI)). Retrieved from https://www.europarl.europa.eu/doceo/document/TA-9-2021-0096_EN.html.

¹⁶⁶ European Parliament Resolution of 3 May 2022 toward a sustainable blue economy in the EU: the role of the fisheries and aquaculture sectors (2021/2188(INI)). Retrieved from https://www.europarl.europa.eu/doceo/document/TA-9-2022-0135_EN.html.

¹⁶⁷ European Parliament Resolution on the UN Climate Change Conference 2023 in Dubai, United Arab Emirates (COP28) (2023/2636(RSP)). Retrieved from https://www.europarl.europa.eu/doceo/document/B-9-2023-0458_EN.html.

¹⁶⁸ European Parliament Resolution of 27 February 2024 on the proposal for a regulation of the European Parliament and of the Council on nature restoration (COM(2022)0304 – C9-0208/2022 – 2022/0195(COD)). Retrieved from https://www.europarl.europa.eu/doceo/document/TA-9-2024-0089_EN.pdf.

¹⁶⁹ European Parliament: EPRS | European Parliamentary Research Service. (2023). What if Europe ran out of water? (PE 753.172). Retrieved from [https://www.europarl.europa.eu/RegData/etudes/ATAG/2023/753172/EPRS_ATA\(2023\)753172_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/ATAG/2023/753172/EPRS_ATA(2023)753172_EN.pdf).

¹⁷⁰ EPRS | Directorate for Impact Assessment and Foresight: Scientific Foresight Unit. (2024). STOA Ongoing Projects. Retrieved from https://www.europarl.europa.eu/cmsdata/280213/STOA_ongoing%20projects_2024_01_22xxx.pdf.

¹⁷¹ https://www.un.org/Depts/los/convention_agreements/texts/unclos/closindx.htm.

beyond National Jurisdiction (the **BBNJ Agreement**)¹⁷² in 2023 was a remarkable achievement. The BBNJ Agreement, together with the **Kunming-Montreal Global Biodiversity Framework**¹⁷³ (GBF) that was agreed by the Conference of the Parties of the UN Convention on Biodiversity¹⁷⁴ in December 2022, address existing gaps and strengthen international ocean governance.

The BBNJ and GBF both require data and knowledge for their implementation. Since the ocean does not have a dedicated science-policy interface like the Intergovernmental Panel on Climate Change¹⁷⁵ (IPCC) or the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services¹⁷⁶ (IPBES), the EU has proposed the creation of a separate platform for the ocean, an Intergovernmental Panel for Ocean Sustainability (IPOS). The idea is to establish IPOS at the 3rd UN Ocean Conference in 2025.

Furthermore, the **2023 UN Water Conference**¹⁷⁷, which took place in March 2023, launched the **Water Action Agenda**¹⁷⁸. It represents voluntary commitments of the EU, nations and stakeholders to accomplish the SDGs and their targets connected to water¹⁷⁹. In a press release published on the day of the Conference, the UN Secretary explicitly called for “game-changing commitments to bring the Water Action Agenda to life¹⁸⁰”.

The European Council welcomed the 2023 UN Water Conference and its Water Action Agenda in the Council Conclusions of 23 March 2023. It also acknowledged “the need for enhanced EU and global action on water” and underlined “the importance of a strategic EU approach to water security”¹⁸¹. In addition, the Council Conclusions on Water in the EU’s External Action of November 2021¹⁸² highlighted the importance of access to water and recalled the human right to safe drinking water and sanitation. It also referred to the Council Conclusions of 19 November 2018 on water diplomacy¹⁸³, reaffirmed the EU’s diplomatic engagement on water, especially transborder and regional water cooperation as a key driver of sustainable development, green transition and peace, and called for a renewed coordinated push for accession and adherence to UN water conventions, transboundary agreements and institutional frameworks.

¹⁷² United Nation General Assembly (2023), Agreement under the United Nations Convention on the Law of the Sea on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction, A/CONF.232/2023/4. Retrieved from <https://digitallibrary.un.org/record/4013344?v=pdf>.

¹⁷³ <https://www.cbd.int/doc/decisions/cop-15/cop-15-dec-04-en.pdf>.

¹⁷⁴ <https://www.cbd.int/conferences/2021-2022>.

¹⁷⁵ <https://www.ipcc.ch/>.

¹⁷⁶ <https://www.ipbes.net/>.

¹⁷⁷ UN 2023 Water Conference. (2023) Retrieved from <https://www.unep.org/un-2023-water-conference>.

¹⁷⁸ UN 2023 Water Conference. (2023). Water Action Agenda | Department of Economic and Social Affairs (un.org). Retrieved from <https://sdgs.un.org/conferences/water2023/action-agenda>.

¹⁷⁹ The call under the Water Action Agenda was for clear commitments, pledges and actions, across all sectors, industries and interests, uniting nations, stakeholders and professionals on actions that help deliver on the water actions in the 2030 Agenda for Sustainable Development, actions that can be scaled and replicated in the years to come.

¹⁸⁰ United Nations (2023). Bring the Water Action Agenda to Life', Secretary-General Urges Conference, Calling for Game-Changing Commitments on World's Most Important Resource (SG/SM/21737).

¹⁸¹ European Council. (2023). European Council meeting (23 March 2023) – Conclusions. EUCO 4/23. Retrieved from <https://data.consilium.europa.eu/doc/document/ST-4-2023-INIT/en/pdf>.

¹⁸² Council of the European Union. (2021). Water in the EU’s external action – Council Conclusions (19 November 2021). 14108/21. Retrieved from <https://data.consilium.europa.eu/doc/document/ST-14108-2021-INIT/en/pdf>.

¹⁸³ Retrieved from <https://data.consilium.europa.eu/doc/document/ST-13991-2018-INIT/en/pdf>.

Furthermore, the Commission is involved in the **regional seas conventions** through its engagement with relevant regional organisations and initiatives, such as the Barcelona Convention and its Protocols¹⁸⁴, the OSPAR Convention¹⁸⁵ for the Protection of the Marine Environment of the North-East Atlantic or the Helsinki Convention¹⁸⁶ on the Protection of the Marine Environment of the Baltic Sea Area. The Commission also represents the EU's interests and commitments within the United Nations Economic Commission for Europe (UNECE) Water Convention¹⁸⁷ which promotes the sustainable use and management of transboundary water resources in the UNECE region, including Europe, North America, and parts of Asia. More broadly, precipitation basins and virtual water trade are creating strong water inter-dependencies with third countries that are increasingly facing water scarcity.

Finally, the EU energy transition depends on water availability in third countries (notably to produce lithium and hydrogen), as underlined in the European Parliament report on EU development cooperation in support of access to energy in developing countries¹⁸⁸.

2.3.1.5. Conclusions

Regarding recent developments in scientific, technological and socio-economic trends, the Commission acknowledges that important steps have been taken in recent years to address the challenges identified in the SIA factsheet through continued research and technological innovation. Since 2019, the EU has taken substantial measures and actions in safeguarding and restoring marine and freshwater ecosystems. EU initiatives have been launched to fight biodiversity loss and pollution, as well as to mitigate and adapt to the effects of climate change, including in the blue economy.

Despite efforts and progress, the ex-ante analysis confirms that the challenges identified in the SIA factsheet (water scarcity, droughts and floods; marine and freshwater degradation; transition to a sustainable blue economy) persist.

As also underlined in the study, effectively addressing these interconnected challenges will require an integrated approach and further support for the development, deep demonstration and deployment at scale of emerging technologies, innovative solutions, flexible governance tools, continued research as well as adequate skills development and training initiatives. A better understanding of environmental and economic impact of water-related challenges is needed, together with efforts to better connect scientific research, technology development and deployment, and policy implementation.

¹⁸⁴ Retrieved from <https://www.unep.org/unepmap/who-we-are/barcelona-convention-and-protocols>.

¹⁸⁵ Retrieved from <https://www.ospar.org/convention>.

¹⁸⁶ Retrieved from <https://helcom.fi/about-us/convention/>.

¹⁸⁷ Retrieved from <https://unece.org/environment-policy/water>.

¹⁸⁸ European Parliament (2023). Report on EU development cooperation in support of access to energy in developing countries, A9-0441/2023 (2023/2073(INI)), https://www.europarl.europa.eu/doceo/document/A-9-2023-0441_EN.html.

All recent European and international initiatives point to the clear need for a coordinated and holistic approach to water in all its forms and dimensions. They recognise the importance of a comprehensive strategy putting in place relevant policy frameworks, promoting collaborative research and innovation, advancing technology development and deployment, and promoting multi-stakeholder and multi-disciplinary collaboration as well as dialogue across EU regions and countries.

2.3.2 Relevance and impact of a Knowledge and Innovation Community (KIC) on water, marine and maritime sectors and ecosystems

The SIA Factsheet

The SIA factsheet says that “a KIC on WMM – with a holistic and integrated approach – will help address the challenges” at stake. It underlines that “this field has a relatively strong knowledge base and high market potential”. It elaborates on the WMM market, stating that “the Union together with China and the United States of America, is one of the leading maritime economies”. It also mentions the strong value, in terms of turnover and skills, of the blue economy.

At the same time, it identifies “a clear fragmentation of efforts and disconnections between education, research and innovation activities”. Therefore, the factsheet specifies that “the establishment of a pan-European multi-disciplinary community of knowledge triangle partners would help promote the blue economy vision and boost worldwide competitiveness of European marine and maritime science and technology. Such a community would help bring to the market innovative projects of blue science and technology that would provide solutions to urgent practical challenges of sustainability and contribute to an ‘Ecosystem-based Blue Economy’ not only at a European but also at a global level.” It says that “establishing a KIC on WMM is intended to comprise a real contribution to strengthening innovation ecosystems and stimulating cooperation across the knowledge triangle, in order to accelerate the uptake of new technologies and approaches and boost the development of more sustainable products and methods [...]”.

The factsheet furthermore underlines the importance of trans-disciplinary approaches, new types of education across disciplines as well as sector-specific knowledge and skills, both for the technological transition of more traditional marine-related sectors and for newly emerging innovation sectors, such as biotechnologies and offshore energy production. Finally, the factsheet states that “a KIC on WMM would lead to better management of human interactions with water-marine ecosystems directly contributing to a sustainable blue economy that develops within ecological limits, in particular by ensuring the sustainable management of marine ecosystems”.

Key findings from the study

Market potential of a KIC in the WMM field

The study confirms the **high market potential** of a WMM KIC highlighting Europe's position as a global leader in marine and maritime sectors, with a robust blue economy contributing significantly to employment and economic growth. It elaborates on the economic value and employment levels of key industries which can be summarised as follows:

Coastal tourism in the EU is the largest EU Blue Economy sector. From 2019 to 2020, it faced a 58% decrease in Gross Value Added (GVA) and a 40% decrease in employment due to the COVID-19 pandemic but showed a strong recovery in 2021¹⁸⁹. The study shows that it not only regained its footing in 2021 but contributed more to the EU Blue Economy than before. To underpin this statement, the study uses as an indicator the total number of nights spent in EU tourist accommodations along coastal areas which reached 877.3 million in 2021 compared to 603.7 million in 2020, so an increase of 45%¹⁹⁰.

EU **maritime transport** is the second largest contributor to employment and gross added value in the EU Blue Economy. It constitutes 23% of the Blue Economy value-added and employs 11% of its workforce. It faced a decline in 2020 but holds growth potential through technological advancements like digitalisation¹⁹¹. Despite challenges arising from the pandemic and the energy crisis, **the shipbuilding and repair** sector employed around 305 500 individuals in the EU in 2020. The **marine equipment industry**, accounting for nearly 50% of global output, generated a total production value of EUR 71.6 billion between 2012 and 2017.

The **EU fisheries industry** employed 156 210 individuals in 2020, with approximately one-third of these workers engaged in the aquaculture subsector¹⁹². The estimated value of **aquaculture** production in the EU for 2021 is an estimated EUR 4.2 billion, which is slightly more than two-fifths of the EU's overall production value for fishery products (including both landings and aquaculture).

The **blue biotechnology** market in Europe is showing considerable potential for growth and innovation¹⁹³, supported by initiatives and funds from the EU. The blue biotechnology sector focuses on the economic utilization of marine organisms and biomass, including algae, bacteria, fungi, and invertebrates.

¹⁸⁹ *ibid.*

¹⁹⁰ Eurostat, online code (TOUR_OCC_NINATDC), Retrieved from https://ec.europa.eu/eurostat/databrowser/view/tour_occ_ninatdc/default/table?lang=en.

¹⁹¹ European Commission. (2023). The EU Blue Economy Report 2023, <https://op.europa.eu/en/publication-detail/-/publication/9a345396-f9e9-11ed-a05c-01aa75ed71a1>.

¹⁹² Eurostat, online code (nama_10_a64_e), (fish_ca_main), (fish_aq_q) and (fish_aq2a).

¹⁹³ The sector is particularly strong in countries with historical access to marine resources and aquatic biomass, such as France, Spain, and Portugal. These countries lead in algae production in Europe, with a total value of EUR 10.7 million in 2018. The sector is dominated by micro-enterprises, with 87% having fewer than five employees.

The **marine energy** sector, with a GVA of EUR 2 145 billion in 2020, is demonstrating growth¹⁹⁴.

The EU **water supply and wastewater treatment** sectors experienced growth in 2020, with data indicating notable advances in wastewater collection and treatment practices across Europe¹⁹⁵. Moreover, in 2020, there were 78 000 enterprises working in the EU's water supply, sewage, waste management, and remediation activities sector according to Eurostat. Together, they employed 1.6 million individuals and generated EUR 102.3 billion in value added.¹⁹⁶

The study presents a comprehensive analysis of the importance of **water stewardship**¹⁹⁷ and the development of a smarter water economy in the context of the EU. It highlights the need for innovative solutions and strategies to tackle water scarcity, promote water reuse, and reduce the risk of droughts and floods.

Fragmentation of efforts and disconnection between relevant actors

The study also confirms that the **fragmentation of efforts and disconnection** between education, research and innovation activities identified in the SIA factsheet are still present and an important bottleneck to innovation.

While the study reports a strong research base in the EU, it also highlights a lack of focus on **higher education** linked to the blue economy, with broad academic programmes not offering specific knowledge and skills needed in the WMM sectors. The study emphasises the need to build synergies and close the gaps in education, research and innovation activities, and in particular the need for upskilling and reskilling, which is essential to enable the much needed green and digital transition in the WMM field. Regarding curricula, the study confirmed thematic and disciplinary gaps in areas, such as ecology, marine engineering or water management and governance.

It found that specialisation is lacking not only at the academic level but also at the level of **vocational education and training**, which hampers effective dynamics within the knowledge triangle¹⁹⁸. The study underscores the importance of addressing skills gaps, particularly in sectors like offshore wind, aquaculture, fishing, ecosystem restoration and blue biotechnology. In addition, while the knowledge base and market potential are solid, they are unevenly distributed among Member States and sectors.

¹⁹⁴ op. cit. (European Commission, 2023).

¹⁹⁵ https://environment.ec.europa.eu/topics/water/urban-wastewater_en.

¹⁹⁶ Eurostat (online data code: sbs_na_ind_r2, sbs_na_sca_r2).

¹⁹⁷ Water stewardship means using water in an equitable, sustainable and efficient manner.

¹⁹⁸ Executive Agency for Small and Medium sized Enterprises, Technopolis Group, and Wageningen Research. (2020). Blue Bioeconomy Forum: Roadmap for the Blue Bioeconomy. LU: Publications Office, <https://data.europa.eu/doi/10.2826/605949>.

Contribution of a KIC to overcome the challenges faced by the WMM sectors

Literature reviews in the framework of the study and the linked stakeholder interviews confirm a **prevailing positive approach towards a WMM KIC**, highlighting the need to build synergies across sectors, topics, policies, initiatives, and the geographic dimension. In general terms, there is a commonly agreed call among all stakeholders for more coordinated and integrated approaches to ocean and freshwater management. Indeed, given the current fragmentation of efforts, disconnection within the knowledge triangle and the lack of required skills, the study finds that a dedicated KIC could help address current and emerging challenges. The EIT model could spur innovation and address the gaps by matching educational and research programmes with private sector needs, promoting entrepreneurial capacity and culture, boosting public-private partnerships and strengthening the knowledge base and transfer processes.

The study considers that improved **integration across the knowledge triangle** has proven to be key to harnessing added value from innovation: the EIT model and KICs can produce desired impacts by building **placed-based innovation ecosystems** integrating the work of leading players in research, education, and business¹⁹⁹. This approach is considered highly relevant for a WMM KIC, given the composite nature of interactions within WMM fields ranging from the overarching sustainable blue economy system to the specificities of the WMM sectors.

The study underlines that **higher education institutions** should turn knowledge in the WMM field into skills, competencies and innovation by developing close cooperation with economic, social and industrial partners within local and regional research and innovation ecosystems. These processes can be supported by a WMM KIC, in coordination with the work done by other KICs, the EIT Regional Innovation Scheme and frameworks like the Smart Specialisation Strategies (S3). Such cooperation would be beneficial for local businesses and Small and Medium-sized Enterprises (SMEs)²⁰⁰, which are widely recognised as WMM key players in the European landscape and profess a culture of innovative entrepreneurship that is fundamental to provide solutions at all levels of sustainable development.

Due to the diversity of the sectors covered by the WMM field, the SIA impact assessment reported that covering most of them could impede the formulation of a coherent KIC strategy. The study specifies that, while this argument can be considered still valid, **integrating the freshwater dimension with the marine and maritime dimensions** across disciplines and communities of stakeholders through an ecosystem-based, holistic approach can also be seen as a necessity. Building on the results of the EU Mission Restore our Ocean and Waters by 2030, BlueInvest²⁰¹ and the European Blue Forum²⁰², such an approach could generate additional

¹⁹⁹ Vrontis, D., Yaakov W., and Tsoukatos, E. (2020). 13th Annual Conference of the EuroMed Academy of Business. Business Theory and Practice – Across Industries and Markets. EuroMed Press.

²⁰⁰ Council conclusions on a European strategy empowering higher education institutions for the future of Europe 2022/C 167/03, ST/7936/2022/INIT (OJ C 167, 21.4.2022, p. 9–17), <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52022XG0421%2802%29>.

²⁰¹ Retrieved from https://oceans-and-fisheries.ec.europa.eu/ocean/blue-economy/blueinvest_en.

²⁰² Retrieved from <https://maritime-spatial-planning.ec.europa.eu/european-blue-forum>.

streams of transformative innovation in interconnected WMM environments by leveraging the dynamics within the knowledge triangle. In order to harmonize the priorities of the different fields, to achieve common objectives, to avoid dispersion of resources and objectives, and to promote synergies and alignment, the KIC should develop its strategy over time by engaging with the relevant stakeholders on a continuous basis and by cooperating with major existing initiatives and policy tools.

Based on the findings of the study, WMM integration can **offer different opportunities**, for instance with regard to increasing the sustainability and the efficiency of productive processes through improved interaction between land-based and ocean-based production systems. The study says that this can foster more efficient agriculture and aquaculture practices with a positive influence on land-to-sea interactions. This is the case of side streams, such as by-products, where agriculture is being used for aquaculture or fisheries and vice versa²⁰³. Furthermore, transversal solutions within the WMM field, such as those offered by biotechnologies, sensing, monitoring and modelling systems, can also leverage cross-sectoral financial opportunities.

According to the study, the creation of a dedicated KIC may also strengthen countries and regions that the European Innovation Scoreboard identifies as **modest and emerging innovators**. The EIT Regional Innovation Scheme aims to enhance their capacity, thus trying to overcome the fragmentation across the EU and beyond.

Overall, the results of the study show that a WMM KIC has the potential to **enhance resilience and economic competitiveness** in a comprehensive manner, contribute to wider EU policy objectives, tackle pressing societal challenges through innovative solutions, and reduce geographical disparities in terms of development and innovation. Its focus should be directed towards:

- (1) sectors that are most affected by or are most benefiting from the green and digital twin transition and those relying on highly innovative approaches, in terms of skill gaps;
- (2) challenges that are considered most urgent at the natural ecosystem level, integrating freshwater and marine dimensions;
- (3) most critical areas of disconnect within the knowledge triangle;
- (4) synergies and alignments with policies and existing initiatives.

2.3.2.1. Further considerations from the Commission

Beyond and in addition to the findings of the independent study, there are some additional elements regarding the relevance of a KIC in the WMM field that need to be taken into consideration.

²⁰³ The Commission furthermore highlights that dealing with pollution from upstream agriculture production is another example of improving land-to-sea interactions. Producing more food from certain aquatic systems (e.g., mariculture and small pelagic fish for direct human consumption) also helps alleviate pressure on soil, freshwater and biodiversity as well as deliver climate benefits contributing to a more sustainable food system.

To start with, the role of the EIT and its KICs in driving innovation by fostering collaboration among various stakeholders across Europe is underpinned by its **achievements**: since 2008, the EIT has created an ecosystem of over 2 400 partners. So far, the EIT has supported over 9 900 ventures and has created 830 start-ups and spin-offs. This has resulted in the development of more than 2 450 new products and services, and EUR 10 billion in investment raised by EIT ventures. Additionally, the EIT has played a crucial role in the growth of nine unicorns²⁰⁴, including Northvolt²⁰⁵.

The EIT has undoubtedly a proven track record in promoting **education and training** as drivers for innovation, developing and supporting entrepreneurial talent in Europe, and ensuring better matching of skills and labour market needs. To date, the EIT has supported more than 9 200 graduates from EIT-labelled Master and Doctoral programmes. The EIT KICs also offer summer schools, short courses, certified professional education, both as online and in-person learning experiences. The EIT courses have a strong emphasis on sustainable technology in combination with entrepreneurial and innovation skills. Besides technical knowledge, they promote leadership abilities, business skills and creative thinking. Indeed, by integrating social and political science skills into higher education curricula focused on the blue economy, higher education institutions can better prepare students to address the complex social, political, and environmental challenges. This holistic approach fosters future leaders and professionals who are equipped to promote sustainability and resilience in the blue economy.

Moreover, with the European Battery Alliance Academy, managed by the EIT and operated by EIT InnoEnergy, the EIT has not only trained 67 000 learners across the battery supply chain in the last two years, but it has paved the way to future **European Academies** to be managed by the EIT, notably the Solar Academy and the Raw Materials Academy under the Net-Zero Industry Act²⁰⁶. With these Academies, the EIT and the KICs are developing a unique, industry-oriented education model that helps closing the skills gap in Europe for critical sectors.

The **New European Innovation Agenda**²⁰⁷ also recognises the contribution of the EIT to a “pan-European Innovation Ecosystem intertwining regional innovation ecosystems across the EU”, including with its EIT Regional Innovation Scheme. Under the European Innovation Agenda, the Commission has entrusted the EIT to manage the **Deep Tech Talent Initiative**. By the end of 2025, with the contribution of all EIT KICs and external pledging partners, the EIT KICs will have trained 1 million deep tech talents. Given the growing role of digitalisation in the WMM sectors and ecosystems, along with deep tech sectors such as AI, Internet of Things, cloud computing and others, the acquired competence and experience of the EIT and its community could be beneficial also to the WMM field.

²⁰⁴ Northvolt, Lilium Aviation, Freyr, Owkin, Ynsect, Sword Health, Cimeworks.

²⁰⁵ <https://northvolt.com>.

²⁰⁶ https://single-market-economy.ec.europa.eu/industry/sustainability/net-zero-industry-act_en.

²⁰⁷ Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions – A New European Innovation Agenda, COM/2022/332 final, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52022DC0332>.

The ability of EIT KICs to create effective **EU-wide ecosystems** is also confirmed by the recently published evaluation study of the European framework programmes for research and innovation for an innovative Europe (phase 1)²⁰⁸. For instance, it confirms that “the KICs are in a prime position in their networks to serve as an animator, analogous to a spider in a web, pulling at the right strings at the right moment to engage actors such as corporates, investors, experts, etc. where beneficial to companies for their business creation. This includes a role as an ecosystem builder, ensuring cross-pollination across stakeholders within the business creation community, as well as the knowledge triangle. EIT KICs have unique expertise in the market, and it is evident from the first wave KICs in the community that the time it takes to set up these complex networks of actors and the trust therein is worth the wait as these services are gaining more and more traction”.

A WMM KIC should, in particular, build on the broad knowledge and innovative solutions developed under the **Mission Ocean and Waters**, the relevant **European partnerships** and Horizon Europe more broadly. Its added value will lie, inter alia, in providing targeted support for deep demonstrations of innovative solutions, their scaling up, commercialisation and broad and place-based deployment across Europe. The KIC would thereby provide an accelerated push for the necessary implementation of innovative solutions in the WMM field at regional and local level to reach the European Green Deal targets. The KIC can help aggregate information on academic, institutional and private R&I actors working in the WMM field. This will improve communication and dissemination within and beyond the network of stakeholders, boost the visibility and accessibility of their R&I activities, and enhance new forms of connectivity between them, including across national boundaries at regional, European or international level.

The potential role of a WMM KIC in the blue transition has been explicitly recognised and called for in the context of the umbrella opinion **A call for an EU Blue Deal** of the European Economic and Social Committee and in the related Declaration for an EU Blue Deal²⁰⁹. More specifically, the umbrella opinion states: “The blue transition entails phasing out processes that are water inefficient, finding concrete solutions for workers and territories with stakeholder involvement. The EESC points out that ensuring the availability of skilled labour and specialised workers, and maintaining the competitiveness of European businesses, require specific action at all levels. The Committee calls for a cross-sectoral blueprint for water and for investment in working conditions, quality jobs and training, especially targeting the younger generation. Know-how in the area of water-saving processes will be a core competence and a key performance indicator for industry in the future. There needs to be a systematic survey of the personnel requirements in the water sector, including the necessary qualifications, workforce development and occupational health and safety management. The EESC urges the Commission

²⁰⁸ European Commission, Directorate-General for Research and Innovation, Naujokaitytė, R., Stančiauskas, V., Cakić, M. et al. (2023). Evaluation study of the European framework programmes for research and innovation for an innovative Europe – Final report – Phase 1. Denham, S.(editor), Publications Office of the European Union, <https://data.europa.eu/doi/10.2777/144504>.

²⁰⁹ European Economic and Social Committee. (2023). Declaration for an EU Blue Deal. Retrieved from https://www.eesc.europa.eu/sites/default/files/files/declaration_for_an_eu_blue_deal_en.pdf.

to start the legislative process to create a new Knowledge Innovation Community for water within the European Institute of Technology (EIT) and to step up the ‘five missions’ approach.”

There is a significant alignment between the goals of **EU investment strategies**, such as the Global Gateway²¹⁰ initiative, and the objectives of the WMM KIC, particularly in promoting greener and more sustainable investments. Thus, the KIC could support innovation, specifically focusing on corporate water stewardship investments in line with EU directives and frameworks like the EU Taxonomy²¹¹, the Corporate Sustainability Reporting Directive (CSRD)²¹² and the Sustainable Finance Disclosures Regulation (SFDR)²¹³. In this context, EU companies are at the forefront of advocating for mandatory disclosure of water-related information, recognizing the importance of supply chains in addressing nature-related impacts²¹⁴. The leading role of EU companies on the global market is exemplified through their active engagement with suppliers to mitigate water-related risks and impacts.

It is crucial for effective policymaking and implementation to acknowledge **regional differences** in infrastructure access and capacity for water supply and wastewater treatment. Low institutional capacity in addition to regulatory complexity of water policy hampers the implementation of EU-funded investments. This is why Cohesion Policy is already enhancing the capacities of managing authorities and beneficiaries in the implementation of water supply and wastewater treatment projects, thanks to the Cohesion for Transitions (C4T) Community of Practice²¹⁵. The WMM KIC could indeed play an important role in addressing these imbalances by tailoring its activities to regions with the greatest needs, and by fostering collaboration and knowledge exchange in order to build bridges between different areas. By aligning its efforts with Cohesion Policy objectives, the WMM KIC can help ensure that its initiatives contribute to more equitable and sustainable water management across the EU.

2.3.2.2. Conclusions

Regarding the relevance of an EIT KIC in the WMM field, the ex-ante analysis concludes that the sustainable blue economy approach has consolidated since the publication of the SIA factsheet. This has been spurred by the expansion of emerging fields, such as blue biotechnology, marine renewable energy, digitalisation and innovative blue tech. The development of a circular and sustainable blue economy in the context of the green and digital

²¹⁰ https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/stronger-europe-world/global-gateway_en.

²¹¹ https://finance.ec.europa.eu/sustainable-finance/tools-and-standards/eu-taxonomy-sustainable-activities_en.

²¹² Directive (EU) 2022/2464 of the European Parliament and of the Council of 14 December 2022 amending Regulation (EU) No 537/2014, Directive 2004/109/EC, Directive 2006/43/EC and Directive 2013/34/EU, as regards corporate sustainability reporting, PE/35/2022/REV/1 (OJ L 322, 16.12.2022, p. 15–80), <http://data.europa.eu/eli/dir/2022/2464/oj>.

²¹³ https://finance.ec.europa.eu/regulation-and-supervision/financial-services-legislation/implementing-and-delegated-acts/sustainable-finance-disclosures-regulation_en.

²¹⁴ Le Sève, M.D., de Souza, E. (2024). Stewardship at the Source. Driving water action across supply chains. CDP Worldwide. <https://www.cdp.net/en/research/global-reports/global-water-report-2023>.

²¹⁵ The C4T Community of Practice is a community-based platform that aims to support all EU Member States and regions to make better use of EU funds for sustainability transitions. C4T engages national, regional, and local cohesion and sustainability transition practitioners in sharing experience and good practices, creating partnerships and jointly identifying solutions. C4T also provides technical assistance to facilitate the development and/or implementation of sustainability transitions.

twin transition is considered a necessity and comes with many challenges: skill gaps, need for investments, market penetration and uptake, upscaling and deployment at scale of innovative solutions, and increasing use of marine space.

In the WMM field, a stronger integration of research, business and education activities is necessary to overcome fragmentation and build on the existing knowledge base to deploy innovative solutions at scale. This will address the urgent challenges faced by WMM sectors and ecosystems and provide an accelerated push for reaching the European Green Deal targets. A WMM KIC can address this fragmentation by connecting countries, regions, sectors, disciplines, and initiatives within the knowledge triangle, tackling the need for skilling, upskilling and reskilling a competitive workforce for Europe, and supporting the uptake, scale-up, commercialisation and deployment at scale of innovative solutions, by building also on existing initiatives.

2.3.3 Synergies and complementarities with existing initiatives

The SIA Factsheet

According to the EIT factsheet, the “KIC on WMM shall establish the strongest possible synergies with relevant Union policy initiatives as well as within Horizon Europe, and interact at an international level with relevant UN initiatives and the SDGs [...]”. The factsheet then goes on to mention, in particular, the Horizon Europe instruments missions, partnerships, clusters, research infrastructure, and the European Innovation Council, various EU Directives, such as the Directive establishing a framework for maritime spatial planning, various EU policy strategies, such as the “Farm to Fork Strategy”, the Commission communication on “An integrated Maritime Policy for the European Union and international commitments”, the regional S3 strategies, the European Investment Bank (EIB) and BlueInvest.

Key findings from the study

According to the findings of the study, the policy landscape and the initiatives launched in WMM-related fields have significantly evolved since 2019.

The study lists a large amount of policy developments, tools, initiatives and projects, prioritised according to their relevance for the WMM KIC. It mentions these new developments not only in the dedicated chapter on synergies, but also throughout the whole analysis of the thematic challenges, thus giving a full picture of the developments and trends in recent years, set against relevant policy frameworks and related initiatives.

Of all these initiatives, the European Green Deal, the EU Mission Restore our Ocean and Waters, the related European partnerships and the Horizon Europe programme in general form the backdrop in terms of EU strategic policy directions and funding for the WMM KIC. Against this background, each single initiative tackles a specific field whose main characteristics and

connections with the WMM KIC are presented in the study. The study also underlines that new initiatives embrace all dimensions of the WMM field and all actors in the knowledge triangle from different perspectives.

Considering the challenges in the WMM field as well as the potential relevance and impact of a WMM KIC analysed in the study, a composite picture of the synergies that would be beneficial to the KIC and, in turn, leverage its potential for substantial impact, emerges.

The study shows that a WMM KIC would have significant synergies and complementarities with existing EU-level initiatives, spanning various policy domains such as biodiversity conservation, sustainable blue economy, circular economy, and climate adaptation. Aligned with the overarching goals of the European Green Deal as well as the broader Sustainable Development Goals, a WMM KIC would further consolidate an integrated, multidisciplinary and cross-sectoral approach to ocean and waters in so far as it would cover all marine, maritime, and water sectors and ecosystems, thus building on and complementing the systemic approach taken by the EU Mission Restore our Ocean and Waters. This focus, coupled with the typical activities of KICs, would position the WMM KIC as a valuable contributor to the EU objectives in the WMM field and beyond, and as an instrument that could provide contextualised and meaningful added value, provided that it would fully leverage on synergies and complementarities with existing initiatives in the field.

Furthermore, careful attention must be paid to avoid overlap with existing initiatives, particularly at EU level. Stakeholders have expressed concerns about potential duplications, particularly in the field of education and innovation, where there may be competition for resources between the WMM KIC and existing initiatives. No further details have been provided on the precise nature of those duplications. However, the study indicates that a well-functioning strategy for synergies should be tailored to the various WMM sectors and challenges and centred around the contributions of the KIC. The emphasis on education, innovation, and research within the KIC resonates with the broader EU strategies, and its potential impact would be bolstered if aligned with initiatives already in place.

The study also suggests considering different geographical dimensions, for instance by looking at rivers, lakes, aquifers and sea basin strategies and agreements, macro-regional strategies, the Outermost Regions or the global dimension. With respect to the international ocean governance framework, the 2022 “Setting the course for a Sustainable Blue Planet - Joint Communication on the EU’s International Ocean Governance Agenda”²¹⁶ provides a clear positioning for the EU and an updated commitment to the implementation of the UN 2030 Agenda, embracing the objectives of all the initiatives analysed in this study. This Joint Communication is to be considered a prime reference for the WMM KIC at the international level.

²¹⁶ SWD (2022) 174 final – Joint Staff Working Document – Synopsis of Consultation Activities accompanying the document ‘Joint Communication to the European Parliament, the Council the European Economic and Social Committee and the Committee of the Regions: Seeing the course for a sustainable blue planet – Joint Communication on the EU’s International Ocean Governance agenda.

2.3.3.1. Further considerations from the Commission

In addition to the policy framework and potential synergies identified in the study, other initiatives should be highlighted.

First of all, there is a high potential of **synergies between the EIT KICs**, as other KICs, in particular EIT InnoEnergy, EIT Food, EIT Digital and EIT Climate-KIC already support water-related projects and technologies, for instance Smart Urban Water²¹⁷, Water and Energy for Climate Change²¹⁸, hydro power stations in underground mines²¹⁹, production plants turning waste water into a source of valuable nanomaterials²²⁰, freshwater production systems powered by intelligent software²²¹ or sustainable aquaculture²²². Moreover, KICs can also cooperate in joint projects, such as the Water Scarcity Programme²²³ that has involved EIT Manufacturing, EIT Food, EIT Climate-KIC and EIT Digital. This is a good example of a multi-disciplinary approach in addressing water-related challenges.

Regarding the potential duplication of efforts between KICs, it is important to note that the key societal challenges covered by the KICs are highly interconnected by definition. This interconnection has a positive effect as it encourages KICs to cooperate on certain aspects within the context of EIT Community actions. Such cooperation allows tapping into different perspectives, groups of stakeholders or geographical areas, which is beneficial for technological advancements, innovation solutions and societal impact.

At the same time, overlaps can be avoided by defining clear mandates and focus areas that differentiate the WMM KIC from other initiatives, monitoring ongoing activities, identifying unmet needs or new opportunities for innovation and active collaboration with existing initiatives, such as European Missions and Partnerships.

As the EU's flagship programme for researchers' doctoral networks and postdoctoral training, the **Marie Skłodowska-Curie Actions (MSCA)** also contribute to the EU policy objectives in the WMM field. Under Horizon 2020 and Horizon Europe, the MSCA has supported 131 projects relevant to the objectives of the Ocean and Waters mission. One of these projects, the RIBES²²⁴ project, has been highlighted in the study and aims to create innovative solutions for freshwater fish protection and river restoration. Other examples include the project AQUALity²²⁵, aimed at developing an interdisciplinary cross-sectoral approach to address the removal of contaminants of emerging concern from water, and the project SEAS²²⁶ which uses autonomous

²¹⁷ <https://www.climate-kic.org/projects/smart-urban-water/>.

²¹⁸ <https://www.climate-kic.org/projects/water-and-energy-for-climate-change>.

²¹⁹ <https://easyhydrosolutions.com/en>.

²²⁰ <https://particularmaterials.com/>.

²²¹ <https://stockholmwater.com/>.

²²² <https://www.eitfood.eu/fishing-for-innovation-in-aquaculture>.

²²³ <https://www.eitfood.eu/projects/water-in-south-finding-innovative-solutions-for-water-scarcity-in-southern-europe>.

²²⁴ <https://www.msca-ribes.eu/>.

²²⁵ <https://cordis.europa.eu/project/id/765860>.

²²⁶ <https://cordis.europa.eu/project/id/101034309>.

vehicles and AI to track marine animals, improving the protection and conservation of European marine waters.

Environment and climate actions are an overarching priority of the **Erasmus+** programme too. Green Erasmus promotes the incorporation of sustainable practices in all projects and supports awareness-raising. The blue dimension is an integral part of the sustainability measures of Green Erasmus. The Erasmus+ Work Programme 2024²²⁷ states that “among other elements, the Programme will also deliver on the so-called ‘Blue Erasmus+’ dimension, notably with project results and knowledge creation, including analyses and best practices relevant for the objective of preserving a healthy ocean, seas, coastal and inland waters”. The WMM stakeholders could therefore create synergies with Erasmus+.

Green skills are in particular central to the **Erasmus+ Alliances for Innovation**. Projects selected under this strand aim to strengthen Europe’s innovation capacity by boosting innovation through cooperation and the flow of knowledge among higher education, vocational education and training, and the broader socio-economic environment, including research. They also aim to boost the provision of new skills and address skills mismatches by designing and creating new curricula for higher education and vocational education and training. For instance, in 2022 and 2023, three projects under the Alliances for Innovation that are related to the WMM field were selected for funding: one addresses digital learning in aquaculture²²⁸, one launches a learning alliance for digital environment and resilient shipbuilding²²⁹ and one promotes the development of disruptive technologies for ecological transition in the nautical sector²³⁰. There is often a close link between Erasmus+ Alliances for Innovation projects and activities carried out by KICs, thus a WMM KIC could build on the findings of concluded projects and establish synergies with future ones.

Furthermore, the **European Solidarity Corps** (ESC) features environmental sustainability as a horizontal priority encouraging participants to take an environmental approach when designing activities. Volunteers and hosting organisations contribute to educating and raising awareness about the WMM field and its challenges. In 2023, a dedicated ESC call supported the implementation of EU Missions including the Mission Restore our Ocean and Waters to mobilise young citizens to be active players and change agents in climate, environmental and health issues, related to the goals of the Missions. Ongoing projects at national level are, for instance, supporting citizen science research on plastics in surface water²³¹, preserving wetland

²²⁷ Commission Implementing Decision on the financing of Erasmus+: the Union Programme for Education, Training, Youth and Sport and the adoption of the work programme for 2024, C (2023) 6157. Retrieved from <https://erasmus-plus.ec.europa.eu/document/2024-annual-work-programme>.

²²⁸ Digital learning in aquaculture 4.0 for the technological training of fish farm technicians (AQUATECHinn 4.0) – project n. 101108913 under ERASMUS-EDU-2022-PI-ALL-INNO.

²²⁹ Learning European Alliance for Digital, Environmental and Resilient Shipbuilding (LeaderSHIP) – project n. 101111595 under ERASMUS-EDU-2022-PI-ALL-INNO

²³⁰ Using disruptive Technologies to facilitate the Ecological transition of the Nautical sector (TEcoNaut) – project. n. 101139940 under ERASMUS-EDU-2022-PI-ALL-INNO.

²³¹ Project n. 2023-1-NL02-ESC51-VTJ 000147060, hosted by the Sail Training Association (the Netherlands), <https://youth.europa.eu/solidarity/projects/details/2023-1-FR02-ESC51-VTJ-000138364>.

and coastal environments²³² and building bridges between science, management and public policy with research activities focusing on wetlands²³³. Synergies with a WMM KIC could focus on informal education, as well as on active citizenship and awareness-raising activities.

As far as “**blue**” **skills** are concerned, the EU supports cooperation projects between business and education through the “Blue careers in Europe” calls for proposals under the **European Maritime and Fisheries (EMFF)** and the **European Maritime, Fisheries and Aquaculture (EMFAF) Funds**. They aim to contribute to the development of the next generation of blue skills and provide opportunities for attractive sustainable maritime careers. They also include concrete actions to close the skills gap, tackle unemployment and raise the attractiveness of “blue careers” among students and young professionals. The WMM KIC would greatly benefit from synergies with these projects.

Overall, closer synergies between the WMM KIC and the **S3 strategies** could contribute to more effective and sustainable solutions to WMM challenges while fostering innovation-driven growth and development in Europe's regions. Thus, to enhance the effectiveness of both initiatives and foster closer synergies, the alignment of priorities and funding opportunities would be explored, as well as the design of collaborative projects and capacity building initiatives, by coordinating policies at European, national, and regional levels to remove barriers.

2.3.3.2. Conclusions

It is paramount for a new KIC to develop clear synergies and complementarities with other initiatives, within and beyond Horizon Europe. A new KIC needs to complement existing initiatives by creating a pan-European ecosystem in the WMM field and connecting education, research and businesses, capitalising on the knowledge, solutions, partnerships and networks from existing EU initiatives in these fields.

In particular, the KIC could provide an added value by developing an integrated approach across freshwater and marine domains, support training and skills development, as well as foster the uptake and deployment at scale including commercialisation of innovative solutions to address the challenges faced by the WMM field.

Reaching the ambitious European Green Deal targets in the WMM field will require an accelerated push for the uptake and roll-out of innovative solutions within the EU and beyond as water basin aquifers, and maritime areas go beyond our borders. It will therefore be crucial for the new KIC to fully align and establish the necessary links with relevant policies and initiatives. It will be equally important to build on the solutions already developed, notably the EU Mission Restore our Ocean and Waters as well as relevant existing and forthcoming European

²³² Project n. 2023-1-FR02-ESC51-VTJ 000138329, hosted by Association pour la mise en valeur des rivières et pour les initiatives locales (France). Retrieved from <https://youth.europa.eu/solidarity/projects/details/2023-1-FR02-ESC51-VTJ-000138329>.

²³³ Project N. 2023-1-FR02- ESC51-VTJ000138364, hosted by Fondation Tour du Valat, Institut de recherche pour la conservation des zones humides méditerranéennes (France). Retrieved from <https://youth.europa.eu/solidarity/projects/details/2023-1-NL02-ESC51-VTJ-000147060>.

Partnerships (in particular Sustainable Blue Economy, Water Security for the Planet, PRIMA, and Zero Emission Waterborne Transport).

3. OVERALL CONCLUSIONS

In compliance with the provisions of the SIA 2021-2027 of the EIT, the Commission has performed, with the assistance of external experts, an ex-ante analysis to evaluate the relevance of the WMM field for setting up an EIT KIC. The Commission has duly reflected in its analysis developments in scientific, technological and socio-economic trends in the WMM field and has also taken into account elements related to the alignment of a WMM KIC with the strategic planning of Horizon Europe, the criteria for European Partnerships as well as the need for ensuring coherence with existing initiatives at Union, national and regional level, including European Partnerships and EU Missions.

Based on the findings of the independent study, the Commission has carried out an ex-ante analysis as requested and hereby confirms that the WMM field is relevant for setting up a KIC.

Similarly, the Commission, based on a scientific, technological and socio-economic analysis, confirms the main challenges in the WMM field as described in the factsheet annexed to the SIA. Without prejudice to the text of the factsheet adopted by the co-legislators, the Commission summarises recent scientific, technological and socio-economic trends and developments in the WMM field in Annex 2, based on the key findings of the independent study.

In addition, the Commission confirms that the launch of a WMM KIC would be fully aligned with the strategic planning of Horizon Europe. The confirmation of the launch of the WMM KIC is also reflected in the Horizon Europe Strategic Plan 2025-2027.

Moreover, the Commission confirms that the future KIC, just as all current KICs, will be fully aligned with the criteria for European Partnerships.

Finally, the Commission confirms that the launch of a WMM KIC would be coherent with existing initiatives at Union, national and regional level, including European Partnerships and Missions. In this context, the independent study identifies current major initiatives in the WMM field on which a future KIC needs to build and be developed in full complementarity.

Against this background, a WMM KIC will be launched in 2026, with a call for proposals to be published by the EIT in 2025, as stipulated in the SIA 2021-2027.

ANNEX 1 – APPENDIX 2 OF THE EIT STRATEGIC INNOVATION AGENDA 2021-27 - FACTSHEET ON THE KIC ON WATER, MARINE AND MARITIME SECTORS AND ECOSYSTEMS

This Appendix presents an overview of the WMM field at the time of preparation of the SIA 2021-2027. Prior to the launch of a KIC on WMM, the Commission shall perform an analysis to reflect developments in scientific, technological and socio-economic trends, and ensure:

- (1) full alignment with the strategic planning of Horizon Europe;
- (2) full alignment with the criteria for European Partnerships set out in Annex III of Regulation (EU) 2021/695; and
- (3) coherence with existing initiatives at Union, national and regional level, including European Partnerships and missions.

I. The challenge

Seas, ocean and inland waters play a central role in human life, health and wellbeing, in the provision of food, critical ecosystem services, renewable energy and other resources, as well as in climate-related dynamics and in the preservation of biodiversity. During the last 100 years, the overuse and mismanagement of natural resources have placed a great pressure on freshwater and marine ecosystems. Therefore, the creation of a circular and sustainable blue economy that develops within ecological limits and that is based on the reliable availability of an acceptable quantity and quality of water as well as on healthy and functioning freshwater and marine ecosystems is a challenge. That challenge encompasses mainly: (1) water scarcity, drought and floods; (2) marine and freshwater ecosystem degradation; and (3) the circular and sustainable blue economy.

1. Water scarcity, drought and floods

Continued climate change and over-extraction of fresh water are increasing the severity and frequency of water scarcity and droughts. Without innovative methods and technologies to gather, predict, prepare and disseminate information and solutions about waterbody safety, potential threats and mitigation of risks, the Union is exposed to severe economic and social harm. Water scarcity accompanies the pressure on land driven by the need to increase biomass production, carbon sequestration and wilderness to achieve decarbonisation and biodiversity targets. The Commission's impact assessment²³⁴ indicates that shifting protein production to non-fed aquaculture and to integrated multi-trophic aquaculture and aquaponics, could relieve pressure on land and freshwater.

²³⁴ Impact assessment accompanying the communication of the Commission of 17 September 2020 on Stepping up Europe's 2030 climate ambition. Investing in a climate-neutral future for the benefit of our people.

2. Marine and freshwater ecosystem degradation

Coastal, marine and freshwater ecosystems are subject to pressure from direct human activity and accelerating climate change. The damage includes the loss of biodiversity, the depletion of fish stocks, damage to the sea floor, including from the use of harmful devices such as fishing gear, obstruction of rivers, eutrophication pollution, and the accumulation of marine litter including a high level of fishing gear and microplastics that are discarded in the ocean. Poor ecological health not only compromises biodiversity targets but also harms those communities and businesses that depend on clean water and healthy ecosystems. The global market for goods and services for measuring and mitigating that degradation is growing and is highly competitive. Innovation that can enhance, restore and recover marine, coastal and freshwater capital and innovation into sustainable fishing gear and methods is key for the competitiveness of Union businesses and to supporting jobs and growth across the Union.

3. The circular and sustainable blue economy

The circular economy path not only safeguards human health and resource efficiency, but is also an engine of sustainable growth. The planned unprecedented growth in offshore wind energy and other innovative ocean energy technologies, which must not undermine environmental protection, offer opportunities both for the enhancement of biodiversity (such as artificial reefs and oyster beds) and for new activities that make use of the space and renewable electricity such as aquaculture and hydrogen electrolysis. Non-fed aquaculture is able to recycle the excess nutrients that would otherwise cause eutrophication. New targets for emissions reduction and renewable fuel in maritime transport require innovation in propulsion and logistics. The reuse of wastewater prevents shortages that may be exacerbated by a changing climate.

II. Relevance and impact

A KIC on WMM – with a holistic and integrated approach – will help address the challenges referred to in chapter I. This field has a relatively strong knowledge base and high market potential. European countries have produced more research papers on water science and technology in the past 15 years than both the United States of America and the rest of the world. Moreover, the Union, together with China and the United States of America, is one of the leading maritime economies. According to the most recent figures from 2018, the established sectors of the blue economy employed over five million people in the Union, and generated EUR 750 billion of turnover and EUR 218 billion of gross value added. However, there is a clear fragmentation of efforts and disconnections between education, research and innovation activities. For example, less than 20% of research and development organisations in water sciences have an effective cooperation with industries or enterprises.

Newly emerging innovation sectors (such as biotechnologies and offshore energy production) open new market opportunities for new technologies and new business and highly skilled jobs. Those sectors and the technological transition of the more traditional marine-related sectors

would require trans-disciplinary approaches and new types of education across discipline boundaries. In particular, academic programmes tend to be rather broad, whereas the sectors require specific knowledge and skills. Additionally, curricula in areas such as engineering, urban design and architecture do not sufficiently cover issues related to ecology, marine engineering and management of water.

Establishing a KIC on WMM is intended to comprise a real contribution to strengthening innovation ecosystems and stimulating cooperation across the knowledge triangle, in order to accelerate the uptake of new technologies and approaches and boost the development of more sustainable products and methods, in particular as far as fishing gear is concerned. The establishment of a pan-European multi-disciplinary community of knowledge triangle partners would help to promote the blue economy vision and boost worldwide competitiveness of European marine and maritime science and technology. Such a community would help bring to the market innovative projects of blue science and technology that would provide solutions to urgent practical challenges of sustainability and contribute to an ‘Ecosystem-based Blue Economy’ not only at a European but also at a global level. A KIC on WMM would lead to better management of human interactions with water-marine ecosystems directly contributing to a sustainable blue economy that develops within ecological limits, in particular by ensuring the sustainable management of marine ecosystems.

III. Synergies and complementarities with existing initiatives

The KIC on WMM shall establish the strongest possible synergies with relevant Union policy initiatives as well as within Horizon Europe and interact at an international level with relevant UN initiatives and the SDGs, in particular SDG 6 ‘Clean Water and Sanitation’, SDG 11 ‘Sustainable Cities and Communities’, SDG 13 ‘Climate Action’ and SDG 14 ‘Life below Water’.

The KIC on WMM shall be aligned with the priorities established in Directive (EU) 2020/2184 of the European Parliament and of the Council²³⁵, Directive 2008/56/EC of the European Parliament and of the Council²³⁶, Directive 2014/89/EU of the European Parliament and of the Council²³⁷, Regulation (EU) No1380/2013 of the European Parliament and of the Council²³⁸, the communication of the Commission of 10 October 2007 on An integrated Maritime Policy for the European Union and international commitments. The KIC on WMM shall contribute to priorities established in the European Green Deal, in particular the ‘Farm to Fork Strategy’, the ‘Zero

²³⁵ Directive 2020/2184/EU of the European Parliament and of the Council of 16 December 2020 on the quality of water intended for human consumption ([OJ L 435, 23.12.2020, p. 1](#)).

²³⁶ Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive) ([OJ L 164, 25.6.2008, p. 19](#)).

²³⁷ Directive 2014/89/EU of the European Parliament and of the Council of 23 July 2014 establishing a framework for maritime spatial planning ([OJ L 257, 28.8.2014, p. 135](#)).

²³⁸ Regulation No 1380/2013 of the European Parliament and of the Council of 11 December 2013 on the Common Fisheries Policy, amending Council Regulations (EC) No 1954/2003 and (EC) No 1224/2009 and repealing Council Regulations (EC) No 2371/2002 and (EC) No 639/2004 and Council Decision 2004/585/EC ([OJ L 354, 28.12.2013, p. 22](#)).

pollution action plan for air, water and soil’, the ‘initiatives to increase and better manage the capacity of inland waterways and the EU Biodiversity Strategy for 2030.

Some regional S3 strategies have identified a number of research and innovation strategies that focus on marine and aquatic industries and explore new links between local assets, potential markets and societal challenges through the involvement of a large set of entrepreneurial actors.

Strong complementarities with the components of Horizon Europe are to be ensured and duplications are to be avoided, in particular with:

- (1) the possible mission on ‘healthy oceans, seas, coastal and inland waters’;
- (2) relevant European Partnerships, in particular the ones on ‘a climate-neutral, sustainable and productive Blue Economy’, ‘Rescuing biodiversity to safeguard life on Earth’, ‘Water4All’, ‘Clean energy transition’, ‘Driving urban transition’, ‘Food systems’ and ‘Research and Innovation in the Mediterranean Area’ (Horizon 2020);
- (3) all clusters of Pillar II ‘Global Challenges and European Industrial Competitiveness’;
- (4) research infrastructures; and
- (5) the EIC.

Strong complementarities with the European Investment Bank (EIB) and BlueInvest are also to be ensured for the uptake of promising innovations and duplications are to be avoided.

IV. Conclusion

The KIC on WMM is best suited to addressing the major economic, environmental and societal challenges referred to in this Appendix. That KIC is needed, in particular, to strengthen the innovation ecosystems throughout Europe tackling the water-related challenges, train the next generation of innovators and entrepreneurs, and find and support innovative solutions for those challenges.

The KIC on WMM shall:

- (1) reduce the fragmentation of the water, maritime and marine sectors’ innovation landscape by fostering the creation of innovation ecosystems that will connect actors and networks across sectors and disciplines at Union, national, regional and local level;
- (2) promote an integrated and multidisciplinary approach through collaboration among HEIs, research organisations, innovative businesses, public and third-sector organisations in the blue economy sectors in order to deliver on the Union objectives on green and digital transitions;
- (3) connect actors and networks across sectors and disciplines at Union, national regional and local level, in particular by identifying the relevant S3 strategies and further regional strategies which include blue economy sectors;

- (4) train and develop the next generation of innovators and entrepreneurs in the blue economy sectors by equipping them with the necessary entrepreneurial and technological skills needed for sustainable and competitive development;
- (5) contribute to the development of the appropriate framework conditions to transform ideas into new technological developments and social innovation, and to their market deployment in view of improving the quality of life and benefitting Union citizens;
- (6) establish synergies with other European Partnerships, missions, the EIC, the EIB and BlueInvest, in order to scale up innovations, allow other sectors to prosper in a sustainable manner and increase the market deployment and societal acceptance of innovative solutions; and
- (7) strengthen the Union's position as a global actor in ocean science, inland waters management and ecosystem protection and restoration.

ANNEX 2 - KEY FINDINGS OF THE INDEPENDENT STUDY

Analysis of the challenges faced by the Water, Marine and Maritime Sectors and Ecosystems today

Challenge 1: Water scarcity, droughts and floods. Scientific responses from 2019 to 2023 include advancements in water treatment, digitalisation, and early warning systems. However, assessing their impact is premature due to the short timeframe. Projected challenges by 2030 include heightened drought risk, decreased precipitation, and higher flood risks. Urgent action is needed, focusing on emerging water technologies, targeted innovations for climate change, and sustained research to understand economic and environmental impacts. A comprehensive approach involving policy frameworks, technology deployment, and ongoing research is crucial to address the escalating water crisis in Europe.

Challenge 2: Marine and freshwater ecosystem degradation. Recent years have seen substantial progress in safeguarding Europe's marine and freshwater ecosystems through EU commitments to combat biodiversity loss and climate change. Scientific efforts focus on understanding long-term degradation processes, while initiatives like the European Digital Twin of the Ocean will contribute to ecosystem assessment. Despite advancements, challenges persist, requiring enhanced cooperation and coordination among stakeholders. The EU has implemented various strategies and plans, such as the European Green Deal and its related strategies, aiming to protect marine and freshwater ecosystems. Although bathing water quality remains high, the Water Framework Directive and the Marine Strategy Framework Directive show modest results, emphasising the need for ongoing efforts and collaborative initiatives.

Challenge 3: Circular and Sustainable Blue Economy. Findings confirm a strong research base in the EU but point to a lack of focus on higher education, particularly in broad academic programmes. Thematic and disciplinary gaps in areas like ecology, marine engineering, and water management are highlighted. Despite the EU's strategic emphasis on the research base, knowledge and competence are unevenly distributed among Member States. The study underscores the importance of addressing skills gaps, particularly in sectors like offshore wind, aquaculture, fishing, and blue biotechnology. It predicts growth in offshore wind energy but highlights challenges such as rising interest rates and potential space conflicts. The study also emphasises the need for innovation in fishing gear, in the reduction of atmospheric pollution in maritime transport, and in the development of a diverse ecosystem of service providers for energy and aquaculture installations.

Analysis of the potential relevance and impact of a KIC in the field

Europe is a global leader in marine and maritime economies, with a robust blue economy contributing significantly to employment and economic growth. The marine equipment industry, accounting for nearly 50% of global output, generated a total production value of EUR 71.6 billion between 2012 and 2017. Despite challenges from the COVID-19 pandemic and the

energy crisis, the shipbuilding and repair sector employed around 305 500 individuals in 2020. Coastal tourism, the largest EU Blue Economy sector, faced a 58% decrease in gross value added and a 40% decrease in employment in 2020 due to the pandemic, but showed a strong recovery in 2021. Maritime transport, constituting 23% of the Blue Economy, faced a decline in 2020 but holds growth potential through technological advancements like digitalization.

Fisheries and aquaculture, contributing to 156 210 jobs in 2020, faced challenges with decreasing catches and changes in the fish stock resource base. The marine energy sector, with a gross value added of EUR 2 145 billion in 2020, demonstrated growth. The offshore oil and gas sector declined in response to net-zero emission targets, while blue biotechnology shows an increase in gross value added.

Water supply and wastewater treatment sectors experienced growth in 2020. However, fragmentation and disconnection within the knowledge triangle, including education, research, and innovation, pose challenges. Stakeholders emphasise the need for coordinated and integrated approaches to ocean and freshwater management.

The proposed WMM KIC aims to address these challenges by fostering collaboration, upskilling, and supporting the development of a sustainable blue economy and water sector. The KIC can play a crucial role in integrating diverse sectors, promoting innovation and the large-scale deployment of solutions, as well as aligning with EU policy objectives for a sustainable and competitive blue economy. The study underscores the importance of overcoming sectoral and educational divides to achieve a holistic, well-performing knowledge triangle and emphasizes the potential of a KIC in addressing existing challenges and promoting transformative innovation and deployment of solutions in the WMM field.

Synergies and complementarities with existing initiatives

The proposed WMM KIC aligns with various EU initiatives, including the European Green Deal and its related strategies and initiatives including the sustainable blue economy strategy, biodiversity strategy, zero pollution action plan, circular economy, and climate adaptation. Unlike similar initiatives, the WMM KIC has the potential to integrate marine, maritime, and water sectors, filling a gap in existing efforts. Aligned with EU goals and Sustainable Development Objectives, the WMM KIC focuses on education, innovation, and research, contributing meaningfully to EU objectives. Collaboration with the EU Mission Restore our Ocean and Waters and related partnerships is encouraged, with consideration for existing sea basin strategies, macro-regional approaches, Outermost Regions, and the global dimension. The EU's commitment to international ocean governance, outlined in the 2022 Joint Communication, serves as a reference for the WMM KIC at the global level. However, caution is advised to prevent duplication and competition for resources with existing initiatives, particularly in education and innovation, as stakeholders express concerns about potential overlaps.

Conclusions of the study

Europe grapples with mounting challenges (e.g., climate change) in managing marine and freshwater resources, necessitating heightened EU support for emerging marine, maritime, and freshwater-relevant technologies. While strides have been made in safeguarding ecosystems through initiatives combating biodiversity loss, persistent challenges demand increased cooperation. The circular and sustainable blue economy, essential for societal well-being, faces a spectrum of challenges and opportunities, including sector-specific impacts from events like the COVID-19 pandemic. The study confirms the continued relevance of a KIC in the WMM field, as holding significant potential in addressing fragmentation, skills gaps, and serving as a vital connecting node. By integrating education, research, and business activities, a WMM KIC contributes to reducing fragmentation across Europe, also through the EIT Regional Innovation Scheme. Strategic alignment with current policies and leveraging on existing frameworks and initiatives are critical for the KIC's success in reconciling human activities with the protection of healthy ecosystems and supporting European SMEs in the WMM sectors and ecosystems.