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**Scalable full-cycle marine litter remediation in the
Mediterranean: Robotic and participatory solutions**

SeaClear2.0

<https://www.seaclear2.eu>

D6.5 Policy Analysis Report

WP6 – Public Engagement, Policy, Dissemination

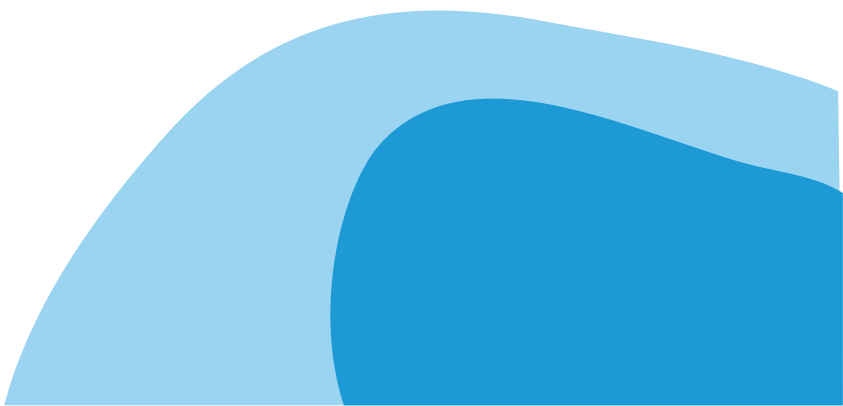
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Acronyms

AI	Artificial Intelligence
ALDFG	Abandoned, Lost or other Discarded Fishing Gear
CE	Circular Economy
CEAP	Circular Economy Action Plan
CSRD	Corporate Sustainability Reporting Directive
EASA	European Authority for Aviation Safety
EMSA	European Maritime Safety Agency
EPR	Extended Producer Responsibility
EU	European Union
GDP	Gross Domestic Product
GES	Good Environmental Status
IMO	International Maritime Organisation
IUCN	International Union for the Conservation of Nature
MAP	Mediterranean Action Plan
MARPOL	Marine Pollution Convention of the International Maritime Organisation
MS	Member States
MSFD	Marine Strategy Framework Directive
OECD	Organisation for Economic Co-operation and Development
PET	Polyethylene Terephthalate
PFAS	Per- and Polyfluoroalkyl Substances
REACH	Regulation on the Registration, Evaluation, Authorisation and Restriction of Chemicals
ROV	Remotely Operated Vehicle
SDGs	Sustainable Development Goals
SME	Small and Medium Enterprise
SSbD	Safe and Sustainable by Design
SUPD	Single-Use Plastics Directive
UAV	Unmanned Aerial Vehicle
UN	United Nations
UNEP	United Nations Environment Programme
USV	Unmanned Surface Vehicle
UWTD	Urban Wastewater Treatment Directive
WFD	Waste Framework Directive



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EXECUTIVE SUMMARY

Marine litter, particularly on the seafloor, is a pervasive environmental challenge, with the Mediterranean Sea being among the most severely affected regions in Europe. The SeaClear2.0 project presents an innovative and integrated approach to address the full cycle of marine litter, from detection to collection and awareness, through the use of autonomous robotic systems and participatory engagement.

The *SeaClear2.0* project (Scalable full-cycle marine litter remediation in the Mediterranean: Robotic and participatory solutions) is developing an integrated system that combines cutting-edge robotic technologies with participatory approaches to tackle marine litter throughout its lifecycle. This includes autonomous robots that can detect, classify, and collect seabed and floating litter, as well as robust citizen engagement and policy components that ensure long-term impact, awareness, and stakeholder buy-in. The project directly supports the European Union’s Mission “Restore our Ocean and Waters by 2030” and is aligned with several key EU environmental and innovation strategies.

This *Policy Analysis Report* represents the foundation for the project’s future policy recommendations. It maps out the complex landscape of EU and international policies that influence the generation, prevention, collection, and management of marine litter, and identifies key legal and institutional gaps, barriers, opportunities, and synergies relevant to the SeaClear2.0 system. The analysis also covers policies affecting the development and commercialisation of marine robotics and related technologies.

The report identifies a robust and growing policy landscape at the EU level, with flagship strategies such as the European Green Deal, the Circular Economy Action Plan (CEAP), the Zero Pollution Action Plan, and the EU Plastics Strategy setting the high-level direction for tackling marine litter. These are complemented by legislation including the Marine Strategy Framework Directive (MSFD), the Single-Use Plastics Directive (SUPD), and the Waste Framework Directive (WFD), all of which contain relevant provisions on marine pollution and waste prevention.

However, the analysis reveals that despite this evolving framework, substantial challenges remain. Key findings include:

- While EU strategic frameworks (e.g. the Green Deal, Circular Economy Action Plan, Zero Pollution Action Plan) establish strong goals for marine protection and pollution reduction, significant fragmentation, inconsistency, and gaps remain in implementation across Member States.
- Policies such as the Single Use Plastics Directive and Waste Framework Directive are crucial but insufficient in isolation. Complementary, harmonised, and enforceable measures are needed, especially for sea-based sources of litter and the integration of autonomous cleanup technologies.
- The regulatory environment for robotics, artificial intelligence, and unmanned systems remains a barrier for the scalable deployment of the SeaClear2.0 system.
- There is a lack of designated responsibilities and funding mechanisms for regular seafloor cleanup, hindering the adoption of innovative remediation technologies.
- The development of the European Oceans Pact presents a timely opportunity to embed seafloor cleanup, marine litter data harmonisation, and regulatory support for innovation into EU ocean governance.



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This report serves as a foundational reference for the stakeholder engagement phase of the project, which will culminate in a co-created *Policy White Paper*. This next phase will include workshops at the project's demonstration, pilot and Associated Region sites, as well as an international policy roundtable. Through these participatory processes, the project will develop actionable and stakeholder-supported policy recommendations aimed at accelerating the adoption of innovative marine litter prevention and remediation solutions.



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1. Introduction

Our oceans contain roughly 25 million tonnes of plastic waste.³ Over 90% of all marine litter is located on the seafloor,⁴ making it difficult and expensive to collect. Every year, hundreds of thousands of tonnes of macroplastics and microplastics enter European seas. While plastic pollution affects all waters across Europe, the Mediterranean is the most affected sea due to its semi-enclosed basin and the intense human activities taking place on the surrounding coastal areas. There is no one-size-fits-all approach to addressing marine litter. Concerted actions, combining legislation, technology and socio-economic tools are required to ensure that there is a paradigm shift in the way materials that end up as marine litter are produced, consumed and managed at the end of their life, and that “legacy” marine pollution is addressed.

The SeaClear2.0 project is developing an integrated approach to address the full cycle of marine litter in a way that will help meet the objectives of the European Union’s Mission to restore, protect and preserve the health of our oceans, seas and water by 2030. This approach includes the development of an autonomous team of robots that can detect and collect seabed and floating litter, the implementation of citizen activation and stakeholder engagement activities to raise awareness about marine litter and the need to prevent it, and the development of recommendations for policy interventions that can help prevent and minimise marine litter as well as support technologies and innovations to restore affected areas and mitigate its impacts.

This report marks the first step in SeaClear2.0’s policy recommendation work. It presents an analysis of the policy framework that affects seabed marine litter (sources, prevention, collection, reuse/recycling) and relevant clean-up operations/technologies (e.g. restrictions on use, etc.) to identify gaps, barriers, opportunities, synergies and coherence problems (both legal and institutional), at the EU and national level. This analysis results in the identification of the key factors to consider for the uptake of the project’s innovations and for their potential to address surface and seabed marine litter and thus meet the European Union’s ambitious targets.

³ Isobe & Iwasaki (2022). The fate of missing ocean plastics: Are they just a marine environmental problem?, *Science of The Total Environment* 825.

⁴ Sherrington (2016). *Plastics in the Marine Environment*, Eunomia.



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2. The SeaClear2.0 System

The SeaClear2.0 system (Figure 1) comprises a team of autonomous robots that can detect and collect marine litter resting on the seabed or floating in the sea column or the sea surface. Detailed system descriptions are available in other project deliverables and will not be repeated here. Instead, this section aims to briefly present the system parts and their capabilities to help the reader understand the relevance of the policies that are being discussed herein to the SeaClear2.0 system's technical capabilities and operational potential.

The system is composed of the following parts:

- **The SeaCAT:** An unmanned surface vehicle (USV) with a catamaran design that acts as the system's hub. It undertakes a preliminary bathymetry scan of the area and identifies litter hotspots. It is also able to collect floating litter while navigating, by trapping it in an opening available in its catamaran structure.
- **The SeaHawk drone:** Tethered to the SeaCAT, this unmanned aerial vehicle (UAV) facilitates litter hotspot identification and robotic system localisation.
- **The Mini Tortuga:** This remotely operated vehicle (ROV) is deployed from the SeaCAT to perform a detailed scan of hotspot areas to detect individual litter items. An Artificial Intelligence (AI) software is able to distinguish between litter and marine life.
- **The SeaCrab smart grapple:** This robotic grapple is deployed from the SeaCAT once litter has been identified. It is able to lift litter items up to 250 kg from depths over 100 m. It is designed to grab, hold and lift items of various shapes and dimensions. It has spatial positioning for litter localisation and thrusters for hovering over the identified litter items.
- **The SeaBees USV mini-drones:** Two compact USVs, adept at navigating tight spaces, tow a 10-metre long net. They collect floating litter and deposit it into the SeaCAT's catamaran structure.
- **The SeaDragon:** This is a USV tender with a catamaran structure, which autonomously docks on the SeaCAT so that collected marine litter can be deposited on it and transported to shore. It has a 6 m³ capacity and a 350 kg payload.



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Figure 1 The SeaClear2.0 System with its Seven Autonomous Robots



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3. Method

The policy analysis was conducted using a desk-study approach, analysing policies that can affect marine litter as well as policies influencing the development, uptake, and commercialisation of the SeaClear2.0 innovations. A funnel approach was employed to systematically identify, review, and analyse relevant policies. Initially, a broad spectrum of policies was identified, with a particular emphasis on those implemented at the European Union (EU) and international levels. To identify potential policies of relevance, keywords relevant to marine litter and technology were compiled. These keywords included 'EU policy', 'EU law', 'waste', 'packaging', 'marine litter', 'plastics', 'artificial intelligence', and 'drones', as well as combinations of these words.

The identified policies were subsequently screened based on their stated aims and objectives, and those deemed irrelevant to the focus areas were excluded from further consideration. For the remaining policies, the analysis sought to determine their potential to impact the generation of marine litter or the development, deployment, and commercialisation of systems such as SeaClear2.0. Specifically, the evaluation addressed how these policies could influence these areas positively or negatively and identified any barriers or opportunities they might present (Figure 2).

A literature review, exploring themes of policy relevance and effectiveness was also undertaken and relevant findings have been included in the discussion.



Figure 2 Schematic representation of the method used for policy analysis

Table 1 presents the European policies that have been identified and are being discussed in this policy analysis document, together with an indication of their relevance to marine litter, specifically whether they include clauses or targets for prevention, reduction or management of marine litter or materials/products that can become marine litter. The colour-coding used in the table is as follows:

- Policies highlighted in green are strategies and/or action plans. They demonstrate the strategic direction and goals of the EU regarding sustainability and circularity and pave the way for the development or revision of legislative measures that will result in achieving these



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goals.

- Policies highlighted in red are Regulations and are thus directly applicable across all EU Member States.
- Policies highlighted in blue are Directives. Member States need to transpose these into national law and are often given flexibility and leeway as to how to ensure that the Directive's provisions and/or targets are met.

Table 1 European policies that are relevant to marine litter

Policy	Adoption Date	Relevance to Marine Litter		
		Prevention	Reduction	Management
A European Strategy for Plastics in a Circular Economy	2018	✓	✓	✓
The European Green Deal	2019	✓		
The New Circular Economy Action Plan	2020	✓	✓	
EU Zero Pollution Action Plan	2021	✓	✓	
EU Mission: Restore our Ocean and Waters	2021	✓	✓	✓
A New Approach for a Sustainable Blue Economy in the EU	2021	✓	✓	✓
Policy Framework on Biobased, Biodegradable and Compostable Plastics	2022	✓		
The European Ocean Pact	In development	✓	✓	✓
Marine Strategy Framework Directive	2008	✓	✓	✓
Single Use Plastics Directive	2019	✓	✓	✓
Urban Wastewater Treatment Directive	1991, amended 2024			✓
Drinking Water Directive	amended 2020			✓
REACH Regulation	amended 2023			✓
Regulation on preventing plastic pellet losses	In development	✓	✓	✓
Waste Framework Directive	2008, amended 2024	✓	✓	✓
Plastic Bag Directive	2015	✓	✓	
Packaging and Packaging Waste Regulation	2025	✓	✓	✓
Ecodesign Regulation	2024	✓		
Repair of Goods Directive	2017, amended 2024	✓		
Port Reception Facilities Directive	2019			✓
Fisheries Control Regulation	2023			✓



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Table 2 European policies that are relevant to the technical and/or commercial aspects of SeaClear2.0

Policy	Adoption Date
Regulation on the Rules and Procedures for the Operation of Unmanned Aircraft	2019
Artificial Intelligence Act	2024
General Data Protection Regulation	2016
Taxonomy Regulation	2020

Table 3 International policies relevant to marine litter

Policy	Relevance to Marine Litter		
	Prevention	Reduction	Management
MARPOL			✓
UNCLOS		✓	✓
London Convention and London Protocol		✓	
IMO Action Plan and Strategy to Address Marine Litter		✓	✓
UN Sustainable Development Goals	✓	✓	
Basel Convention			✓
UN Plastics Treaty	✓	✓	✓
Barcelona Convention	✓	✓	✓
OSPAR Convention	✓	✓	✓
Helsinki Convention	✓	✓	✓
Bucharest Convention	✓	✓	✓



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4. European Strategic Direction

There are several strategic documents adopted by the European Commission that lay out the vision and pathways for optimising the production and consumption of materials and products and addressing key environmental challenges, including marine and terrestrial pollution. This section presents these policies in a chronological order, thus also demonstrating the evolution in the Commission's approach.

4.1 A European Strategy for Plastics in a Circular Economy

In 2015, the European Commission adopted its first Circular Economy Action Plan,⁵ which presented the Commission's first step to define and implement measures that would help stimulate the transition towards circularity while boosting competitiveness and creating new job opportunities. Within this circular economy action plan, plastics were identified as a key priority value chain and the Commission committed to preparing a strategy that would define how plastics fit within a European circular economy to help address the challenges related to inefficient resource use and plastic pollution. Thus, the European Strategy for Plastics in a Circular Economy was adopted in 2018 (COM/2018/028).⁶ The Strategy includes four pillars of actions that should be taken to turn the vision for plastics in a circular economy into reality:

- Improving the economics and quality of plastics recycling**
 Achieved by (i) improving the design and supporting innovation to make plastics and plastic products easier to recycle (Design for recyclability), (ii) boosting demand for recycled plastics through innovation, standards, regulation and voluntary agreements, (iii) expanding and modernising the EU's sorting and recycling capacity, and (iv) ensuring that there is better and more harmonised separate collection and sorting of plastic waste.
- Curbing plastic waste and littering**
 Recognising the pressing issue of growing waste generation and leakage into the environment, the strategy outlines the Commission's plan, which includes (i) preventing plastic waste in the environment through promoting access to tap water for EU citizens, promoting reusable items and packaging, reducing the unnecessary generation of plastic waste from single-use items and over-packaging, raising awareness and reducing discharges by ships, (ii) establishing a clear regulatory framework for plastics with biodegradable properties to ensure clear labelling and identify applications with clear environmental benefits, (iii) addressing intentionally added and accidentally released microplastics.
- Driving innovation and investment towards circular solutions**
 To achieve the objectives of the strategy, the Commission has set out a plan that includes (i) driving investment in recycling infrastructure and innovation by mobilizing an estimated €8.4–16.6 billion, allocating additional research funding through Horizon 2020, and promoting technological advancements such as chemical recycling and advanced sorting methods, (ii) strengthening market incentives for recycled plastics through Extended Producer Responsibility (EPR) schemes, encouraging sustainable product design, and exploring the creation of a private-led fund to support investment in innovative recycling solutions, (iii) leveraging economic instruments such as taxation and public procurement to prioritise waste prevention and recycling, while enhancing financial support through EU Structural and Investment Funds, the European Fund for Strategic Investment, and the Circular Economy

⁵ https://environment.ec.europa.eu/topics/circular-economy/first-circular-economy-action-plan_en

⁶ <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1516265440535&uri=COM:2018:28:FIN>



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Finance Support Platform to facilitate access to funding for circular economy projects.

- *Harnessing global action*

Recognising the global nature of plastics-related challenges and opportunities, the Commission has outlined a plan that includes (i) strengthening international cooperation by supporting waste prevention and management systems, engaging in global initiatives such as G7, G20, and the United Nations, and participating in Regional Sea Conventions to tackle marine litter, (ii) leveraging EU external funding instruments to promote best practices worldwide, launching targeted projects to address plastic pollution in East and South-East Asia, the Mediterranean, and major river basins, while facilitating cooperation between EU outermost regions and neighbouring countries on waste management and recycling, (iii) advancing a circular plastics economy by investing in modern recycling technologies, developing new recyclable materials, promoting international standards to build industry confidence, and ensuring that exported plastic waste is processed under environmentally sound conditions aligned with EU waste shipment regulations.

The EU Plastics Strategy defined, for the first time, the vision for plastics in the Union, presenting the measures that must be taken to create a circular plastics economy. Since the adoption of the EU plastics strategy, progress has been made with the Single Use Plastic Directive coming into force in 2019, the New CEAP being adopted in 2020, the Communication on a policy framework for biobased, biodegradable and compostable plastics being adopted in 2022, the adoption of the REACH restriction on intentionally added microplastics, and the proposal for a Regulation on preventing pellet losses to reduce microplastics pollution being adopted in 2023 (all these policies are discussed further down).

Nonetheless, a key concern about the Strategy is that its emphasis is not on curbing plastic production⁷ but rather on presenting and developing an economic opportunity for the closed-loop recycling of plastics. In fact, the Strategy was developed on the premise that plastic production will continue to increase. The plastics industry is responsible for 3.4% of global greenhouse gas emissions, set to double by 2060⁸, which is contradictory to the EU's Fit for 55 ambition.⁹ Furthermore, nearly a decade from the adoption of the Strategy some of the key issues that it identified as hindering factors to plastics circularity persist. For example, there are still important discrepancies between the recycling systems among MSs meaning that plastics are collected in different ways that can often cause a reduction in secondary material quality that makes them unsuitable for recycling. Moreover, progress regarding design for recycling and circularity is slow as there are over 13,000 substances that are added to plastics, which once included are very difficult to extract¹⁰, making large-scale recycling impossible. While chemical recycling offers a possible solution to addressing this issue, the associated costs can be prohibitive. As a result, plastic circularity in Europe remains low, and just an estimated 15% of end-of-life plastics generated each year were recycled into new materials in 2021.¹¹ Overall,

⁷ Hasselbalch, J. (2025) "8 Toxic growth in the circular economy: is the EU Plastics Strategy a bad policy?". *Ineffective Policies: Causes and Consequences of Bad Policy Choices*, edited by Ian Roberge, Heather McKeen-Edwards and Malcolm Campbell-Verduyn, Bristol, UK: Policy Press, 2025, pp. 115-129. <https://doi.org/10.56687/9781447371564-011>

⁸ <https://www.europarl.europa.eu/topics/en/article/20181212STO21610/plastic-waste-and-recycling-in-the-eu-facts-and-figures>

⁹ <https://www.consilium.europa.eu/en/policies/fit-for-55/>

¹⁰ <https://www.eea.europa.eu/en/european-zero-pollution-dashboards/indicators/plastics-recycling-in-europe-obstacles-and-options>

¹¹ <https://materialeconomics.com/sites/default/files/2024-06/material-economics-europe-s-missing-plastics%20%282%29.pdf>



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plastic recycling is also lower than other recyclables such as paper and cardboard, at approximately 40%.¹² What is worrying is that in 2022 and 2023, investments in the development of plastics recycling capacity in Europe slowed down, with the sector's total capacity being below the total production of plastic waste for recycling. The high production and energy costs, the lack of demand for EU-recycled plastics, and the increase in imports of virgin and recycled plastic from outside the EU are quoted as the key reasons for this reduction in capacity growth.¹³

In terms of the SeaClear2.0 innovations, the EU Plastics Strategy aims to support innovative solutions, which is positive for the project's innovation. Nonetheless, other policies, developed later, are more relevant.

4.2 The European Green Deal

In 2019, the European Commission communicated The European Green Deal (COM/2019/640),¹⁴ its flagship initiative for tackling climate change and environmental pollution. The European Green Deal sets the framework for transforming the European Union "into a fair and prosperous society, with a modern, resource-efficient and competitive economy where there are no net emissions of greenhouse gases in 2050 and where economic growth is decoupled from resource use."

The various elements of the Green Deal are presented in Figure 3.

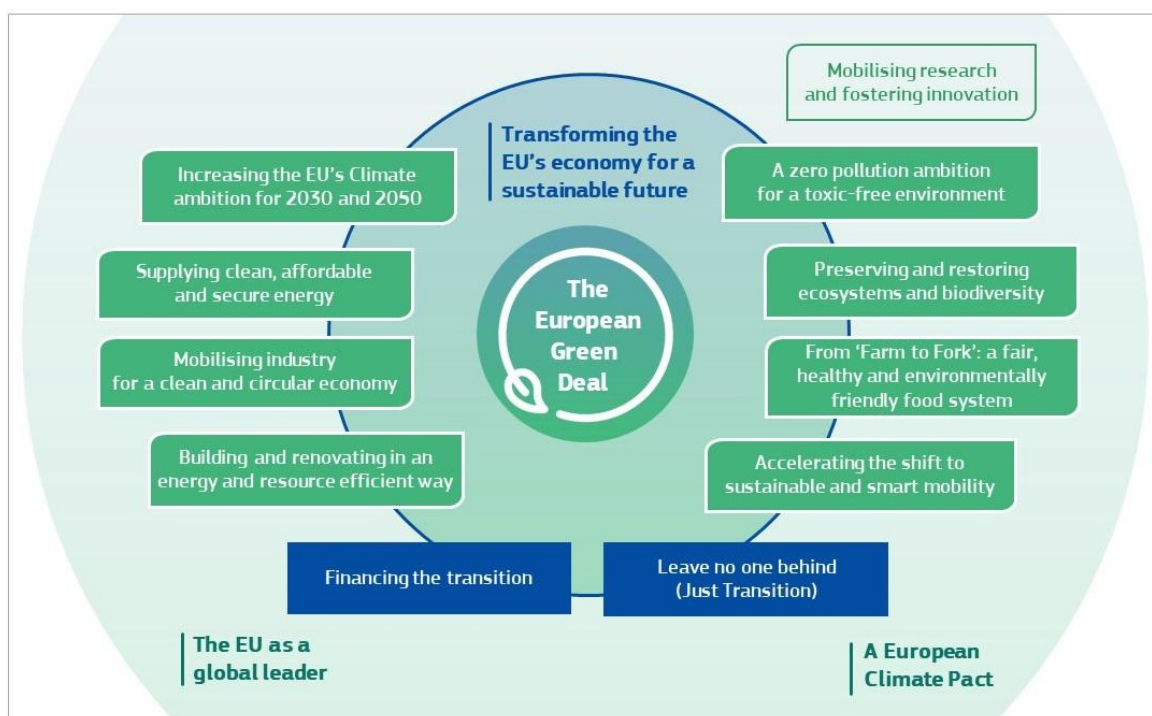


Figure 3 The European Green Deal

The European Green Deal presents the Union's vision for a more sustainable and climate-neutral

¹² <https://www.plasticexpert.co.uk/how-much-plastic-is-recycled-in-europe/>

¹³ <https://www.plasticsrecyclers.eu/news/stagnation-in-plastic-recycling-capacities-latest-market-data-shows/>

¹⁴ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52019DC0640>

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European Union by 2050 and outlines the actions that will need to be taken to get there. There are several policies that are related to or stem directly from the Green Deal that are relevant to SeaClear2.0 and marine litter. Some of the policies are strategic documents that focus on presenting the direction that the Commission aims to take to achieve objectives of the Green Deal. Others are legislative instruments that present the means through which the strategies will be implemented and the goals achieved.

4.3 The New Circular Economy Action Plan

Following the communication of the European Green Deal, the New Circular Economy Action Plan (CEAP), updating the 2015 Action Plan, was adopted in 2020 (COM/2020/98)¹⁵ as one of the main building blocks of the Green Deal. It sets the framework for sustainable product policies within the EU by announcing actions across three stages of product lifecycle: design, production and consumption.

Designing sustainable products is a key step towards the transition to a circular economy and the CEAP states the Commission's commitment to widen the Ecodesign Directive to include other products beyond those that are energy-related, to the broadest possible range of products. The aim is to ensure that product durability is enhanced, the recycled content in products is increased, remanufacturing and high-quality recycling are enabled, the carbon and environmental footprints of products are reduced, single-use and premature obsolescence are restricted, destruction of unsold durable goods is banned, product-as-a-service or other similar models are incentivised, digitalisation of product information is mobilised and that products are rewarded based on their sustainability performance.

The CEAP aims to incorporate circularity in **production** processes. This will be achieved through a series of measures including the integration of circular practices in the Best Available Techniques reference documents of the Industrial Emissions Directive, by facilitating industrial symbiosis, implementing the Bioeconomy Action Plan to support the sustainable and circular bio-based sector, promoting the uptake of green technologies, and fostering circular industrial collaboration among SMEs.

Empowering **consumers** and public buyers is another important aim of the CEAP. This mostly focuses on ensuring that consumers receive transparent and trustworthy information on products so that they can make informed purchasing decisions. This information should include their lifespan, the availability of repair services, spare parts and repair manuals. The Commission also aims to tackle greenwashing by setting minimum requirements for sustainability labels or logos and for information tools. To facilitate consumers to make informed decisions, companies are required to substantiate their environmental claims using Product and Organization Environmental Footprint methods.

The CEAP focuses on key product value chains for the implementation of these practices and steps. These include electronic equipment, batteries, end-of-life vehicles, waste oils, packaging waste, plastics, textiles, and construction and buildings.

The CEAP mostly relates to SeaClear2.0's work in terms of its potential to curb the production of plastic marine litter. The Commission announced its intention to introduce mandatory requirements for recycled content and plastic waste reduction measures for key products such as plastic packaging, construction materials and vehicles. The increased recycled content would act as an opportunity to

¹⁵ <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1583933814386&uri=COM:2020:98:FIN>



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collect plastic waste and thus minimise the amount of waste inappropriately discarded. Furthermore, the proposed restrictions on intentionally added microplastics and measures on unintentional release of microplastics, could contribute to microplastic reduction in coastal and marine environments. These measures are better defined in other legislative instruments, including the EU Strategy for Plastics and the Circular Economy, the Single Use Plastics Directive and the EU Policy Framework on Biobased, Biodegradable and Compostable Plastics (see details below).

Five years since the communication of the CEAP, there are significant disparities in circular economy (CE) implementation among EU countries, where Northern and Western European countries generally exhibit more advanced circular economy practices, while Eastern and Southern European countries lag behind.¹⁶ These differences can be attributed to varying economic development levels, environmental awareness and the effectiveness of national CE-related policies. Furthermore, estimates suggest that there is a gap of €6.7 to €8.6 billion in targeted investments in recycling infrastructure, particularly in Central and Eastern Europe where sorting and recycling capacities are weaker, and this will make it very difficult to meet the EU's target of using 10 million tonnes of recycled plastics annually by 2025.¹⁷

To achieve a cohesive EU-wide transition to a circular economy, tailored policy and financial measures that consider the unique circumstances of each MS should be implemented to address specific challenges and leverage opportunities. Specific measures targeting difficult-to-recycle plastics and composite packaging should also be implemented.

4.4 The EU Zero Pollution Action Plan

A key element of the Green Deal is the ambition for a zero-pollution and toxic-free environment, which resulted in the development of the EU Zero Pollution Action Plan (COM/2021/400).¹⁸ The 2050 vision of the Zero Pollution Action Plan is for air, water and soil pollution to be reduced to levels that are not harmful to health and natural ecosystems and that respect the planetary boundaries, thus creating a toxic-free environment.

Nine flagships are included in the Zero Pollution Action Plan:

1. Flagship 1: Reducing health inequalities through zero pollution
2. Flagship 2: Supporting urban zero pollution action
3. Flagship 3: Promoting zero pollution across regions
4. Flagship 4: Facilitating zero pollution choices
5. Flagship 5: Enforcing zero pollution together
6. Flagship 6: Showcasing zero pollution solutions for buildings
7. Flagship 7: Living Labs for green digital solutions and smart zero pollution
8. Flagship 8: Minimising the EU's external pollution footprint
9. Flagship 9: Consolidating the EU's Knowledge Centres for Zero Pollution

The Action Plan sets the following **targets for 2030** to reduce:

¹⁶ Mazur-Wierzbicka, E. (2021) Circular economy: advancement of European Union countries. *Environ Sci Eur* **33**, 111. <https://link.springer.com/article/10.1186/s12302-021-00549-0>

¹⁷ European Investment Bank (2023). Cutting plastics pollution – Financial measures for a more circular value chain. https://www.eib.org/attachments/lucalli/20220248_cutting_plastics_pollution_en.pdf

¹⁸ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021DC0400&qid=1623311742827>



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1. By more than 55% the health impacts (premature deaths) of air pollution
2. By 30% the share of people chronically disturbed by transport noise
3. By 25% the EU ecosystems where air pollution threatens biodiversity
4. By 50% nutrient losses, the use and risk of chemical pesticides, the use of the more hazardous ones, and the sale of antimicrobials for farmed animals and in aquaculture
5. By 50% plastic litter at sea and by 30% microplastics released in the environment
6. Significantly total waste generation and by 50% residual municipal waste.

The Action Plan itself does not define any new actions but rather combines all the ongoing and planned efforts for pollution prevention in an integrated strategy.

The most relevant target for SeaClear2.0 is target 5, which focuses on the reduction of plastic litter at sea and microplastics released into the environment. The REACH Regulation, which aims to prevent the intentional addition of microplastics into products such as cosmetics and detergents, the Urban Wastewater Treatment Directive, which includes provisions for the capture of microplastics from wastewater treatment facilities, and the proposed regulation for the prevention of plastic pellet loss, are the three EU policies that directly target microplastics and will help meet target 5. These policies are discussed in greater detail in Chapter 5 of this report. Nonetheless, all the policies that affect plastic production and management will also contribute to meeting the 50% reduction target for plastic litter, as well as the 30% reduction target for microplastics.

4.5 EU Mission Restore our Water and Oceans

The EU Missions are strategic initiatives that aim to support the EU's research and innovation efforts in meeting the ambitious goals of key legislative initiatives, including the EU Green Deal. There are five EU Missions:¹⁹

1. Adaptation to Climate Change: support at least 150 European regions and communities to become climate resilient by 2030
2. Cancer: working with Europe's Beating Cancer Plan to improve the lives of more than 3 million people by 2030 through prevention, cure and solutions to live longer and better
3. Restore our Ocean and Waters by 2030: protect and restore the health of our ocean and waters through research and innovation, citizen engagement and investments.
4. 100 Climate-Neutral and Smart Cities by 2030: involve local, regional and national authorities, citizens, businesses and investors in the delivery of 100 climate-neutral and smart cities.
5. A Soil Deal for Europe: 100 living labs and lighthouses to lead the transition towards healthy soils by 2030.

The most relevant mission to plastic pollution and marine litter is the Mission to Restore our Ocean and Waters by 2030, in short 'Mission Ocean',²⁰ which has the following objectives:

- 1) Protect and restore marine and freshwater ecosystems and biodiversity, in line with the EU Biodiversity Strategy 2030:
 - a) Protect a minimum of 30% of the EU's sea area and integrate ecological corridors, as part of a true Trans-European Nature Network.

¹⁹ https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/eu-missions-horizon-europe_en

²⁰ <https://missionoceanwaters.eu/#/>



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- b) Strictly protect at least 10% of the EU's sea area.
 - c) Restore at least 25,000 km of free-flowing rivers
 - d) Contribute to relevant upcoming marine nature restoration targets including degraded seabed habitats and coastal ecosystems.
- 2) Prevent and eliminate pollution of our ocean, seas and waters, in line with the EU Action Plan Towards Zero Pollution for Air, Water and Soil:
 - a) Reduce by at least 50% plastic litter at sea.
 - b) Reduce by at least 30% microplastics released into the environment.
 - c) Reduce by at least 50% nutrient losses, the use and risk of chemical pesticides.
- 3) Make the sustainable blue economy carbon-neutral and circular, in line with the proposed European Climate Law and the holistic vision enshrined in the Sustainable Blue Economy Strategy:
 - a) Eliminate greenhouse gas emissions from maritime economic activities in the EU and sequester those emissions that cannot be avoided (net zero maritime emissions)
 - b) Develop zero-carbon and low-impact aquaculture, and promote circular, low carbon multi-purpose use of marine and water space.

The SeaClear2.0 project is funded through the EU Mission Oceans 'Restore our Ocean and Waters by 2030', particularly through the Mission's 'development and piloting phase' (2021-2025). It directly contributes to the achievement of its objectives, specifically objective 2 by developing an innovative solution that can contribute to pollution elimination and by implementing citizen engagement activities that can contribute to marine pollution prevention. It also contributes to objective 1(d) as it can have an important role to play in the restoration of polluted seabed habitats. As such, SeaClear2.0 is one of the innovative solutions that are being developed and demonstrated, and could possibly be selected for wider deployment and market entry during the 'deployment and upscaling' phase of the Mission (2026-2030).

The targets and objectives set within Mission Ocean will be reviewed by the end of the development and piloting phase to determine their progress.

4.6 A New Approach for a Sustainable Blue Economy in the EU

The Communication for a new approach for a sustainable blue economy in the EU (COM/2021/240),²¹ was adopted to emphasise the critical role of the blue economy in achieving the European Green Deal's objectives for a climate-neutral, resource-efficient, and resilient Europe. As the ocean supports key economic sectors and ecological functions—providing jobs, food, energy, and oxygen—its sustainable management is vital. However, the cumulative impacts of pollution, climate change, and biodiversity loss threaten both marine ecosystems and the socio-economic benefits they provide. By integrating ocean policy with broader economic and environmental goals, the Communication outlines a strategic shift from traditional "blue growth" to a sustainable blue economy that fosters innovation, creates green jobs, supports decarbonisation, and protects marine resources. It calls for stronger stakeholder engagement and international cooperation, presenting a realistic agenda and tools to drive this transition while ensuring that economic prosperity and environmental stewardship go hand in hand.

To transform the European blue economy value chains, the communication outlines interventions that

²¹ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2021:240:FIN>



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cover the following key areas:

- Climate neutrality and zero pollution
- Circular economy and preventing waste
- Biodiversity and investing in nature
- Coastal resilience
- Responsible food systems

The interventions concerning the promotion of the circular economy principles and the prevention of waste within Europe's blue economy value chains are those that are of greatest relevance to SeaClear2.0's objectives. The blue economy can play a crucial role in combatting pollution and promoting circular solutions. The communication emphasises the EU's commitment to reducing marine litter, with a focus on single-use plastics and fishing gear, through the Single-Use Plastics Directive, setting circular design standards for fishing gear, and providing financial support for fishers to retrieve waste. Within the Communication, the Commission also states its intention to take action to halve plastic litter at sea by 2030, restrict the intentional addition of microplastics in products and the unintentional release of microplastics in the environment, ensure that litter caught during fishing operations is brought back to port and that fishing gear made of plastic is recycled, and propose revisions to the ship recycling Regulation to ensure marine environment protection.

The SeaClear2.0 project is aligned with the objectives of the blue economy strategy by contributing to the reduction of marine pollution, particularly in the context of marine litter. Furthermore, SeaClear2.0 incorporates innovative technological solutions, and has the potential to collect important data, contributing to the overall digitalisation and smart innovation in the blue economy, supporting the Commission's focus of boosting digital technologies for cleaner, more efficient maritime operations. SeaClear2.0 also works towards better resource management, recycling and reducing waste through specific activities focusing on the upscaling of collected litter and through citizen activations.

4.7 EU policy framework on biobased, biodegradable and compostable plastics

The Communication on the EU policy framework on biobased, biodegradable and compostable plastics (COM/2022/682)²² was one of the measures announced in the Plastics Strategy, the Green Deal and the Circular Economy Action Plan. It aims to set the conditions to ensure that the environmental impact of the production and consumption of biobased, biodegradable and compostable plastics is positive, to fill policy gaps and to guide future EU policy on such matters, and provide orientation for the market. It reflects the Commission's views and intentions on these materials and aims to ensure that the further development and use of biobased, biodegradable and compostable plastics does not hinder the progress towards the circular economy, that it is aligned with the need to reduce resource use, that materials are kept in the loop for as long as possible, and that secondary raw materials are preferred to primary raw materials.

To better understand the premise and approach within this policy framework, it is important to define what biobased, biodegradable and compostable plastics are. The definitions provided by Dilkes-

²² https://environment.ec.europa.eu/document/download/14b709eb-178c-40ea-9787-6a40f5f25948_en?filename=COM_2022_682_1_EN_ACT_part1_v4.pdf



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Hoffman et al. (2019)²³ are presented here for clarity:

- Bioplastic: a plastic that is biobased and/or biodegradable
- Biodegradable plastic: a plastic that can be completely biodegraded through biological activity resulting in biomass, CO₂ and water under aerobic conditions, and biomass, CO₂, methane and water under anaerobic conditions.
- Biobased plastics: plastics that are either wholly or partly derived from biomass.
- Compostable plastics: a subset of biodegradable plastics that are designed to biodegrade under controlled conditions, typically industrial composting or anaerobic digestion.

Therefore, based on these definitions, the biobased character of a plastic could affect its overall environmental footprint because of feedstock sustainability, but it does not affect the issue of marine litter. Whether a plastic is made from biological or fossil-based feedstock does not affect how the plastic will behave in the marine (or terrestrial) environment. However, the biodegradable nature of plastics could. Biodegradable plastics cannot biodegrade everywhere. They biodegrade under specific conditions. For example, a plastic that has been developed to biodegrade in soil will likely not biodegrade in aquatic environments. Therefore, it is important to ensure that biodegradable plastics do not spill into unintended environments, as this might lead to their incomplete breakdown and thus their contribution to microplastics or even nanoplastics. This is why the European Commission's Group of Chief Scientific Advisors recommends limiting the use of biodegradable plastics in the open environment only to specific applications where reduction, reuse or recycling are not feasible. The Group also emphasises that these plastics should not be considered a solution to inappropriate waste management or littering.

Thus, the policy framework on biobased, biodegradable and compostable plastics includes three key principles for developing relevant new policy measures:

- (i) that biodegradation must be regarded as a 'system property' that takes into account not only the properties of the material but also the conditions of the receiving environment and the risks associated;
- (ii) that the use of open environment biodegradable plastics must be limited to those materials that fully (and provenly) biodegrade within a specific timeframe and to specific applications where collection and recycling of products is not feasible, and that substitutions of conventional plastics with biodegradable plastics should not be considered a solution for inappropriate waste management or littering; and
- (iii) consumer behaviour and how this could affect the way that biodegradable plastics are managed should be carefully considered to avoid misleading consumers. As such, labels on litter-prone items should not include any claims regarding their biodegradability, and plastics labelled as biodegradable must always specify the receiving environment and their biodegradation timeframe.

The policy sets a clearer vision for the EU for the use of biobased, biodegradable and compostable plastics, aiming to foster the further development of these plastics in a way that is in line with the principles of the Circular Economy, that avoids consumer confusion and thus biobased, biodegradable and compostable plastic waste mismanagement, and that ensures effective biodegradation in specific environments. As such, this can contribute to the reduction of marine litter. The policy framework

²³ Dilkes-Hoffman et al. (2019). Public attitudes towards bioplastics – knowledge, perception and end-of-life management. *Resources, Conservation and Recycling*, 151, 104479. <https://doi.org/10.1016/j.resconrec.2019.104479>



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emphasises the need for consistent and science-based testing and certification standards for the biodegradation of plastic in the open environment. The policy also states that plastics labelled as ‘biodegradable’ must always specify the receiving open environment for which they are intended and the required timeframe for the biodegradation; however, biodegradation claims should not be made about litter-prone products and any products included in the Single-Use Plastics Directive.

However, it is not always possible to know the receiving environment of biodegradable products. For example, although mulching films might be designed to biodegrade on agricultural land within a certain period of time, it is likely that this same mulching film might find its way in the marine environment, where it will likely not be able to biodegrade as effectively (if at all) and could thus contribute to plastic and microplastic pollution through incomplete disintegration.

There is still significant uncertainty regarding the open environment biodegradation of biodegradable plastics, and this is highlighted by the fact that the Commission has launched several calls and funded a number of research projects to work on this topic both in terms of developing truly biodegradable plastics and in terms of consumer behaviour and labelling. As stated above, the mismanagement of biodegradable plastics and their inappropriate disposal in the marine and terrestrial environment could contribute to the issue of plastic pollution, rather than helping to address the issue. On the other hand, it is true that the development of biodegradable plastics for specific applications, such as mulching films for example, could contribute to halting significant plastic pollution caused by the use of these products. Therefore, whether biodegradable plastics are a solution or a contributor to plastic pollution is inherently related to their design and their end-of-life management.

4.8 The European Oceans Pact

At the beginning of 2025, the European Commission launched a call for evidence for The European Oceans Pact,²⁴ a new single reference policy framework for all ocean-related policy actions, with a focus on boosting the blue economy and ensuring the good governance and sustainability of our oceans in all of their dimensions. At the time, the SeaClear2.0 partnership welcomed and utilised the opportunity offered by the call for evidence to contribute insights from the project partnership’s experience to the development of the Pact.²⁵

The European Oceans Pact was adopted in June 2025 ahead of the United Nations Ocean Conference. It aims to serve as a unified reference framework for EU ocean policies. It supports six strategic priorities:

- Protecting and restoring ocean health
- Boosting the sustainable competitiveness of the blue economy
- Supporting coastal, island communities and outermost regions
- Advancing ocean research, knowledge, skills and innovation

²⁴ https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/14474-The-European-Oceans-Pact_en

²⁵ SeaClear2.0 (2025). Response to the Call for Evidence for The European Oceans Pact.

<https://drive.google.com/file/d/1nVBVvqkHJbtvQh-XTyUjQz-CZadK5HBF/view?usp=sharing>



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- Enhancing maritime security and defence as a prerequisite
- Strengthening EU ocean diplomacy and international rules-based governance.

A key objective of the Pact is to strengthen ocean governance across the EU by laying the foundation for a future Oceans Act. This Act will consolidate relevant targets under a single legislative framework, building on a revision of the Marine Spatial Planning Directive, to ensure more coherent and effective policy implementation. Financial and advisory support under the BlueInvest platform will be scaled up, aiming to mobilise €1 billion in public and private investments by 2028, with a particular focus on research, development, and innovation (RDI) as well as support to start-ups.

On the environmental side, the Pact signals the Commission's intention to revise the Marine Strategy Framework Directive (MSFD) to facilitate faster progress toward achieving Good Environmental Status (GES). This will involve simplifying implementation and reducing the administrative burden linked to reporting and data management. In the context of marine pollution, the Pact outlines actions to strengthen the capacity of coastal communities to address land-based pollution and pledges funding for R&I on microplastics. Moreover, maritime transport-related pollution is highlighted as a priority, with plans to expand the CleanSeaNet²⁶ satellite-based monitoring system to detect a broader range of pollutants, including garbage and lost containers.

To enhance the competitiveness of the sustainable blue economy, the Commission proposes several initiatives, including to (i) evaluate and possibly revise the Common Fisheries Policy, (ii) set the 2040 vision for fisheries and aquaculture, (iii) publish a new Blue Generational Renewal Strategy in 2027 that will promote education, ocean literacy and intergenerational knowledge transfer to foster a skilled next-generation workforce in marine research, ocean tech and sustainable fisheries, (iv) adopt a new EU Ports Strategy to reinforce the function of EU ports as strategic assets for competitiveness and security, and (v) develop an Industrial Maritime Strategy that will lead to the transition to clean tech in Europe's maritime industry.

Recognising existing gaps in marine data collection and management, the Pact announces the Ocean Observation Initiative, which will cover both coastal and deep-sea environments. This initiative aims to secure historical datasets, identify knowledge gaps, and establish an integrated, high-tech, cost-effective, and secure observation infrastructure by 2027. It will contribute to the European Digital Twin of the Ocean. Complementarily, the Ocean Research and Innovation Strategy will address the financing gap between basic research and innovation, supported by a European network of ocean technology testing sites to accelerate the deployment of new technologies.

To reinforce engagement, the Pact commits to enhancing ocean literacy and youth participation, scaling up the European Coalition for Ocean Literacy, launching an EU Ocean Youth Ambassador and Intergenerational Network, and establishing initiatives such as Youth Policy Dialogues and a Blue Economy Internship Programme.

Regarding maritime security and defence, the Pact introduces a set of high-tech initiatives, including the deployment of a European fleet of unmanned airborne drones integrating AI and advanced sensors for real-time monitoring, and a European Maritime Domain Awareness programme to build an integrated surveillance network. A coordinated UXO (Unexploded Ordnance) removal strategy will

²⁶ [Satellite based Services - CleanSeaNet service - EMSA - European Maritime Safety Agency](#)



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also be implemented, relying on advanced detection and disposal technologies.

Finally, the Pact affirms the EU's commitment to international ocean governance. Of particular relevance to the SeaClear2.0 system are the Commission's pledges to support the Biodiversity Beyond National Jurisdiction (BBNJ) Agreement,²⁷ including the goal of protecting 30% of the high seas, for which an EU law is expected, and to advance the negotiation of the Global Plastics Treaty, a key international mechanism to curb marine plastic pollution.

Recognising that there is a gap in data acquisition and management, the Commission announced the launch of the Ocean Observation Initiative for the coastal and deep sea. The Ocean Observation Initiative, which will secure historical data, map the knowledge gaps, develop an integrated, high-tech, cost-effective, reliable and secure observation system, and create a standardised approach to observation campaigns by 2027, will feed the European Digital Twin of the Ocean. Furthermore, the Commission announced the development of the Ocean Research and Innovation Strategy to fill the financing gap between research and innovation. Coupled with the establishment of a European network of ocean technology testing sites, the Strategy will accelerate innovation and deployment of key ocean technologies. To support these initiatives, the Ocean Pact also iterates the Commission's commitment to strengthening ocean literacy and citizen engagement through scaling up the European Coalition for Ocean Literacy, establishing an EU Ocean Youth Ambassador and Intergenerational Network, hosting annual Youth Policy Dialogues, and implementing a blue economy internship programme for youth.

Although the Pact does not introduce new targets specifically on marine litter, it reinforces the Commission's commitment to existing objectives and lays the groundwork for future legislative and strategic initiatives. Key elements of relevance include the planned revision of the MSFD, which may simplify pathways for marine litter monitoring and reporting, and financial support for microplastics research, which could indirectly benefit innovation in detection and removal technologies.

The Pact's provisions are highly relevant to the SeaClear2.0 system in several ways:

1. **Technology Development and Exploitation:** The expansion of BlueInvest presents a significant funding opportunity for the further development, exploitation, and commercialisation of SeaClear2.0 technologies. SeaClear2.0's future commercial exploitation and spin-offs could benefit from these mechanisms to scale up, form partnerships and access European markets.
2. **Marine Data Collection:** The Ocean Observation Initiative opens up avenues for SeaClear2.0 to contribute to data acquisition on seabed marine litter, an area where current knowledge remains limited. The system's capacity to detect, map and classify marine litter specifically on the seabed can feed unique and currently underrepresented data streams into the Digital Twin of the Ocean, making SeaClear2.0 a critical data provider.
3. **Testing Infrastructure:** The creation of a European network of ocean technology testing sites can directly support SeaClear2.0's system testing and validation in real-world conditions.
4. **UXO Removal Synergies:** The SeaClear2.0 system's capabilities in underwater detection and robotic handling could be adapted or extended to support the UXO removal strategy, offering cross-functional technological applications.

²⁷ <https://www.un.org/bbnjagreement/sites/default/files/2024-08/Text%20of%20the%20Agreement%20in%20English.pdf>



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5. Policies Directly Addressing Marine Litter

There is a range of European legislative instruments that affect the issue of plastic pollution and marine litter either directly or indirectly. This section focuses on the relatively small number of policies that specifically aim to address the issue of marine litter, aiming to curb its production and manage its impacts. Five policies are included. The first two, the Marine Strategy Framework Directive and the Single-Use Plastics Directive, predominantly concern macroplastics. The remaining three focus specifically on microplastics.

Microplastics, i.e. plastic items smaller than 5 mm,²⁸ are ubiquitous in the marine environment and can have important health implications for marine organisms and humans.²⁹ There are two types of microplastics, primary and secondary. Primary microplastics are those that are designed and produced as such, for example, plastic pellets used as the source material for plastic production, as well as microfibres shed from clothing and other textiles. Secondary microplastics result from the breakdown of larger plastic items. Microplastics ingested by marine wildlife cause various health impacts, ranging from physical damage such as tissue scarring and fibrosis³⁰ to biochemical process disruption³¹ and reduced energy reserves.^{32 33} Microplastics have been identified in marine organisms destined for human consumption,^{34 35 36 37} indicating potential negative impacts on human health³⁸ through toxic chemical accumulation.^{39 40}

Recognising the negative effects of microplastics and the need to take action to address them, the Commission has made revisions to key policies such as the Urban Wastewater Treatment Directive and the REACH Regulation so that these policies include measures to address microplastics, and is

²⁸ Thompson et al. (2004) Lost at sea: where is all the plastic? *Science* 304 (5672), 838.

<https://doi.org/10.1126/science.109455>.

²⁹ Singh et al. (2020) Synthetic microfibers: pollution toxicity and remediation. *Chemosphere* 257, 127199.

<https://doi.org/10.1016/j.chemosphere.2020.127>

³⁰ Charlton-Howard et al. (2023) 'Plasticosis': characterising macro- and microplastic-associated fibrosis in seabird tissues.

J. Hazard. Mater. 450, 131090. <https://doi.org/10.1016/j.jhazmat.2023.131090>

³¹ Banaee et al. (2024) Environmental toxicology of microplastic particles on fish: a review. *Comp. Biochem. Physiol. C*

Toxicol. Pharmacol. 287, 110042. <https://doi.org/10.1016/j.cbpc.2024.110042>

³² Rochman et al (2013) Ingested plastic transfers hazardous chemicals to fish and induces hepatic stress. *Sci. Rep.* 3 (1), 1–

7. <https://doi.org/10.1038/srep03263>

³³ Wright et al. (2013) Microplastic ingestion decreases energy reserves in marine worms. *Curr. Biol.* 23 (23), R1031–R1033.

<https://doi.org/10.1016/j.cub.2013.10.068>

³⁴ Browne et al. (2008) Ingested microscopic plastic translocates to the circulatory system of the mussel, *Mytilus edulis* (L.). *Environ. Sci. Technol.* 42, 5026–5031.

³⁵ Digka et al. (2018) Microplastics in mussels and fish from the Northern Ionian Sea. *Mar. Pollut. Bull.* 135, 30–40.

<https://doi.org/10.1016/j.marpolbul.2018.06.063>

³⁶ Nadal et al. (2016) High levels of microplastic ingestion by the semipelagic fish bogue *Boops boops* (L.) around the

Balearic Islands. *Environ. Pollut.* 214, 517–523. <https://doi.org/10.1016/j.envpol.2016.04.054>

³⁷ Van Cauwenberghe & Janssen (2014) Microplastics in bivalves cultured for human consumption. *Environ. Pollut.* 193,

65–70. <https://doi.org/10.1016/j.envpol.2014.06.010>

³⁸ Karbalaee et al. (2018) Occurrence, sources, human health impacts and mitigation of microplastic pollution. *Environ. Sci.*

Pollut. Res. 25 (36), 36046–36063

³⁹ Tanaka et al. (2020) In vivo accumulation of plastic-derived chemicals into seabird tissues. *Curr. Biol.* 30 (4), 723–728.e3.

<https://doi.org/10.1016/j.cub.2019.12.037>

⁴⁰ Rochman et al (2014) Polybrominated diphenyl ethers (PBDEs) in fish tissue may be an indicator of plastic contamination in marine habitats. *Sci. Total Environ.* 476–477, 622–633. <https://doi.org/10.1016/j.scitotenv.2014.01.058>



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proposing new legislation on preventing plastic pellet loss and release to the environment.

5.1 Marine Strategy Framework Directive

Marine litter first appeared as an EU policy topic in the Marine Strategy Framework Directive (MSFD) of 2008.⁴¹ The MSFD aimed to establish the framework that would guide member states (MS) to take the necessary steps to achieve the Good Environmental Status (GES) of their marine environment, by establishing a marine strategy for their marine waters in cooperation with other MSs that share the same marine region. The marine strategies are developed through a series of incremental steps comprised of: (1) the assessment of the current environmental status of the MS's marine waters (a baseline study), (2) the determination of what good environmental status would look like, (3) the establishment of targets and associated indicators to help measure the level of achievement of GES, (4) the establishment and implementation of a monitoring programme to help undertake this assessment, and (5) the development of programmes of measures that would help the MS achieve GES. The marine strategies developed by MSs have a cycle of 6 years and the MSFD is now in its third implementation cycle (2024-2030), with most MSs currently reviewing and updating their initial assessments, the good environmental status and their targets.⁴²

Within the MSFD, GES is defined by the following eleven qualitative descriptors:

1. biological diversity
2. non-indigenous species
3. population of commercially exploited fish and shellfish
4. marine food webs
5. human-induced eutrophication
6. seafloor integrity
7. hydrographical conditions
8. concentration of contaminants in water
9. concentration of contaminants in fish and seafood
10. properties and quantities of marine litter
11. introduction of energy, including underwater noise.

Through the inclusion of Descriptor 10 'properties and quantities of marine litter', the MSFD ensured for the first time that all MSs had to consider the issue of marine litter and take measures to monitor and address it. However, each MS can define what GES means and how it will be achieved. With each implementation cycle, MSs are expected to set more ambitious targets to ensure the continuous improvement of GES. However, as the Commission Notice on recommendations on the 2020 updated reports for Article 11 of the MSFD⁴³ states, less than a quarter of MSs have established adequate means to determine the GES for the descriptor on marine litter. Furthermore, as underlined in the Commission's report⁴⁴ to the European Parliament and the Council on the MSFD's implementation, the data collected by MSs through their monitoring programmes are not comparable. For beach/coastal marine litter, this can be addressed through the proper implementation of the Joint List

⁴¹ <https://eur-lex.europa.eu/eli/dir/2008/56/oj/eng>

⁴² https://environment.ec.europa.eu/topics/marine-environment/implementation-marine-strategy-framework-directive_en

⁴³ https://environment.ec.europa.eu/document/download/1c2ea641-f426-43ab-aa87-6ce0375729da_en?filename=C_2023_2203_F1_COMMUNICATION_FROM_COMMISSION_EN_V5_P1_2532109.PDF

⁴⁴ <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0259&from=EN>



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of Litter Categories for Marine Macrolitter Monitoring.⁴⁵ For floating and seabed marine litter, the issue is more complex and data collection can be considerably more expensive.

The SeaClear2.0 system can support the implementation of the MSFD, particularly as it relates to the monitoring and assessment needs for descriptor 10 ‘Properties and quantities of marine litter do not cause harm to the coastal and marine environment’. SeaClear2.0 can support MSs in the implementation of the monitoring programmes and their programmes of measures and in achieving the MSFD descriptor through the monitoring of marine litter in the water, especially in areas that are at a distance from the coast and/or difficult to reach. On the other hand, SeaClear2.0’s system’s operation could contribute to underwater noise and thus negatively impact Descriptor 11 ‘Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment’. However, this is not expected to be a real issue since (i) the noise level will be relatively low due to top use of electric motors for most of the system components, (ii) the operation of the system is done in short periods, and (ii) the system only operates in coastal locations, so pelagic marine organisms would not be affected.

5.2 The Single Use Plastics Directive

The introduction of the Single Use Plastics Directive (SUPD)⁴⁶ marked the first time that the European Commission enacted legislation that aimed to reduce the impact of plastic pollution through bans or restrictions on the use of certain products. In so doing, the SUPD aims to prevent and reduce the impact of certain products on the environment, particularly the aquatic environment, and human health, as well as to promote the transition to a circular economy. It thus imposes bans or restrictions on the use of the top marine litter items found on European coasts. The Directive’s provisions range from market restrictions and consumption reduction targets to extended producer responsibility and awareness-raising measures (see Table 4).

In essence, where market alternatives are readily available and affordable, such as is the case for cotton bud sticks, cutlery, plates, straws, stirrers, and sticks for balloons, then the SUPD imposes market restrictions. Due to their adverse effects on the environment, market restrictions apply to cups, food and beverage containers made of expanded polystyrene and all products made of oxo-degradable plastic. The remaining measures presented in the table below are applied to other single-use plastic products. The Directive also sets specific targets that include the separated collection for plastic bottles by 2025 and the incorporation of a minimum of 25% of recycled plastic in Polyethylene Terephthalate (PET) beverage bottles from 2025 and 30% in all plastic beverage bottles from 2030.

⁴⁵ <https://mcc.jrc.ec.europa.eu/main/dev.py?N=41&O=459>

⁴⁶ <https://eur-lex.europa.eu/eli/dir/2019/904/oj>



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Table 4 Measures imposed by the Single Use Plastics Directive

Single-use plastic items	Consumption reduction	Extended producer responsibility	Awareness raising measures	Marking requirements	Market restriction	Separate collection objective	Product design requirement
Food containers	X	X	X				
Cups for beverages	X	X	X				
Cotton bud sticks					X		
Cutlery, plates, stirrers, straws					X		
Sticks for balloons					X		
Balloons		X	X	X			
Packets & wrappers		X	X				
Beverage containers, their caps & lids		X	X				X
Beverage bottles		X	X			X	X
Tobacco product filters		X	X				
Wet wipes		X	X	X			
Sanitary towels			X	X			
Lightweight plastic carrier bags		X	X				
Fishing gear		X	X				

Source: https://ec.europa.eu/commission/presscorner/detail/en/MEMO_18_3909

As a result of the measures, the Directive directly impacts the production of these types of waste and thus contributes to reducing marine litter pollution stemming directly from them. Research suggests that while the SUPD is an important first step for the reduction of marine litter, and that the bans it includes will be successful in reducing the specific single use plastic products they address, their contribution to the reduction of marine litter pollution in Europe will only be between 2% and 6%.^{47 48} Therefore, it is important to ensure that the other measures included in the SUPD are equally as effective as the bans. When these are related to mandatory collection targets, as is the case for plastic bottles, there is greater confidence that they will be achieved and will result in the desired effect. However, when these are related to softer measures such as extended producer responsibility schemes and awareness-raising campaigns, as is the case for tobacco related products, doubts exist as the level of success will depend on the means of implementation of these measures, which can vary between MSs.⁴⁹

Cigarette butts and other tobacco related products make up a significant proportion of marine litter, especially in highly touristic areas in the Mediterranean, and tend to persist even after regular cleanup operations by coastal area management authorities.⁵⁰ Addressing this source of pollution is thus urgent. The Single Use Plastics Directive requires Member States to implement Extended Producer Responsibility schemes to collect cigarette butts, however allows each Member State to determine how these schemes will be implemented. As a minimum, the schemes need to include awareness

⁴⁷ Herberz et al. (2019) Sustainability Assessment of a Single-Use Plastics Ban. *Sustainability*, 12(9), 3746. <https://doi.org/10.3390/su12093746>

⁴⁸ Kiessling et al. (2023) What potential does the EU Single-Use Plastics Directive have for reducing plastic pollution at coastlines and riversides? An evaluation based on citizen science data. *Waste Management*, 164, 106-118. <https://doi.org/10.1016/j.wasman.2023.03.042>

⁴⁹ Kiessling et al. (2023) What potential does the EU Single-Use Plastics Directive have for reducing plastic pollution at coastlines and riversides? An evaluation based on citizen science data. *Waste Management*, 164, 106-118. <https://doi.org/10.1016/j.wasman.2023.03.042>

⁵⁰ Loizidou et al. (2018). Persistent marine litter: small plastics and cigarette butts remain on beaches after organized beach cleanups. *Environ Monit Assess* 190, 414 (2018). <https://doi.org/10.1007/s10661-018-6798-9>



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raising campaigns, the establishment of collection infrastructure and the collection of fees from tobacco manufacturers, importers or distributors to finance these activities. While this is a positive initiative and a step forward in addressing cigarette butt pollution, additional, supporting actions should be implemented to more holistically address the issue.

In fact, a more rounded approach and a wider scope could help make the SUPD more effective. Research suggests that the focus of the SUPD should not only be on single-use plastics but on single-use items in general⁵¹ since this will ensure that banned/restricted single-use plastics are not replaced by other single-use products made of different materials. Marine litter monitoring protocols, e.g. the J-Code List of the MSFD Task Group 10, should ensure that common alternatives to banned single-use plastic items are captured, to have quantitative evidence to support any future policy interventions. In fact, the OECD suggests that a policy mix is required to address marine litter, and this should cover both single-use plastics and their alternatives, and place emphasis on monitoring and enforcement.⁵²

As with all policies, it is also important to ensure that loopholes are minimised as much as possible. While the Single-Use Plastics Directive has successfully phased out certain plastic products, regulatory loopholes have allowed the emergence of unsustainable alternatives. For example, the availability of sturdier plastic straws, often in their individual plastic wrappers, marketed as “reusable” but in essence treated as single-use items at bars and cafeterias, undermines the Directive’s impact. European policy should strengthen enforcement mechanisms by introducing clearer definitions, stricter monitoring, and mandatory eco-design criteria to ensure that alternatives truly contribute to waste reduction.

5.3 Urban Wastewater Treatment Directive

The Urban Wastewater Treatment Directive⁵³ (UWTD) (EU 204/3019) was first adopted in 1991 to regulate the collection, treatment and discharge of urban wastewater and the treatment and discharge of wastewater from certain industrial sectors to protect the environment. In 2024, the UWTD was updated to ensure that it addresses new sources of urban pollution, including microplastics or micropollutants. Discharges from wastewater treatment plants can release millions of microplastics into water bodies while the quantities of microplastics retained in the biosolids that are later used as fertilisers are much greater.⁵⁴ To address this issue, the 2024 revision of the UWTD requires that by 2035 all agglomerations with over 1000 people must ensure that urban wastewater is treated before it is discharged to the environment. More stringent treatment requirements for agglomerations of over 150,000 people are set, gradually ensuring that wastewater treatment from all such agglomerations will meet the requirements of quaternary treatment.

In line with the “polluter pays” principle, the Directive includes Extended Producer Responsibility provisions so that at least 80% of the costs of advanced wastewater treatment will be paid by pharmaceuticals and cosmetics industries, whose products are responsible for most of the micropollutants in wastewater, including microplastics and PFAS (per- and polyfluoroalkyl substances). The Directive is also aligned with the principles of the circular economy as it sets new

⁵¹ Herberz et al. (2019) Sustainability Assessment of a Single-Use Plastics Ban. *Sustainability*, 12(9), 3746. <https://doi.org/10.3390/su12093746>

⁵² <https://www.actu-environnement.com/media/pdf/news-38416-rapport-plastiques-ocde.pdf>

⁵³ https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L_202403019

⁵⁴ Murphy et al. (2016) Wastewater treatment works (WwTW) as a source of microplastics in the aquatic environment. *Environ. Sci. Technol.* 50, 5800–5808. <https://doi.org/10.1021/acs.est.5b05416>



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requirements for recovering valuable wastewater and sewage sludge components, such as phosphorus for use in agriculture. Importantly, it is also noted in the directive that where treated sludge is used in agriculture, particular attention should be paid to microplastics and relevant monitoring should be undertaken. The Directive also mandates the establishment of national systems for monitoring pollutants in wastewater influent and effluent, thus allowing the understanding of the operational efficiency of wastewater treatment plants. Furthermore, the directive requires the monitoring, where relevant, of microplastics in storm water outflow discharges and urban runoff.

5.4 Drinking Water Directive

The recast Drinking Water Directive (EU 2020/2184),⁵⁵ which was adopted in 2020, aims to ensure that all EU citizens have access to sufficient, safe and high-quality drinking water. The revised Drinking Water Directive sets high water quality standards, takes a preventative approach to reducing pollution at source, ensures better access to water, particularly for vulnerable and marginalised groups, harmonises the quality standards for materials and products in contact with water, includes measures to reduce water leakages, promotes the use of tap water to reduce plastic bottle consumption and tackles emerging pollutants including PFAS and microplastics. Specifically regarding microplastics, in 2024 the Commission notified a delegated decision⁵⁶ on a methodology to measure microplastics in water intended for human consumption. This methodology will allow MSs to measure microplastics in drinking water in a harmonised way, thus providing valuable data and knowledge that could support the development of further policy, if necessary.

5.5 REACH Regulation

The main objectives of the Regulation on the registration, evaluation, authorisation and restriction of chemicals (EC 1907/2006)⁵⁷ (REACH) are to:

- Ensure human health and the environment are protected to a high level against harmful substances
- Assess the safety of chemical substances in use in the European Union
- Promote innovation and competitiveness
- Promote alternative methods that do not involve animal testing for the assessment of the substance hazards.

The European Chemicals Agency estimates that approximately 42,000 tonnes of microplastics are released into the environment every year because of the use of products to which they are added intentionally.⁵⁸ Therefore, the Commission proceeded to amend REACH (C/2023/6419) to regulate microplastics under its Annex XVII. This prohibits the use of synthetic polymer microparticles as substances on their own and in mixtures. The restrictions on use will be phased in gradually for different applications to give the industry enough time to develop alternatives and adapt production processes.

The restrictions apply as follows:

⁵⁵ <https://eur-lex.europa.eu/eli/dir/2020/2184/oj>

⁵⁶ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32024D1441&qid=1716300770530>

⁵⁷ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32006R1907>

⁵⁸ <https://echa.europa.eu/hot-topics/microplastics>



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- From October 2023, all synthetic polymer particles that are:
 - solid, and
 - contained in particles and constitute at least 1% by weight of those particles or build continuous surface coating on particles, and
 - at least 1% of the particles referred to have dimensions equal to or less than 5mm or the length of particles is equal to or less than 15mm and their length to diameter ratio is greater than 3
- From October 2027, cosmetic rinse-off products
- From October 2028, detergents, fertilisers and products for agricultural and horticultural use
- From October 2029, medical devices, cosmetic leave-on products and fragrances
- From October 2031, plant protection products, biocidal products and granular infill for synthetic sports surfaces
- From October 2035, lip, nail and make-up products.

As such, this amendment to the REACH regulation supports the Zero Pollution Action Plan target to reduce microplastics released into the environment by 30% by 2030.

5.6 Proposal for a Regulation on preventing plastic pellet losses to reduce microplastic pollution

It is estimated that, within the EU, between 52,000 tonnes and 184,000 tonnes of plastic pellets are unintentionally released into the environment every year. In fact, plastic pellets account for 7-10% of the total unintentionally released microplastics.⁵⁹ In October 2023, the Commission proposed a regulation (COM/2023/645)⁶⁰ to tackle microplastic pollution resulting from losses of plastic pellets. Together with the REACH Regulation, the Commission expects that this regulation will help achieve the EU's target for a 30% reduction in the release of microplastics in the environment by 2030.

Pellets are lost to the environment during various steps of the lifecycle, including during processing, distribution, storage or transport. Pellets that are lost during processing in industrial settings are mostly recovered through industrial or wastewater treatment facilities, although they can also be released into the environment. Pellets lost during logistic or shipping operations often enter the environment directly.

The proposed regulation would apply to all EU economic operators that handle plastic pellets in quantities over 5 tonnes per year, as well as EU and non-EU carriers transporting plastic pellets in the EU by road, rail, inland waterways, and maritime transport. These economic operators would be required to perform the following actions in the following priority order: (i) to prevent the spill of pellets from primary containment during routine handling, (ii) to contain spilled pellets to ensure they are not lost to the environment, and (iii) to clean up after a spill or loss event.

The rules proposed by the Regulation have different requirements for companies of different sizes. Operators that handle above 1500 tonnes of plastic pellets annually would need to be certified by an independent third party that they are implementing appropriate measures to prevent, contain and clean up spills, small companies also handling over 1500 tonnes/year will need to be certified once-

⁵⁹ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=SWD%3A2023%3A0332%3AFIN>

⁶⁰ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52023PC0645>



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off 5 years after the entry into force of the Regulation, whereas companies handling less than 1500 tonnes and microenterprises will only need to issue a self-declaration of conformity.⁶¹

As of April 2025, the Council and the Parliament agreed on the new rules. Once the Council and Parliament endorse and adopt the proposal, the regulation will be published in the Official Journal of the EU and become applicable two years after publication.

⁶¹ <https://www.consilium.europa.eu/en/press/press-releases/2025/04/08/plastic-pellet-losses-council-and-parliament-agree-on-new-rules-to-reduce-microplastic-pollution/>



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6. Product and Waste Management Relevant Policies

This section presents European policies that include requirements for waste management, packaging, product design and product repair and as such can have a significant impact on how products that end up as marine litter are produced, consumed and managed at the end of their useful life.

6.1 The Waste Framework Directive

Adopted in 2008 and last revised in 2024 to better align with the Green Deal and the Circular Economy principles, the Waste Framework Directive (2008/98/EC)⁶² lays down the measures to protect the environment and human health by preventing or reducing the generation of waste, and the adverse impacts of the generation and management of waste, and to reduce the overall impacts of resource use and improve the efficiency of such use. The Waste Framework Directive (WFD) defines the waste hierarchy where prevention is the preferred route, followed consecutively by preparing for reuse, recycling, other recovery (e.g. energy recovery), and finally disposal. The WFD also presents the requirements of the concept of Extended Producer Responsibility (EPR), where MSs must ensure, through legislative or non-legislative measures, that those who professionally develop, manufacture, process, treat, sell, or import products have extended producer responsibility for these products. This means that they must accept returned products and the waste that remains when those products have been used, and manage that waste. The minimum requirements for EPR schemes are outlined in Article 8a of the Directive. The WFD also mandates that MSs must take measures to prevent waste generation, and sets targets for preparing end-of-life material for reuse and recycling by 2025, 2030 and 2035. Importantly, Article 29 stipulates that MSs shall establish waste prevention programmes (examples of these programmes are included in Annex IV of the Directive).

The Waste Framework Directive (WFD) contributes to marine litter reduction through several mechanisms. By prioritising the waste hierarchy, it encourages waste prevention, reuse, and recycling, which helps minimise waste generation and reduce the likelihood of litter entering marine environments. The mandate for Extended Producer Responsibility (EPR) ensures that manufacturers are accountable for the entire lifecycle of their products, incentivising them to design items that are easier to reuse and recycle, thereby decreasing post-consumer waste that could become marine debris.

Additionally, the requirement for MSs to establish waste prevention programs promotes initiatives such as public awareness campaigns and policies aimed at reducing single-use plastics, directly impacting marine litter. The WFD also sets increasingly stringent targets for recycling and reuse of several waste materials, including plastics, by 2025, 2030, and 2035, thus diverting these materials from landfill and the environment.

6.2 Plastic Bag Directive

The Directive on reducing the consumption of lightweight plastic carrier bags (EU 2015/720)⁶³ came into force in 2015 as an amendment to the Packaging and Packaging Waste Directive to ensure that there was legislation to set targets for the consumption of plastic bags, which, while a form of packaging, were not included in the Packaging and Packaging Waste Directive. The Directive concerns plastic carrier bags with a wall thickness below 50 microns, and stipulates that MSs should take measures to ensure that there is a sustained reduction in the consumption of these bags. These

⁶² <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02008L0098-20180705>

⁶³ <https://eur-lex.europa.eu/eli/dir/2015/720/oj/eng>

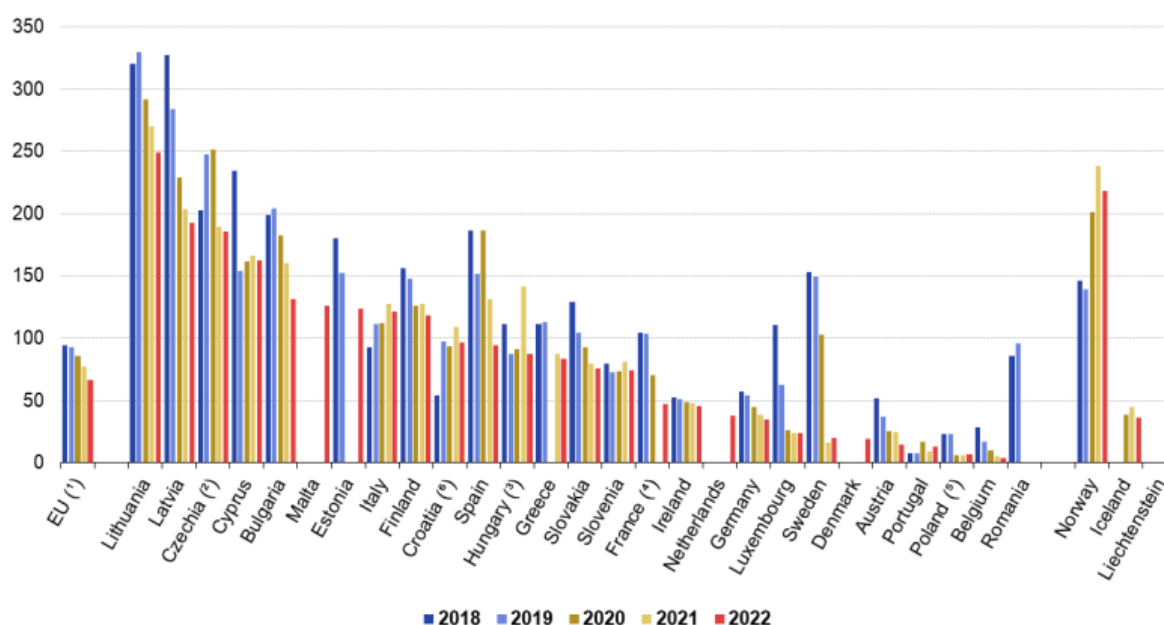


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measures should ensure that the annual consumption should not exceed 40 lightweight plastic carrier bags per person per year by the end of 2025 and/or that lightweight plastic carrier bags should not be provided free of charge at the point of sale of goods/products. Furthermore, MSs are required to report the annual consumption of these bags when providing data on packaging and packaging waste to the Commission.

The latest data available through Eurostat are for 2022.⁶⁴ Consumption of lightweight plastic bags across the EU decreased to 67 bags per person in 2022, down from 77 bags in 2021. Overall, between 2018 (the first reporting year) and 2022, consumption decreased by 29%. The detailed results that appear in Figures 4 and 5 demonstrate that there are discrepancies among MSs, with some having already met the 2025 target, whereas others still have some way to go. Some MSs had adopted measures to reduce the consumption of lightweight plastic carrier bags before this was mandated by the directive, and this is a plausible reason for the discrepancies among MSs. Another reason is the difference in measures taken by MSs, as concerns for example whether their measures include absolute bans of these bags, whether they have measures in place for very lightweight plastic carrier bags (below 15 microns) and whether the levy/tax that they set is high enough to disincentivise the use of these bags.

Consumption of lightweight plastic carrier bags, 2018-2022 (number per capita)



Note: data not available for all years for all countries. Countries are ranked based on 2022 data.

(1) 2018 and 2022: Eurostat estimate.

(2) Definition differs. 2018-2019: estimate.

(3) 2021: break in time series.

(4) 2018-2019: estimate. 2020: break in time series.

(5) 2018: Eurostat estimate.

(6) Definition differs.

Source: Eurostat (online data code: env_waspcb)

eurostat

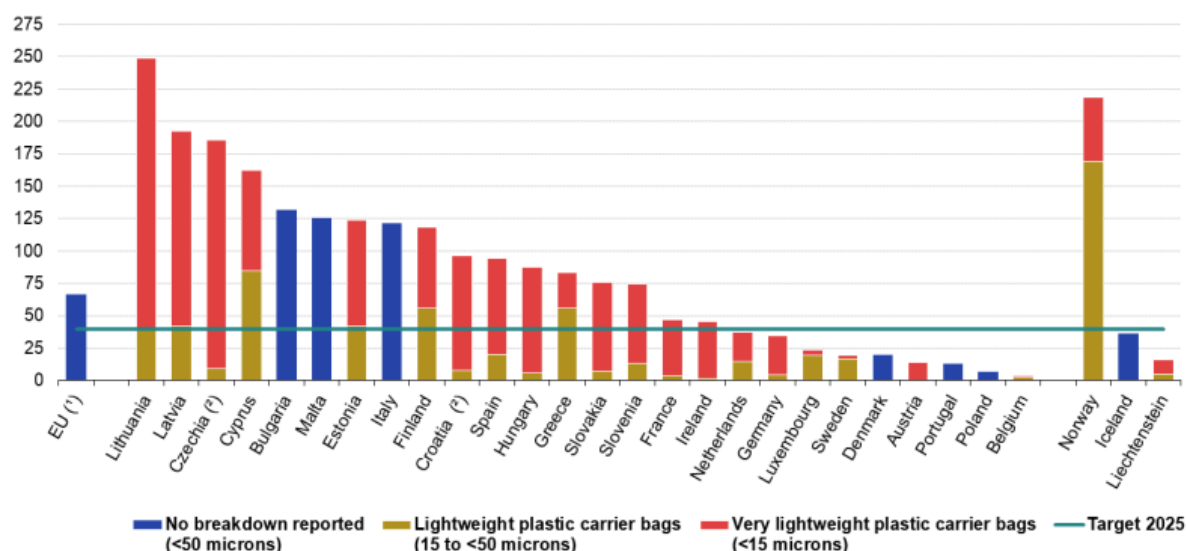
Figure 4 Change in the EU consumption of plastic lightweight bags from 2018 to 2022. Source: Eurostat

⁶⁴ https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Consumption_of_plastic_carrier_bags_-_estimates



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Consumption of lightweight plastic carrier bags, 2022 (number per capita)



Note: Romania: not available.

(*) Eurostat estimate.

(*) Definition differs.

Source: Eurostat (online data code: env_waspcb)

eurostat

Figure 5 2022 consumption of lightweight and very lightweight plastic bags by EU Member State. Source: Eurostat

The available data suggest that while MSs could meet the targets set by the Directive, in some MSs the consumption of very lightweight plastic carrier bags remains high, and considering that these are single-use plastic products that can find their way into the environment, this can be a problem. The scoping study that was commissioned by the Commission recommends that the directive should be amended to ensure that MSs also report on the consumption of very lightweight plastic carrier bags to ensure that the reductions demonstrated in the consumption of lightweight plastic bags are not because of a substitution of these with very lightweight bags. Similarly, the report also recommends that MSs should be required to report on plastic carrier bags with a wall thickness equal to or greater than 50 microns, again to investigate the potential effects of the reduction measures for lightweight plastic carrier bags on shifting consumption to heavier plastic carrier bags.⁶⁵

6.3 The Packaging and Packaging Waste Regulation

The Packaging and Packaging Waste Regulation (EU 2025/40)⁶⁶ came into force in February 2025, and its provisions will become generally applicable from August 2026. The Regulation replaces the Packaging and Packaging Waste Directive and its amendments, targeting the alignment of the requirements for packaging and packaging waste with the Union's carbon neutrality and product safety targets. It regulates the kind of packaging that can be placed on the EU market, as well as management and prevention measures for packaging waste. The Regulation has four overarching

⁶⁵ <https://op.europa.eu/en/publication-detail/-/publication/3f3ee30e-7cc5-11ec-8c40-01aa75ed71a1/language-en>

⁶⁶ https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ:L_202500040&pk_campaign=todays_OJ&pk_source=EUR-Lex&pk_medium=X&pk_content=Environment&pk_keyword=Regulation



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aims:⁶⁷

- To prevent and reduce packaging waste, including through reuse and refill systems,
- To make all packaging on the EU market recyclable by 2030, ensuring that its recyclability is economically viable,
- To increase the use of recycled plastics in packaging, and
- To decrease the use of virgin materials in packaging.

The Regulation includes the following requirements:

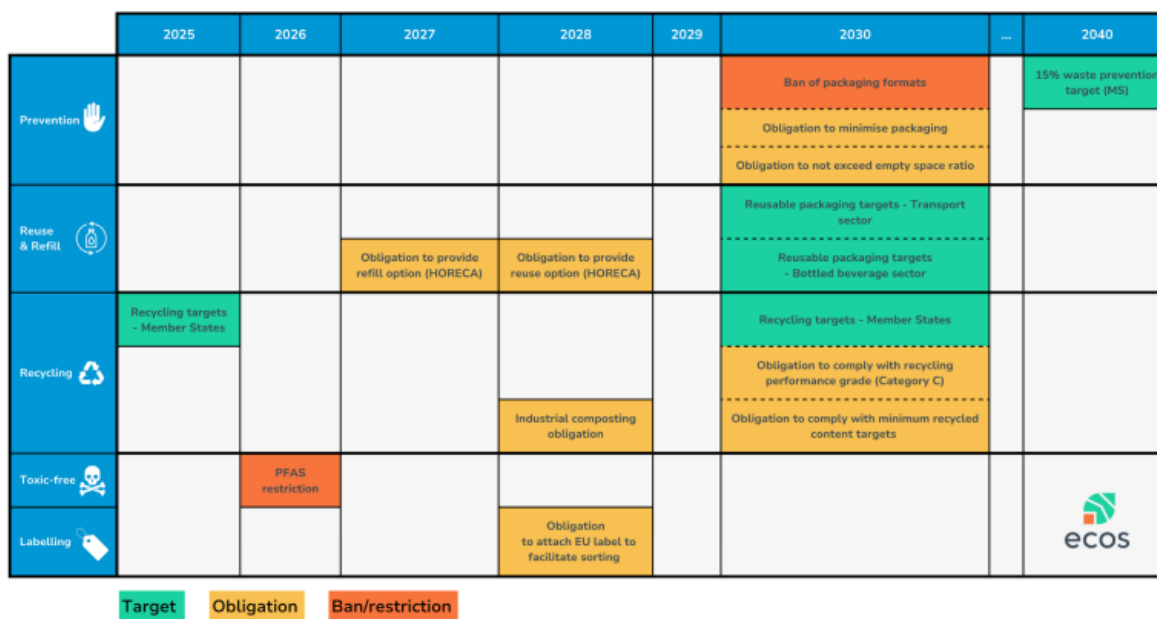
- Minimises substances of concern in packaging and sets maximum concentration levels for PFAS, also called forever chemicals.
- All packaging placed on the market should be recyclable. To be considered 'recyclable', packaging must be designed for material recycling i.e. must enable the use of secondary raw materials of sufficient quality to substitute raw materials (standards will be developed to this end), and the resulting packaging waste must be collected separately, sorted into specific waste streams and recycled at scale.
- Sets minimum recycled content in plastic packaging, with increasingly more stringent targets for 2030 and 2040, reaching a recycled content of up to 65% for some packaging, such as single-use beverage bottles.
- Sets increasingly stringent recycling targets to ensure that by 2030, a minimum of 70% of all packaging waste generated will be recycled, and sets minimum recycling rates for different materials. For plastics, a 55% minimum recycling rate by 2030 is mandated.
- Makes requirements for certain packaging, specifically permeable tea, coffee or other beverage bags intended to be used and disposed of together with the product, as well as sticky labels attached to fruit and vegetables, to be compostable in industrially controlled conditions.
- Includes requirements for the reduction of weight and volume of packaging, and for the reduction of empty space in packaging, to avoid excessive packaging.
- Defines the requirements for packaging to be considered reusable.
- Restricts certain single-use plastics, such as pre-packed fruit and vegetables weighing less than 1.5 kg and individual sachets of condiments, sauces, and sugar in hotels, bars and restaurants.
- Requires take-away businesses to offer their customers the option to bring their own containers at no extra cost.
- In terms of lightweight carrier bags, the Regulation reiterates the Plastic Bag Directive's maximum consumption target of 40 plastic carrier bags per capita per year. The Regulation also bans very lightweight carrier bags, except for loose food or when required for hygiene reasons.
- It also sets targets for gradually reducing the per capita generation of packaging waste to at least 15% of 2018 values by 2040.
- Deposit and return systems become mandatory by 2029 for all single-use plastic and metal beverage containers with a capacity of up to 3 litres, except where MSs are able to separately collect 80% of single-use beverage plastic bottles and single-use metal beverage containers by 2026.

⁶⁷ https://environment.ec.europa.eu/topics/waste-and-recycling/packaging-waste_en



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The timeline of the requirements of the Regulation is graphically presented in Figure 6.⁶⁸



Position paper
Packaging and Packaging Waste Regulation (PPWR) | Analysis
Figure 6 Graphical representation of the timeframe of the requirements of the Packaging and Packaging Waste Regulation.
Source: ecos standards

Changing the Packaging and Packaging Waste Directive into a Regulation is meant to lead to greater harmonisation among EU MSs and to avoid discrepancies in the way packaging and packaging waste are handled. The targets and requirements set by the Regulation could contribute to better quality materials entering the manufacturing chain, promoting recycled plastics, whereas reuse and reduction targets could contribute to plastic waste prevention, which is an area where EU legislation was lax. These can have important impacts on the amounts of plastic waste entering the marine and terrestrial environment and thus have the potential to significantly contribute to the reduction of plastic pollution. Nonetheless, leeway is given to MSs allowing them to make some targets more stringent if they so wish. This is particularly the case for targets on reuse, recyclable packaging and compostable packaging. The Regulation also allows MSs to request exemptions and derogations, such as for example, exempting micro enterprises from the single-use packaging bans or exempting containers smaller than 0.1 litres from deposit and return systems. These exemptions could hinder the Regulation from achieving its maximum impact. Businesses can notify national competent authorities that they use innovative packaging, for which recycling at scale and recycling performance requirements would not apply for 5 years from their first entry into the market. Such exemptions could be easily misused, and therefore MSs should be careful to only grant them to very promising packaging innovations.⁶⁹

6.4 Regulation on Ecodesign for Sustainable Products

The Regulation on Ecodesign for Sustainable Products (EU 2024/1781)⁷⁰ was adopted in 2024 as part of the package of measures that were introduced to help meet the aims of the New Circular Economy

⁶⁸ https://ecostandard.org/wp-content/uploads/2025/01/2025-01-22_ECOS_Position-PPWR-analysis.pdf

⁶⁹ https://ecostandard.org/wp-content/uploads/2025/01/2025-01-22_ECOS_Position-PPWR-analysis.pdf

⁷⁰ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32024R1781&qid=1719580391746>

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Action Plan. It replaces the Ecodesign Directive 2009/125/EC, which applied only to energy-related products. It aims to make products circular by design to contribute to climate neutrality, energy and resource efficiency and a non-toxic circular economy. It sets the framework regarding ecodesign requirements that products need to adhere to before being placed on the market or put into service. While the previous Ecodesign Directive focused on electronic products, the Ecodesign Regulation applies to any physical goods that are placed on the market or put into service, including their components and intermediate products, with the exception of food, feed, medicinal products, veterinary medicinal products, living plants, animals and micro-organisms, products of human origin, products of plastics and animals relating directly to their future reproduction, and vehicles.

Ecodesign requirements will be set up in delegated acts and products can only be placed on the market or put in service if they comply with these requirements. The requirements will aim to improve durability, reliability, reusability, upgradability, repairability, the possibility of maintenance and refurbishment, the presence of substances of concern, energy use and energy efficiency, resource use and resource efficiency, recycled content, the possibility of remanufacturing, recyclability, the possibility of materials recovery, environmental impacts including carbon footprint and environmental footprint, and the expected generation of waste. The Regulation also requires the development of digital product passports that will provide information about the product to relevant economic operators. The information on the digital product passport will be accessible electronically and can include the product's technical performance, materials and their origins, repair activities, recycling capabilities and lifecycle environmental impacts.

The Regulation prioritises the following product groups: iron and steel, aluminium, textiles (particularly garments and footwear), furniture including mattresses, tyres, detergents, paints, lubricants, chemicals, energy-related products, information and communication technology products and other electronics.

Importantly, the Regulation also provides requirements for the prevention of the destruction of unsold consumer products, specifically clothes and clothing accessories and footwear, and requires economic operators to disclose the amounts and types of these products that they destroy as well as the reasons for doing so. As public procurement is responsible for 14% of the EU's GDP, the Regulation aims to ensure that public authorities will purchase products that will meet the highest standards of circularity and sustainability.

By mandating requirements that will improve product durability, reusability, reparability, maintenance and refurbishment, the Eco-design Regulation could lead to the reduction of the creation of waste and subsequently the reduction of the possibility that these products could end up in the environment as litter. Nonetheless, the Regulation does not include plastics and polymers in its first work programme and this omission in essence minimises the potential contribution of the Regulation to the reduction of the marine litter and plastic pollution problem. Several stakeholders are urging the Commission to change this,⁷¹ particularly since two of the prioritised product groups (textiles and tyres) could benefit from upstream ecodesign measures on plastics and polymers⁷² and also since chemicals are an identified prioritised sector. The stakeholders, representatives of 40 NGOs, also state that including plastics and polymers in the first working plan will complement other ambitious actions

⁷¹ <https://eeb.org/wp-content/uploads/2025/01/Letter-include-Plastics-Polymers-into-ESPR-work-programme-1.pdf>

⁷² <https://publications.jrc.ec.europa.eu/repository/handle/JRC138903>



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that the EU must take on plastics, specifically address the unsustainable use of PVC and show global leadership on plastic design, such as it aimed to do though the negotiations for the Global Plastic Treaty.

Furthermore, while the Ecodesign Regulation bans the destruction of unsold textiles and footwear, it does not ban the destruction of unsold electronics,⁷³ although it is possible that this might change in the Commission's review of the Regulation in three years.

An additional concern raised in the literature is that the introduction of the digital product passports poses some challenges that must be overcome if this tool is to be effective.⁷⁴ One of these is to develop standardised data formats that will facilitate the seamless exchange of information across supply chains and will be interoperable between different digital systems. Furthermore, it is crucial to balance transparency with confidentiality to ensure that industry's innovations are not compromised, when it comes to for example sharing information regarding product remanufacturing. Finally, limited resources and technical expertise among SMEs might pose difficulties in the adoption of digital product passports and this is something that must be considered.

6.5 Directive on the Repair of Goods

This Directive (EU 2024/1799),⁷⁵ which first came into effect in 2017 and was amended last in 2024, lays down common rules strengthening the provisions related to the repair of white goods and certain other electronics, specifically household washing machines and household washer-dryers, household dishwashers, electronic displays, welding equipment, vacuum cleaners, servers and data storage products, mobile phones, cordless phones and slate tablets, household tumble dryers, and goods incorporating light means of transport batteries.

The main elements of the Directive are as follows:

- Manufacturers of products that are subject to repairability requirements under EU law must repair those products within reasonable timeframes and at a reasonable cost.
- A European Repair Platform will be set up so that consumers can find repairers more easily.
- Repairers will be able to use a standardised European Repair Information Form to share information about their repair services with consumers.
- The legal guarantee of products will be extended by one year if consumers choose to repair the product instead of replacing it.
- Member States will have to promote repair within their territory through financial or non-financial measures.

The Directive, which must be transposed into national law by 31 July 2026, will increase the lifetime of these products, offering affordable repair options. This could minimise the overall disposal as well as the inappropriate disposal into the (marine) environment.

⁷³ <https://repair.eu/news/new-ecodesign-for-sustainable-products-regulation-espr-what-does-it-mean-for-repair/>

⁷⁴ https://www.researchgate.net/profile/Leonidas-Milios/publication/376208532_Digital_Product_Passports_Implications_of_policy_coherence_and_implementation_towards_a_circular_economy/links/656eeb0feb682952273fe482/Digital-Product-Passports-Implications-of-policy-coherence-and-implementation-towards-a-circular-economy.pdf

⁷⁵ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32024L1799>



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7. Policies Addressing Sea-based Sources of Marine Litter

Every year, in the European Union, between seven and thirty-four per cent of ship-related waste, amounting to between 60,000 and 300,000 tonnes, is not delivered at ports⁷⁶ and by extension is likely lost or disposed of at sea. Additionally, circa 11,000 tonnes of fishing gear are abandoned, lost or discarded at sea every year.⁷⁷ Shipping, fishing, aquaculture and other maritime activities are important contributors to marine litter. This section presents the most pertinent international and European policies that aim to address the issue of marine litter from the maritime sectors, particularly shipping and fishing.

7.1 MARPOL

The International Maritime Organisation's Marine Pollution Convention (MARPOL)⁷⁸ is the main international policy instrument concerning ship waste management at sea. The technical aspects of MARPOL are included in six Annexes, each providing regulations for the prevention or control of pollution from various ship-related sources. MARPOL Annex V, which entered into force 31 December 1988, relates to the "Prevention of Pollution by Garbage from Ships" and defines garbage as "all kinds of food, domestic and operating waste, excluding fresh fish, generated during the normal operation of the vessel and liable to be disposed of continuously or periodically". MARPOL mandates minimum waste segregation and management requirements in its Annex V. A revised version of Annex V, which puts a complete ban on the disposal of plastics, entered into force in 2018. Its discharge provisions are summarised in Table 4.⁷⁹ Furthermore, MARPOL Annex V also obligates governments to have adequate port reception facilities to receive the waste segregated onboard vessels.

⁷⁶ European Commission (2018) Impact Assessment accompanying the document 'Proposal for a Directive of the European Parliament and of the Council on port reception facilities for the delivery of waste from ships, repealing Directive 2000/59/EC and amending Directive 2009/16/EC and Directive 2010/65/EU. Strassburg.
<https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52018SC0021&rid=3>

⁷⁷ European Commission, 2021. Circular Economy: Commission provides guidance for harmonised application of Single-Use Plastic rules and advances on monitoring of fishing gear. Brussels.
https://ec.europa.eu/commission/presscorner/detail/en/i_p_21_2710

⁷⁸ [https://www.imo.org/en/about/Conventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-\(MARPOL\).aspx#:~:text=The%20International%20Convention%20for%20the,2%20November%201973%20at%20IMO.](https://www.imo.org/en/about/Conventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-(MARPOL).aspx#:~:text=The%20International%20Convention%20for%20the,2%20November%201973%20at%20IMO.)

⁷⁹ <https://www.imo.org/en/ourwork/environment/pages/garbage-default.aspx>



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Table 5 Discharge provisions of MARPOL Annex V

Garbage type ¹	All ships except platforms ⁴		Regulation 5 Offshore platforms located more than 12 nm from nearest land and ships when alongside or within 500 metres of such platforms ⁴
	Regulation 4 Outside special areas and Arctic waters (Distances are from the nearest land)	Regulation 6 Within special areas and Arctic waters (Distances are from nearest land, nearest ice-shelf or nearest fast ice)	
Food waste comminuted or ground ²	≥3 nm, en route and as far as practicable	≥12 nm, en route and as far as practicable ³	Discharge permitted
Food waste not comminuted or ground	≥12 nm, en route and as far as practicable	Discharge prohibited	Discharge prohibited
Cargo residues ^{5, 6} not contained in washwater	≥ 12 nm, en route and as far as practicable	Discharge prohibited	Discharge prohibited
Cargo residues ^{5, 6} contained in washwater		≥ 12 nm, en route and as far as practicable (subject to conditions in regulation 6.1.2 and paragraph 5.2.1.5 of part II-A of the Polar Code)	
Cleaning agents and additives ⁵ contained in cargo hold washwater	Discharge permitted	≥ 12 nm, en route and as far as practicable (subject to conditions in regulation 6.1.2 and paragraph 5.2.1.5 of part II-A of the Polar Code)	Discharge prohibited
Cleaning agents and additives ⁵ in deck and external surfaces washwater		Discharge permitted	
Animal Carcasses (should be split or otherwise treated to ensure the carcasses will sink immediately)	Must be en route and as far from the nearest land as possible. Should be >100 nm and maximum water depth	Discharge prohibited	Discharge prohibited
All other garbage including plastics, synthetic ropes, fishing gear, plastic garbage bags, incinerator ashes, clinkers, cooking oil, floating dunnage, lining and packing materials, paper, rags, glass, metal, bottles, crockery and similar refuse	Discharge prohibited	Discharge prohibited	Discharge prohibited

¹ When garbage is mixed with or contaminated by other harmful substances prohibited from discharge or having different discharge requirements, the more stringent requirements shall apply.

² Comminuted or ground food wastes must be able to pass through a screen with mesh no larger than 25 mm.

7.2 Port Reception Facilities Directive

The most common type of waste from the shipping industry is plastic.⁸⁰ The management of ship waste has consistently been among the top ten environmental priorities of European ports since 2013.⁸¹ However, shipping is a global industry, making waste management optimisation particularly challenging, as the legislative framework and implemented practices vary significantly between home ports and ports of call across the world. Nonetheless, proper waste segregation onboard is often inadvertently disincentivised by the lack of proper waste segregation at port reception facilities.⁸² This issue is addressed by the Port Reception Facilities Directive (EU 2019/883),⁸³ which focuses on what

⁸⁰ Moheeta et al. (2012) Inventory of waste streams in an industrial port and planning for a port waste management system as per ISO14001. Ocean Coast Manag 61(6):10–19

⁸¹ European Sea Ports Organization [ESPO] (2022) Environmental Report 2022.

<https://www.ecoport.com/publications/environmental-report-2022>

⁸² European Commission (2018) Impact Assessment accompanying the document 'Proposal for a Directive of the European Parliament and of the Council on port reception facilities for the delivery of waste from ships, repealing Directive 2000/59/EC and amending Directive 2009/16/EC and Directive 2010/65/EU. Strassburg. <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52018SC0021&rid=3>

⁸³ <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019L0883>



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happens to ship waste once it comes on land. The 2019 amendment of the Port Reception Facilities Directive aims to harmonise the Directive with the provisions of the International Maritime Organization and MARPOL, and to better align it with other advancements in European policy, including the 2018 revision of the Waste Framework Directive and the EU Circular Economy policy.

The directive requires MSs to provide facilities to collect waste from ships in ports, prepare waste reception and handling plans, set up discharge criteria for ship wastes, and set up cost-recovery systems. The aim of the Directive is to ensure that vessels are disincentivised from discharging their waste at sea. A key reason for the development of EU law is that EU law provides for compliance and enforcement mechanisms that international law does not.⁸⁴

Waste collected from ships is considered “waste” under the Waste Framework Directive. Therefore, the management of ship-generated waste must follow the waste management hierarchy. However, an evaluation of the directive⁸⁵ concluded that this was not being done, and waste reception and handling plans developed by EU ports do not reflect the application of the waste management hierarchy in general and waste prevention in particular.

Importantly, the fees imposed by ports for the receipt of waste vary between MSs and even between ports. This could result in vessels selecting where to dispose of their waste based on cost, rather than on the quality of the waste management operations at ports. Furthermore, the way ship-generated waste is collected at ports can also vary, as the classification of different waste types varies between countries and, therefore, between ports. Thus, separation on ships does not necessarily match what is found in port reception facilities.⁸⁶

7.3 Fisheries Control Regulation

Nearly 2% of global fishing gear is lost in the marine environment annually.⁸⁷ These are either lost accidentally due to bad weather or damage by wildlife,⁸⁸ discarded involuntarily when they become too tangled on rocky substrates or marine wildlife and fishermen must cut them to minimise their losses, or discarded purposefully at the end of their useful lifetime because fishermen have no incentive, or in some cases are disincentivised by disproportionately high costs and the lack of alternative management solutions, to properly dispose of them. This abandoned, lost, or discarded fishing gear (ALDFG) continues to catch fish while in the marine environment causing what is called ‘ghost fishing’. It is estimated that 46 % of species on the International Union for the Conservation of Nature (IUCN) Red List of Threatened Species have been affected by ALDFG, mainly through

⁸⁴ Argüello (2020) Environmentally sound Management of Ship Wastes: challenges and opportunities for European ports. Journal of Shipping and Trade. 5, 12. <https://doi.org/10.1186/s41072-020-00068-w>

⁸⁵ European Commission. COM (2016) 168. REFIT Evaluation of Directive 2000/59/EC on port reception facilities for ship-generated waste and cargo residues.

⁸⁶ Farmer, A. et al (2022). Report on institutional and policy analysis. SEALIVE project, Deliverable 6.2.

⁸⁷ Richardson et al. (2022) Global estimates of fishing gear lost to the ocean each year. Sci. Adv. <https://doi.org/10.1126/sciadv.abq0135>

⁸⁸ Richardson et al. (2021) Global causes, drivers, and prevention measures for lost fishing gear. Front. Mar. Sci. 8, 690447. <https://doi.org/10.3389/fmars.2021.690447>



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entanglement or ingestion.⁸⁹ A recent study by Perroca et al.⁹⁰ in the Mediterranean analysed videos from digital media and identified cases of ALDFG entanglement involving 86 species, at least ten of which are threatened with extinction. Entanglement by ALDFG leads to significant marine life loss⁹¹ and negatively impacts vulnerable Mediterranean habitats such as coral reefs.^{92 93 94} Ghost fishing can also have significant impacts on the economies of fishing communities when commercial fish stocks are affected⁹⁵ and can pose a serious navigational hazard.⁹⁶ Wear and tear and the continuous breakdown of ALDFG in the marine environment lead to the release of plastic microfibres and contribute to microplastic pollution.⁹⁷

ALDFG has been identified as one of the top ten marine litter items to be addressed.⁹⁸ Fishing gear is included in the European Single Use Plastics Directive, discussed earlier. MSs are required to report annually on the fishing gear placed on the market and implement extended producer responsibility schemes to improve fishing gear collection.

The Fisheries Control Regulation (EU 2023/2842),⁹⁹ which was adopted in 2023 and entered into force in 2024, aims to ensure a high, uniform and effective level of control, inspection and compliance with the rules of the Common Fisheries Policy.¹⁰⁰ While this regulation does not relate directly to marine litter and/or technological innovation, some of its requirements could impact the issue of ghost fishing. Specifically, the Regulation requires fishermen's logbooks to include information on fishing gear and loss of fishing gear. It also makes provisions for the marking and identification of fishing gear. Additionally, in case of fishing gear lost at sea, the fishing logbook should include the following information: (i) the type and approximate dimensions of the lost gear, (ii) the date and estimated time when the gear was lost, (iii) the position where the gear was lost, and (iv) the measures undertaken to retrieve the lost gear. The Regulation also states that catching vessels should have equipment on board to retrieve lost gear, and if such gear cannot be retrieved, the information about the gear must be included in the logbook.

⁸⁹ FAO (2020) The State of World Fisheries and Aquaculture 2020. Sustainability in action, Rome.
<https://doi.org/10.4060/ca9229en>

⁹⁰ Perroca et al. (2024) Negative effects of ghost nets on Mediterranean biodiversity. *Aquat. Ecol.* 58, 131–137.
<https://doi.org/10.1007/s10452-022-09985-3>

⁹¹ Lively and Good (2019) Ghost Fishing. *World Seas: An Environmental Evaluation* (Second Edition), pp. 183–196.
<https://doi.org/10.1016/B978-0-12-805052-1.00010-3>

⁹² Angiolillo and Fortibuoni (2020) Impacts of marine litter on Mediterranean Reef systems: from shallow to deep waters. *Front. Mar. Sci.* 7, 581966. <https://doi.org/10.3389/fmars.2020.581966>

⁹³ Consoli et al. (2019) Marine litter from fishery activities in the Western Mediterranean sea: The impact of entanglement on marine animal forests. *Environ. Pollut.* 249, 472–481. <https://doi.org/10.1016/j.envpol.2019.03.072>

⁹⁴ Consoli et al. (2020) The impact of marine litter from fish aggregation devices on vulnerable marine benthic habitats of the central Mediterranean Sea. *Mar. Pollut. Bull.* 152, 110928. <https://doi.org/10.1016/j.marpolbul.2020.110928>

⁹⁵ Scheld et al. (2016) The dilemma of derelict gear. *Sci. Rep.* 6 (1), 1–7. <https://doi.org/10.1038/srep19671>

⁹⁶ Hong et al. (2017) Navigational threats by derelict fishing gear to navy ships in the Korean seas. *Mar. Pollut. Bull.* 119 (2), 100–105. <https://doi.org/10.1016/j.marpolbul.2017.04.006>

⁹⁷ Sharma et al. (2024) Fishing gears and nets as a source of microplastic. In: Shahnawaz, M., Adetunji, C.O., Dar, M.A., Zhu, D. (Eds.), *Microplastic Pollution*. Springer, Singapore. https://doi.org/10.1007/978-981-99-8357-5_8

⁹⁸ European Commission, 2018. Impact assessment – reducing marine litter: action on single use plastics and fishing gear. SWD(2018) 254 final. Brussels. https://eur-lex.europa.eu/resource.html?uri=cellar:4d0542a2-6256-11e8-ab9c-01aa75ed71a1.000.1.02/DOC_2&format=P

⁹⁹ https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ:L_202302842

¹⁰⁰ https://oceans-and-fisheries.ec.europa.eu/policy/common-fisheries-policy-cfp_en



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8. Key International Policies Affecting Plastic Pollution and Marine Litter

In addition to European policy on plastic pollution and marine litter, several important international and/or regional policies should be discussed, and this section focuses on these.

8.1 United Nations Law of the Sea Convention (UNCLOS)

The United Nations Convention on the Law of the Sea (UNCLOS)¹⁰¹ establishes the comprehensive legal framework governing all activities in the oceans and seas. It outlines obligations for states to protect and preserve the marine environment, including measures to prevent, reduce, and control pollution from various sources.

In 2005, the UN General Assembly adopted Resolution A/RES/60/30, which specifically addresses the issue of marine litter. The resolution underscores the importance of implementing Part XII of UNCLOS, focusing on the protection and preservation of the marine environment. It encourages states to integrate marine litter management into national strategies, promote the use of port reception facilities, and control pollution from land-based sources.

Further reinforcing these commitments, Resolution A/RES/78/241, adopted in 2023, reaffirms the unified character of UNCLOS and highlights the necessity of international cooperation to address cumulative pressures on oceans, including marine litter.

Additionally, the 2023 Agreement on Biodiversity Beyond National Jurisdiction, developed under the framework of UNCLOS, aims to ensure the conservation and sustainable use of marine biodiversity in areas beyond national jurisdiction. While not exclusively focused on marine litter, the agreement supports broader efforts to mitigate marine pollution through environmental impact assessments and the establishment of area-based management tools.

8.2 International Maritime Organization Conventions and Policies on Marine Litter

The International Maritime Organization (IMO), a specialised agency of the United Nations, has developed a comprehensive framework to prevent marine pollution from ships, including marine litter. The International Convention for the Prevention of Pollution from Ships (MARPOL) is the primary IMO instrument aimed at preventing pollution from ships. As this has been discussed in section 7.1, information about it is not included in this section.

8.2.1 London Convention and London Protocol

The London Convention (1972),¹⁰² in force since 1975, was one of the first global agreements to protect the marine environment from pollution caused by the dumping of wastes and other matter at sea. It aimed to control all sources of marine pollution by prohibiting the dumping of certain hazardous materials, including persistent plastics, and requiring permits for others.

In 1996, the Convention was modernised through the adoption of the London Protocol, which entered into force in 2006. The Protocol is more restrictive, embodying the "precautionary principle" and the

¹⁰¹ https://www.un.org/depts/los/convention_agreements/texts/unclos/unclos_e.pdf

¹⁰² <https://www.imo.org/en/OurWork/Environment/Pages/London-Convention-Protocol.aspx>



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"polluter pays principle" as general obligations. Under the Protocol, all dumping is prohibited unless explicitly permitted, following a "reverse list" approach that specifies materials that may be considered for dumping, subject to rigorous assessment and permitting procedures.

8.2.2 IMO Action Plan and Strategy to Address Marine Plastic Litter from Ships

In 2018, the IMO adopted an Action Plan to Address Marine Plastic Litter from Ships. The Action Plan includes actions to enhance the implementation of existing regulations, improve port reception facilities, and promote the reporting and retrieval of lost fishing gear.

Building on this, in 2021, the IMO adopted a Strategy to Address Marine Plastic Litter from Ships,¹⁰³ setting a vision to "strengthen the international framework and compliance with the relevant IMO instruments, endeavouring to achieve zero plastic waste discharges to sea from ships by 2025." The Strategy aims to reduce marine plastic litter generated from, and retrieved by, fishing vessels; reduce shipping's contribution to marine plastic litter; and improve the effectiveness of port reception facilities and treatment in reducing marine plastic litter.

In 2025, the IMO's Sub-Committee on Pollution Prevention and Response agreed on a draft Revised Action Plan to Address Marine Plastic Litter from Ships,¹⁰⁴ which includes a dedicated action for the development of mandatory measures to reduce the environmental risks of plastic pellets transported by sea in freight containers. The draft plan updates timeframes for expected completion of actions, grouping them into short-, mid-, long-term, and continuous actions.

Furthermore, the IMO, in collaboration with the Food and Agriculture Organization (FAO), launched the GloLitter Partnerships Project¹⁰⁵ to assist developing countries in reducing marine litter from the maritime transport and fisheries sectors. The project supports the implementation of the IMO Action Plan and Strategy by providing technical assistance, capacity-building, and promoting best practices.

8.3 The United Nations Sustainable Development Goals

The 2030 Agenda for Sustainable Development, adopted in 2015 through UN Resolution 70/1, outlines 17 Sustainable Development Goals (SDGs)¹⁰⁶ to guide global efforts toward social, economic, and environmental sustainability. While plastics are not explicitly mentioned within the SDGs, several targets are directly relevant to addressing marine litter and plastic pollution, particularly through their focus on sustainable consumption, waste reduction, and marine protection.

Key SDG targets related to marine litter include:

- **SDG 12.4:** Achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water, and soil to minimise their adverse impacts on human health and the environment (target date: 2020).

¹⁰³

<https://wwwcdn.imo.org/localresources/en/MediaCentre/HotTopics/Documents/marine%20litter/STRATEGY%20TO%20ADDRESS%20MARINE%20PLASTIC%20LITTER%20FROM%20SHIPS.pdf>

¹⁰⁴ <https://www.imo.org/en/MediaCentre/Pages/WhatsNew-2221.aspx>

¹⁰⁵ <https://glolitter.imo.org/>

¹⁰⁶ <https://sdgs.un.org/goals>



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- **SDG 12.5:** Substantially reduce waste generation through prevention, reduction, recycling, and reuse by 2030.
- **SDG 12.c:** Rationalise inefficient fossil fuel subsidies that encourage wasteful consumption, including by phasing out harmful subsidies and restructuring taxation systems to reflect environmental impacts, while considering the needs of developing countries.
- **SDG 14.1:** By 2025, prevent and significantly reduce marine pollution of all kinds, particularly from land-based activities, including marine debris and nutrient pollution.

These targets provide a strategic framework for action on plastics. They support and guide the development of coherent international and EU-level policies, such as the UN Plastics Treaty (see section 8.5), ensuring that these align with sustainable development objectives.

8.4 The Basel Convention

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal¹⁰⁷ is administered by the United Nations Environment Programme (UNEP). The principal aims of the Basel Convention are to reduce the generation of hazardous waste and to promote its environmentally sound management, to restrict transboundary movement of hazardous waste unless this is done in accordance with the principles of environmentally sound management, and to develop a regulatory framework applicable where transboundary movements are permissible.

In 2019, the Parties to the Convention adopted amendments to specifically include plastic waste under its scope. These amendments make certain categories of plastic waste subject to prior informed consent before export, aim to prevent the illegal dumping of poorly managed plastic waste in countries lacking the capacity to manage it, and promote transparency and accountability in international plastic waste trade. The Basel Convention launched the Plastic Waste Partnership in 2019.¹⁰⁸ This voluntary initiative focuses on reducing plastic waste generation, promoting innovative solutions for plastic circularity, and improving the sound management of plastic waste, thus mitigating its leakage into the ocean.

As the only legally binding instrument on the transboundary movement of plastic waste, the Basel Convention is instrumental in ensuring that plastics are managed in countries that have the capacity to safely do so, and that illegal plastic waste dumping is prevented. Nonetheless, while the Convention provides the framework and the tools to prevent the illegal transport of waste, it is up to the parties of the Convention to develop policies and procedures to detect and reject such waste.

8.5 UN Plastics Treaty

During the United Nations Environment Assembly in 2022, the mandate for the negotiations of a global plastics treaty was adopted, aiming to create by the end of 2024 a first-of-its-kind internationally legally binding instrument to end plastic pollution.¹⁰⁹ Since then, there have been five negotiating sessions for the UN Plastics Treaty: INC-1 convened in Punta Del Este, Uruguay in December 2022, INC-2 in Paris, France in May and June 2023, INC-3 in Nairobi, Kenya in November 2023, INC-4 in Ottawa,

¹⁰⁷ <https://www.basel.int/>

¹⁰⁸ <https://www.basel.int/Implementation/Plasticwastes/PlasticWastePartnership/tabid/8096/Default.aspx>

¹⁰⁹ <https://www.unep.org/inc-plastic-pollution>



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Canada in April 2024, and INC-5 in Busan, Korea in November 2024, which saw a record turnout of 3,300 delegates. Since no agreement was made in the last session, INC5.2 will convene in August in Geneva, Switzerland.

Throughout the negotiating sessions, a constant divisive issue has been the different approaches preferred by several country coalitions regarding the preferred approach to reduce plastic pollution. On the one hand, the so-called “high ambition coalition” countries,¹¹⁰ comprised of 69 countries and the European Union, and co-chaired by Norway and Rwanda, are pushing for effective interventions along the full lifecycle of plastics in line with the circular economy principles and calling for a reduction in plastic production and a phase-out of certain plastic products and toxic chemical additives. On the other hand, oil-producing nations are pushing for a treaty that will focus on recycling and the management of plastics.

In September 2024, the United Nations Environment Programme published a Zero Draft text of the Plastics Treaty, which was revised following the INC-3 in Nairobi. The most recent text of the treaty is the Chair’s text released after INC-5 in Korea (UNEP/PP/INC.5/4).¹¹¹ Within this version of the Treaty, a previous provision for an article on the Scope of the treaty has been excluded. Previous options on the scope presented diverging texts including or excluding plastic production. Instead, a much simpler ‘Objective’ is now included as Article 1 which states

‘The objective of this Convention is to protect human health and the environment from plastic pollution, including in the marine environment [based on a comprehensive approach that address the full life cycle of plastics].’

The Chair’s text contains a very short list of definitions, including “plastic”, “plastic pollution”, “plastic product” and “plastic waste”. Notably, neither does the proposed definition for plastic pollution include microplastics, nor is a separate definition for microplastics included. Article 3 concerns ‘Plastic Products’, which was one of the most contentious issues discussed at the meeting.¹¹² The Chair’s text is heavily bracketed, demonstrating the extent of divergent opinions on the matter. Notably, no consensus was reached on whether this article should include the restriction of production of certain products, reference to chemicals of concern, and whether measures should be voluntary or mandatory and applied globally or nationally. The Chair’s text also includes provisions for establishing a committee to undertake relevant work in this area. Should this be agreed, potential provisions on restricting the use of certain products would in essence include phase-out dates for several single-use plastic items globally, including the items included in the SUPD as well as rinse-off cosmetics and personal care products containing intentionally added microbeads.

Article 5 is on Plastic Product Design. It states that taking into account its national circumstances and capabilities, each Party shall take appropriate measures to:

- ‘(a) improve plastic product design, in pursuit of circular economy approaches, in order to:*
- i. contribute to sustainable production and consumption of plastics by increasing reuse and recycling of plastics, including, as appropriate, through reuse and recycled content*

¹¹⁰ <https://hactoendplasticpollution.org/press-release-countries-aim-to-end-plastic-pollution-by-2040/>

¹¹¹ https://wedocs.unep.org/bitstream/handle/20.500.11822/46710/Chairs_Text.pdf

¹¹² <https://enb.iisd.org/plastic-pollution-marine-environment-negotiating-committee-inc5-summary>



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targets;

- ii. *improve the durability, reusability, refillability, refurbishability, repairability and recyclability of plastic products, and promote the use of safe and sustainable additives;*
- iii. *ensure disposal of plastic products in an environmentally sound manner in accordance with the waste hierarchy; and*
- iv. *minimize releases of plastic, including microplastics, during the product life.*

- (b) *foster research, innovation, development and use of sustainable and safer alternatives and nonplastic substitutes, including products, technologies and services, taking into account environmental, economic, social and human health aspects and their potential for waste reduction and reuse, as well as availability, accessibility and affordability, based on life cycle assessments and best available science, and, where relevant, traditional knowledge, knowledge of Indigenous Peoples and local communities.'*

Article 6 on [SUPPLY][SUSTAINABLE PRODUCTION] was another particularly contentious part of the text. There are two options under this article. Option 1 is to include no such article at all, reflecting the strong opposition of some delegations to include articles on production, whereas option 2 is a highly bracketed text, as follows:

'Option 2

[1. The Conference of the Parties shall, at its first meeting, adopt [as an annex to this Convention] a[n] [aspirational] global target to [reduce] [maintain] [manage] the [consumption and] production [and consumption] [and use] of [primary] plastic[s] [polymers] [to reduce plastic pollution through consumption] [to sustainable levels].]

[2. Each Party shall [, as appropriate] take measures across the full lifecycle of plastics to [achieve] [contribute to] the global target referred to in paragraph 1.]

[3. Each Party shall report [available] statistical data on [its] [efforts to manage the consumption and its] production, [imports and exports] [of primary plastic polymers] [and consumption of plastics] and the measures taken [to achieve the global target referred to in] [under] paragraph [1] [2].] ...'

Depending on the results of the next negotiation phase, the text in this option could range from mandatory reduction targets to more voluntary measures. Importantly, the text in the revised Zero draft version, which concerned reduction in plastic demand, is no longer present, highlighting the difficulty associated with achieving consensus on certain objectives as well as the very divergent opinions of the delegates.

Article 7 on releases and leakages urges parties to take measures to prevent, reduce and, where possible, eliminate the release and leakage of plastics, including microplastics, plastic pellets, flakes and powders, and pollution from fishing activities, using the best available and affordable technologies and environmental practices, and taking into account national circumstances and capabilities. References to emissions, which were included in previous versions of the text, are no longer present in the Chair's text, thus effectively excluding greenhouse gas and other emissions related to the



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production of plastic products.¹¹³

In terms of plastic waste management, Article 8 mandates the environmentally sound management of plastic waste through promoting circular economy approaches, setting national targets for collection and recycling, preventing littering and promoting behavioural changes, inter alia. However, in terms of tackling existing plastic pollution, the text takes a more lenient/voluntary approach (Article 9).

Policy analysis work undertaken within the EU-funded project SEALIVE,¹¹⁴ makes the following recommendations for addressing fundamental gaps as the UN Plastics Treaty is being developed:

- A forward-looking vision is needed for the role of plastics, identifying which types of plastics are essential for specific applications, and where alternatives could be used. This clarity will determine which plastics and associated waste streams require targeted management.
- A comprehensive strategy for achieving full circularity of plastics must be developed, recognising the capabilities and limitations of both mechanical and chemical recycling, and how these vary globally due to diverse waste management infrastructures. This will enable businesses and policymakers to adapt and plan effectively.
- There should be a harmonised international policy framework that clearly defines expectations for different plastic types, including assessments of potential harm and suitability for reuse and recycling.

The UN Plastics Treaty is still being negotiated, and such a Treaty can form the basis for further law and policy development and the elaboration of national plans and measures. While it is taking longer to agree than originally anticipated, parties seem more interested in ensuring that a clear and comprehensive Treaty on plastics is established, rather than agreeing to a hasty or inadequate Treaty.

8.6 Regional Sea Conventions

The four Regional Sea Conventions within Europe serve as key frameworks through which states sharing marine waters collaborate to protect the marine environment. These are important instruments as they engage non-EU member states in actions for the protection of the marine environment. The European Union is a contracting party to three of the four Regional Sea Conventions, the Barcelona Convention, the OSPAR Convention and the Helsinki Convention, and an observer to the Bucharest Convention. Generally, EU policy is the main driver for the Regional Sea Conventions, as often policies are first adopted in the EU and then transferred to the Conventions, so that similar provisions are adopted by non-EU MSs as well.

8.6.1 The Barcelona Convention

The Barcelona Convention,¹¹⁵ encompassing 21 Mediterranean countries and the European Union, is implemented through the United Nations Environment Programme's Mediterranean Action Plan (UNEP/MAP). The Mediterranean Action Plan (MAP) was the first initiative established under the UNEP Regional Seas Programme and laid the foundation for the development of the Barcelona Convention and its initial two Protocols. In 1995, MAP was revised and updated through the adoption of the Action Plan for the Protection of the Marine Environment and the Sustainable Development of

¹¹³ <https://enb.iisd.org/plastic-pollution-marine-environment-negotiating-committee-inc5-summary>

¹¹⁴ Baldwin et al. (2024). Updated recommendations for international policies. SEALIVE project, Deliverable 6.6.

¹¹⁵ <https://www.unep.org/uneppmap/>



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the Coastal Areas of the Mediterranean (MAP Phase II).

MAP Phase II promotes the Ecosystem Approach to environmental management, aiming to achieve 11 Ecological Objectives that align with the 11 Descriptors of the EU Marine Strategy Framework Directive (MSFD). Among these, Ecological Objective 10 specifically targets marine litter, stating: “Marine and coastal litter does not adversely affect coastal and marine ecosystems.”

To date, the Barcelona Convention has led to the adoption of seven Protocols, each addressing a distinct aspect of Mediterranean environmental protection. Of particular relevance to marine litter is the Protocol for the Protection of the Mediterranean Sea Against Pollution from Land-Based Sources and Activities (LBS Protocol). Under Decision IG.21/7, the 18th Meeting of the Contracting Parties adopted the Regional Plan on Marine Litter Management in the Mediterranean, pursuant to Article 15 of the LBS Protocol. In 2021 and 2023, the Contracting Parties adopted updated Regional Plans under Article 15 of the Land-Based Sources and Activities Protocol, introducing legally binding measures and targets for key sectors.¹¹⁶

The main objectives of the Regional Plan are to:

- Prevent and significantly reduce marine litter pollution and its impacts on ecosystem services, habitats, species and public health and safety,
- Remove existing marine litter using environmentally sound practices,
- Improve understanding and knowledge of marine litter issues, and
- Ensure that marine litter management is aligned with internationally recognised standards and regional initiatives, and harmonised with actions in other marine regions, where appropriate.

The Marine Litter MED II project (2020–2023) supported the implementation of these plans by expanding reduction and prevention measures, developing monitoring indicators, and enhancing inter-basin cooperation, particularly with the Black Sea region.

8.6.2 The OSPAR Convention

The Convention for the Protection of the Marine Environment of the North-East Atlantic, known as the OSPAR Convention,¹¹⁷ in force since 1998, covers the North-East Atlantic and is implemented by the OSPAR Commission. The Convention contains five Annexes, each dealing with a specific area of marine environment protection:

- Annex I concerns the prevention and elimination of pollution from land-based sources
- Annex II concerns the prevention and elimination of pollution by dumping or incineration
- Annex III concerns the prevention and elimination of pollution from offshore sources
- Annex IV concerns the assessment of the quality of the marine environment
- Annex V concerns the protection and conservation of the ecosystems and biological diversity of the maritime area.

In 2010, OSPAR published the quality status report, which showcased that the area faced extensive litter problems, and formed the basis on which to extend marine litter monitoring within the OSPAR’s maritime area. Following this monitoring, the Regional Action Plan for the Prevention and

¹¹⁶ <https://www.unep.org/mediterranean-action-plan-map-barcelona-convention>

¹¹⁷ <https://www.ospar.org/convention/text>



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Management of Marine Litter in the North-East Atlantic was published in 2014.¹¹⁸ In 2022, OSPAR adopted its Second Regional Action Plan for Marine Litter (RAP ML 2), aligning with the North-East Atlantic Environment Strategy 2030.¹¹⁹ RAP ML 2 sets ambitious targets, including reducing commonly found single-use plastic and maritime-related plastic items on beaches by 50% by 2025 and 75% by 2030, compared to a 2016 baseline. It also aims for a 70% reduction in the prevalence of all marine litter on beaches by 2030.

8.6.3 The Helsinki Convention

The Convention on the Protection of the Marine Environment in the Baltic Sea Area,¹²⁰ the Helsinki Convention, effective since 2000, addresses the protection of the Baltic Sea environment. Marine litter is implicitly addressed in Annex I of the Helsinki Convention, which includes ‘persistent materials which may float, remain in suspension or sink’ (i.e. plastics) in the list of priority groups of harmful substances, and in Annex IV that concerns the prevention of pollution from ships and mandates that contracting parties should comply with the provisions of MARPOL.

In 2015, the implementing body of the Helsinki Convention, the Helsinki Commission (HELCOM), adopted a Regional Action Plan on marine litter. In 2021, HELCOM adopted an updated Regional Action Plan on Marine Litter, building upon the initial 2015 plan. The revised plan incorporates lessons learned and the best available information on litter amounts, composition, sources, and pathways.¹²¹ The plan aims for a significant reduction of marine litter by 2025, with implementation led by the Sea-based Pressures Working Group and coordinated with relevant subsidiary bodies.

8.6.4 The Bucharest Convention

The Convention on the Protection of the Black Sea against Pollution, the Bucharest Convention, was signed in 1992 and ratified in 1994. A key aim of the Bucharest Convention is to reduce and prevent pollution of the Black Sea from land and sea-based sources.

In 2009, the Bucharest Convention adopted the Strategic Action Plan for the Environmental Protection and Rehabilitation of the Black Sea. The Action Plan includes a list of management targets, several of which are relevant to marine litter:¹²²

- Minimise ghost fishing caused by discarded, abandoned or lost fixed and floating nets, including those used in illegal/unregulated fishing activities
- Amend national waste strategies and/or national coastal zone management plans with the aim of coastal and marine litter minimisation.
- Develop regional and national marine litter monitoring and assessment methodologies based on common research approaches, evaluation criteria and reporting requirements.
- Provide adequate port reception facilities for ship-generated wastes according to MARPOL 73/78, Annex I, IV, V.

¹¹⁸ Loizides et al. (2019). Review of tools and legal instruments to address marine litter. MELTEMI Project, Deliverable D3.4.

¹¹⁹ <https://www.ospar.org/work-areas/eiha/marine-litter/regional-action-plan/rap2>

¹²⁰ <https://helcom.fi/about-us/convention/>

¹²¹ <https://helcom.fi/action-areas/marine-litter-and-noise/marine-litter/marine-litter-action-plan/>

¹²² Loizides et al. (2019)



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- Establish a harmonised fee/cost recovery system on ship-generated waste.
- Promote/develop investment projects within national strategies/local plans to engineer, construct and install new solid waste recycling facilities, landfill sites and incineration plants, complying with BAT regulations.

In 2018, the Black Sea Commission, the implementing body of the Bucharest Convention, adopted a Regional Action Plan on Marine Litter, developed in collaboration with UNEP/MAP. The plan outlines measures to minimise ghost fishing, amend national waste strategies, develop monitoring methodologies, and improve waste management infrastructure.



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9. Policies affecting the Technical and Commercial Aspects of the SeaClear2.0 system

Having considered the policies that can have an impact on reducing marine litter, particularly plastics, this section examines some key policies that can support (or hinder) the further development and deployment of innovative systems such as the one being developed within SeaClear2.0 for addressing the marine litter issue.

9.1 Regulation on the Rules and Procedures for the Operation of Unmanned Aircraft

The use of the SeaClear2.0 system's unmanned aerial vehicle (UAV), the drone, is governed by the Commission Implementing Regulation (EU) 2019/947 of 24 May 2019¹²³ on the rules and procedures for the operation of unmanned aircraft. This lays down the detailed provisions for the operation of drones as well as for personnel operating the drones. There are three categories of drones defined within the regulation, depending on their risk profile. The category associated with the lowest risk is the "open" category, and it is under this category that the drone operated in SeaClear2.0 falls.

The 'open' category is divided in three sub-categories – A1: fly over people but not over assemblies of people, A2: fly close to people, A3: fly far from people. Each of these sub-categories comes with its own set of requirements, which depend on the class of the drone that will be used. A summary of the operation and drone pilot/operator requirements appears in Figure 7.

¹²³ https://eur-lex.europa.eu/eli/reg_impl/2019/947/oj/eng



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WHAT TYPE OF DRONE CAN I FLY?										
Operation			Drone Operator / pilot							
C-Class	Max Take off mass	Subcategory	Operational restrictions	Drone Operator registration?	Remote pilot qualifications	Remote pilot minimum age				
Privately build	<250g 	A1 Not over assemblies of people (can also fly in subcategory A3)	Operational restrictions on the drone's use apply (follow the QR code below)	Yes No if toy or not fitted with camera/sensor 	Read user's manual	No minimum age (certain conditions apply)				
legacy < 250g										
C0										
C1	<900g 	A2 Fly close to people (can also fly in subcategory A3)		Yes	Check out the QR code below for the necessary qualifications to fly these drones	16				
C2	<4kg 									
C3	A3 Fly far from people									
C4										
Privately build										
Legacy drones (art 20)										
	<25kg 									



#EASAdrones

together4safety

For more details go to
<https://www.easa.europa.eu/domains/civil-drones-rpas>



Figure 7 Operation and operator requirements for different categories and classes of drones. Source: EASA¹²⁴.

Further requirements are defined by the national authorities where the drones will be operated, depending on the location of the operation. As such these vary from country to country. Details of these variations are included in Deliverable 2.2¹²⁵ of the SeaClear2.0 project and are thus not repeated here.

The use of systems such as SeaClear2.0, which involve UAVs, would be facilitated and more easily transferable if the rules governing the operations of these UAVs were standardised across countries, and specific locations/environments, including near potentially sensitive infrastructure.

9.2 Using Unmanned Surface Vehicles

There is no single, comprehensive EU regulation for USVs, but they are governed by a patchwork of existing maritime, environmental, digital, and safety laws. USVs fall under general maritime regulations, but there are no EU-specific laws exclusively targeting them yet. As the existing rules were written for manned vessels, there are grey areas regarding unmanned navigation, collision avoidance and liability.

¹²⁴ <https://www.easa.europa.eu/en/domains/drones-air-mobility/operating-drone/open-category-low-risk-civil-drones>

¹²⁵ <https://www.seaclear2.eu/wp-content/uploads/2024/05/D2.2-Public-Demonstrations-Pilot-Sites-and-Showcases-Plan.pdf>



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The European Maritime Safety Agency (EMSA) has begun examining the integration of autonomous ships, including USVs. Efforts are ongoing to:

- Clarify legal definitions and status of USVs, particularly by the IMO¹²⁶
- Address navigation rights and liability
- Support standardisation and harmonisation across EU states through CEN, CENELEC and ISO.

While these efforts are ongoing, there is no clarity on whether they will address all sizes of vessels, including smaller ones, such as those being developed within SeaClear2.0. As stated in Deliverable 2.2 of the SeaClear2.0 project, while the use of these waterborne vehicles is not currently regulated at EU level, local authorities and ministries across MSs have set conditions and permitting procedures to ensure that risks from their operation are minimised. The requirements, permissions to obtain and limitations in each of the project's demonstration and pilot sites are summarised in Table 5 of Deliverable 2.2. Just as for UAVs the development of European-wide, cohesive rules on the use of unmanned surface vehicles would facilitate the deployment of systems such as that of SeaClear2.0.

9.3 The Artificial Intelligence Act

The Artificial Intelligence Act,¹²⁷ which was adopted in March 2024 and will enter into force 2 years after its official publication date in the Official Journal of the EU, aims to improve the functioning of the internal market and to promote the uptake of human-centric and trustworthy AI, while ensuring a high level of protection of health, safety and fundamental rights, including democracy, the rule of law and environmental protection, against the harmful effects of AI systems in the Union, and to support innovation.

According to the Act, there are seven ethical principles of AI: human agency and oversight; technical robustness and safety; privacy and data governance; transparency; diversity, non-discrimination and fairness; societal and environmental well-being and accountability. Within the scope of the Regulation (Article 2) it is stated that it does not apply to AI systems or models and their outputs that are specifically developed and put into service solely for scientific research and development. Therefore, in the current state of the SeaClear2.0 system, the Regulation would not be applicable. However, once the system is commercialised, then this could become applicable. Nonetheless, the AI system used in SeaClear2.0 is not a high-risk or systematic risk system, and therefore there are no requirements in the Regulation that would hinder or restrict its use.

9.4 General Data Protection Regulation

The General Data Protection Regulation of 2016 (EU 2016/679)¹²⁸ lays down the rules relating to the protection of natural persons regarding the processing of personal data and rules relating to the free movement of personal data. The reason why this policy is considered relates to the SeaClear2.0 system's potential to collect personal data, in terms of images/video, of people, mainly through the UAV's operation. However, the nature of the system's operation i.e. working in defined marine areas, in the absence of swimmers and boaters, means that such a risk is avoided. Therefore, the GDPR neither hinders nor supports the system's operation.

¹²⁶ <https://www.imo.org/en/MediaCentre/HotTopics/Pages/Autonomous-shipping.aspx>

¹²⁷ <https://artificialintelligenceact.eu/>

¹²⁸ <https://eur-lex.europa.eu/eli/reg/2016/679/oj/eng>



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9.5 The EU Taxonomy Regulation

The EU Taxonomy Regulation (EU 2020/852)¹²⁹ entered into force on 12 July 2020. It aims to establish clear and uniform criteria for determining whether an economic activity qualifies as environmentally sustainable. Its overarching aim is to ensure that there is a common classification system for sustainable economic activities across the EU, to ensure that investments are directed towards sustainable projects and activities and that greenwashing is avoided.

For an economic activity to be classified as environmentally sustainable according to the EU Taxonomy, it must meet the following criteria:

- It contributes substantially to one or more of the environmental objectives set out in the regulation.
- It does not significantly harm any of these environmental objectives.
- It is carried out in compliance with the minimum safeguards set out in the regulation.
- It complies with technical screening criteria set up by the European Commission in accordance with the regulation.

The environmental objectives set within the EU Taxonomy Regulation are:

1. Climate change mitigation,
2. Climate change adaptation,
3. Sustainable use and protection of water and marine resources,
4. Transition to a circular economy,
5. Pollution prevention and control, and
6. Protection and restoration of biodiversity and ecosystems.

The technical screening criteria are developed in delegated acts. To date, three delegated acts that include technical screening criteria have been published:

- The Climate Delegated Act (Delegated Regulation (EU) 2021/2139),¹³⁰ which includes technical screening criteria for economic activities that substantially contribute to the objectives of climate change mitigation and climate change adaptation.
- The Complementary Climate Delegated Act (Delegated Regulation (EU) 2022/1214)¹³¹ through which, under strict conditions, specific nuclear and gas energy activities have been added to the list of economic activities covered by the EU Taxonomy.
- The Environmental Delegated Act (Delegated Regulation (EU) 2023/3851),¹³² which establishes the technical screening criteria for economic activities that substantially contribute to the sustainable use and protection of water and marine resources, to the transition to a circular economy, to pollution prevention and control, or to the protection and restoration of biodiversity and ecosystems.

The types of activities that are covered by each of the Delegated Acts are included in Annexes to the

¹²⁹ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32020R0852>

¹³⁰ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32021R2139>

¹³¹ <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32022R1214&from=EN>

¹³² https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=PI_COM%3AC%282023%293851



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Acts. Additionally, the European Commission has also prepared an EU Taxonomy Compass,¹³³ which offers a visual representation of the sectors, activities and criteria included in the EU Taxonomy. However, to date, this only includes activities that relate to the Climate Delegated Act and the Complementary Climate Delegated Act.

Companies that fall under the scope of the Corporate Sustainability Reporting Directive (EU 2022/2464)¹³⁴ must report to what extent their activities are covered by the EU Taxonomy and comply with the criteria set in the Taxonomy delegated acts. The Corporate Sustainability Reporting Directive (CSRD) applies to all large companies and all listed companies (except listed micro-enterprises). It requires them to disclose information on what they see as the risks and opportunities arising from social and environmental issues, and on the impact of their activities on people and the environment.

Other companies, not included above, can use the Taxonomy on a voluntary basis, as a guide for investments, i.e. they can choose to meet the criteria with the aim of attracting investors interested in green opportunities.

While the SeaClear2.0 system is currently being developed the EU Taxonomy regulation is not applicable, as it is not an economic activity. Once the service is commercialised however, the EU Taxonomy might be relevant, although perhaps not mandatory, as it will likely not be commercialised through a company that falls within the Corporate Sustainability Reporting Directive. However, the entity commercialising the SeaClear2.0 system might wish to voluntarily assess it against the Taxonomy's criteria.

A future SeaClear2.0 service would not fall within the economic activities described in the Climate Delegated Act or the Complementary Climate Delegated Act. It could, however, fall within the Environmental Delegated Act; specifically, within Annex III: Pollution Prevention and Control.¹³⁵ As the EU Taxonomy Compass does not yet include examples of economic activities that fall within Pollution Prevention and Control, whether SeaClear2.0's future service will be EU Taxonomy compliant remains to be determined. For argument's sake, a preliminary assessment, based on the available text in the delegated act is included below.

Activity 2.4 of Annex III of the Environment Delegated Act concerns "Remediation of contaminated sites and areas". Inter alia, the activity includes:

"(d) cleaning up oil spills and other types of pollutants on or in:

- ...
- (iii) marine water as defined in Directive 2008/56/EC;
- (iv) sediments (for all surface water types);
- (v) aquatic ecosystems;
- (vi) ..."

As the future SeaClear2.0 service would concern remediation of marine water and seabed from marine litter, it fits with this type of cleaning operations.

The technical screening criteria included for this activity are split into two parts: substantial

¹³³ <https://ec.europa.eu/sustainable-finance-taxonomy/taxonomy-compass>

¹³⁴ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32022L2464>

¹³⁵ https://finance.ec.europa.eu/system/files/2023-06/taxonomy-regulation-delegated-act-2022-environmental-annex-3_en_0.pdf



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contribution to pollution prevention and control and do no significant harm. The table below summarises the criteria and explains how the future SeaClear2.0 service would be compliant with them.

Table 6 Compliance of the SeaClear2.0 system with the Technical Screening Criteria for Remediation of Contaminated Sites and Areas

Technical Screening Criterion	SeaClear2.0 System's Compliance
Substantial Contribution to pollution prevention and control	
1. Remediation is not carried out by, or on behalf of, the person who caused the pollution.	The sources of marine litter are mostly diffuse, and it is often not possible to identify one polluter. The potential customers of the SeaClear2.0 system would be local authorities, port authorities, fishery managers, etc., and not one specific polluter.
2. The relevant contaminants are removed, controlled, contained, or diminished so that the contaminated area no longer poses any significant risk to human health and the environment.	Any collected marine litter will be removed from the marine environment, and properly managed according to local laws and regulations, and in accordance with the end-of-life solutions identified by the SeaClear2.0 project.
3. The remediation activity is conducted in line with best industry practice and includes all the following elements: a. The original activity that led to the contamination has been addressed (except long-range transboundary air pollution or other unidentifiable diffuse sources;)	Marine litter would fall within the exception for unidentifiable diffuse sources, in most cases. The only exception to this would be a site-specific and identifiable source of marine litter pollution. In such a case, the remediation plan should include actions to prevent recontamination.
b. Preparatory investigations are carried out to define the environmental targets for the remediation and evaluate the remedial options	Preparatory investigations could include the bathymetry scans and the scans using sonar and magnetometers that are undertaken by the SeaClear2.0 system. Additionally, the system includes an assessment of whether the identified litter items should be removed to ensure that there is no harm done to the marine environment.
c. The remedial options are analysed in line with Annex II to Directive 2004/335/CE and the most suitable remedial measures are defined in a dedicated remediation plan, including monitoring requirements and plan.	
d. Any hazardous or non-hazardous waste extracted or produced by the remediation activity should be appropriately collected, transported, treated, recovered, or disposed by an authorised operator.	Any collected marine litter will be removed from the marine environment, and properly managed according to local laws and regulations, and in accordance with the end-of-life solutions identified by the SeaClear2.0 project.
e. Remediation methods do not	This is not applicable to marine litter.



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include reducing pollutant concentrations through dilution or watering down.	
f. Control, monitoring, or maintenance activities are carried out in the after-care phase for at least 10 years, unless a different duration sufficient to guarantee long-term risk control is defined in the national law or in the remediation and monitoring plan.	This would be an action for inclusion in the remediation plan and could include scans/use of the SeaClear2.0 system at regular intervals to maintain the status of the marine environment.
4. The remediation and monitoring plan is approved by the competent authority, following consultation with local stakeholders.	The competent authority could be the relevant public body, e.g., the Marine Departments of (local) government, public authorities, or port authorities.
Do no significant harm	
1. Climate Change: The activity does not involve the degradation of land with high carbon stock	The SeaClear2.0 system does not cause any harm to land or the seabed, as an assessment to determine whether marine litter can be safely removed will be implemented prior to collection.
2. Climate Change: The activity complies with the criteria set out in Appendix A to this Annex	This concerns an assessment of the vulnerability of the economic activity to certain physical climate risks. The SeaClear2.0 is not deemed to be particularly vulnerable to any of these risks, therefore a vulnerability assessment would not be required.
3. Sustainable use and protection of water and marine resources: The activity complies with the criteria set out in Appendix B to this Annex	The criteria are related to preserving water quality and avoiding water stress. SeaClear2.0 contributes to water quality improvement, and to the achievement of good environmental status of marine waters. It should be noted however, that the USV SeaCAT is equipped with a diesel generator, which consumes around 40 litres of diesel per day and produces 2.6 kg of CO ₂ per litre of consumed diesel (104 kg CO ₂ per day). This is the only source of direct emissions of the system.
4. Transition to a Circular Economy: at least 70% of non-hazardous construction, demolition or other waste materials generated during remediation are prepared for reuse, recycling or other material recovery, including backfilling.	Any collected marine litter will be removed from the marine environment and properly managed according to local laws and regulations, and in accordance with the end-of-life solutions identified by the SeaClear2.0 project.
5. Protection and restoration of biodiversity and ecosystems: The activity complies with the criteria in Appendix D to this	An Environmental Impact Assessment is not required for the types of services offered by SeaClear2.0, nonetheless the opinion of the



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Annex. It should be ensured that the activity does not harm Natura 2000 sites, the activity is not detrimental to protected species, and that the introduction of invasive species is prevented.	competent authority should be sought before each use of the service.
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In all likelihood, the system will not fall within those economic activities that must undertake an assessment, but the body offering the services will rather undertake such an assessment voluntarily. The initial indication is that the SeaClear2.0 service would be EU Taxonomy compliant.



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10. Conclusions, Recommendations and Next Steps

As is evident from the previous sections in this report, the European and international policy framework that can impact the issue of marine litter and help address it is comprehensive and evolving. This section summarises the key outcomes and conclusions from the above policy analysis and makes initial recommendations that should be taken into consideration when policies are updated and/or new policies are enacted.

10.1 Design and Prevention

- **Strengthen the focus on prevention:** More recent legislative documents, such as the Ecodesign Regulation, include a clear focus on waste prevention, which is a positive shift. Nonetheless, key policy documents, such as the Circular Economy Action Plan, were developed with the underlying assumption (and almost resignation) that plastic production will continue to grow in the coming decades. Unless ambitious and enforceable plastic production reduction targets are set, this trajectory will continue, undermining the transition to a truly circular economy. A more decisive policy shift toward prevention is thus necessary.
- **Mandate eco-design for plastics and polymers:** The Ecodesign Regulation currently excludes plastics and polymers in its first work programme, which minimises the potential contribution of the Regulation to the reduction of the marine litter and plastic pollution problem. Including plastics and polymers in the Regulation's first working plan will compel material and product manufacturers to identify upstream solutions and practices that address plastic and microplastic pollution, including from prioritised product groups such as textiles and tyres.
- **Accelerate the phase-out of harmful additives:** Tens of thousands of different chemicals are added to plastics as additives to improve their performance and durability, many of which can cause significant risks to human and environmental health. The European Commission's Safe and Sustainable by Design (SSbD) framework¹³⁶ could help reduce the use of chemicals of concern and thus minimise their impact on the environment and human health. The framework is currently implemented voluntarily, with the potential to gain momentum and become mandatory in the future, once the industry has had time to adapt and identify safer additive alternatives and processes. In the interim, we recommend incentivising innovation and faster uptake of the Safe and Sustainable by Design framework through labelling and certification programmes.
- **Expand bans on the destruction of unsold goods:** The Ecodesign Regulation bans the destruction of unsold textiles and footwear, in response to increasing concerns about the environmental impacts of the fashion industry. Such bans should be extended to include other priority products, including plastic-intensive product groups, such as unsold electronics. This will help reduce overproduction and promote design practices that support reuse and remanufacturing.
- **Close loopholes in the SUPD and expand its scope:** Although the Single-Use Plastics Directive (SUPD) aims to phase out certain plastic products, regulatory loopholes have allowed the emergence of unsustainable alternatives. For example, the availability of sturdier plastic straws marketed as "reusable" but essentially treated as single-use items, undermines the Directive's potential impact. Introducing clearer definitions, stricter monitoring, and mandatory eco-design criteria to ensure that alternatives truly contribute to waste reduction could help address such regulatory loopholes. Additionally, there is a lack of data on whether the SUPD has resulted in the uptake and inappropriate disposal of alternatives to single-use plastic items. A practical step would be to revise the J-Code List of the Marine Strategy Framework Directive Task Group 10 to include these items and provide quantitative evidence to support any future policy interventions.

¹³⁶ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32022H2510>



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Consideration should also be given to expanding the SUPD's restrictions to single-use items made of all types of materials, not just plastic. This might not be an effective or realistic solution for all single-use items, however, in certain cases, it could avoid the replacement of single-use plastics with other unsustainable single-use alternatives. A typical example of this is the replacement of plastic straws with paper alternatives, which are not fit for purpose and can often lead to multiple straws being required for one drink, casting serious doubts on the sustainability of this alternative in terms of resource consumption.

- **Mandate reporting and explore reduction targets for very lightweight plastic bags <15 microns):** There are discrepancies among Member States regarding the consumption of lightweight plastic carrier bags (<50 microns). While some Member States, especially those that took early action to minimise consumption and those that effectively banned them or mandated a heavy levy for their use, have drastically reduced their consumption, others are lagging far behind. Furthermore, available data demonstrate that the consumption of very lightweight plastic carrier bags (<15 microns) is high. While the benefits of using very lightweight bags for hygiene or food wastage minimisation are not to be disregarded, these are single-use plastic items and consideration should be given to whether reduction targets should be set for them as well (further to the restrictions set by the Packaging and Packaging Waste Regulation). As a minimum, reporting should become mandatory for both very lightweight plastic carrier bags and heavyweight plastic carrier bags to investigate whether the reduction targets and associated measures set for lightweight plastic carrier bags are causing a shift toward the consumption of these alternatives.
- **Support SMEs in adopting digital product passports:** Product digital passports are an important instrument that will help the EU meet its circularity ambition by ensuring that information about product manufacturing, recyclability and remanufacturing is available, transparent and interoperable. However, SMEs, which form the backbone of the EU's economy, often lack the resources to implement such systems effectively. It is therefore important to ensure that they are provided with training, technical assistance and financial support schemes to ensure equitable participation.

10.2 Waste Management

- **Support a levelled circular economy (CE) approach across Europe:** Disparities in recycling and waste management systems among Member States hinder the effective collection and recycling of high-quality plastics and thus the proper implementation of the circular economy. Tailored technical and financial support must be provided to help underperforming countries build capacity and implement more advanced circular economy practices.
- **Address difficult-to-recycle plastics:** The issue of difficult-to-recycle plastics and composite packaging should be urgently addressed. While all plastics could in theory be recyclable, the relatively small volumes of different combinations and composites of plastics make their recycling practically difficult, if not impossible. The new Packaging and Packaging Waste Regulation sets a target for packaging to be both recyclable and effectively recycled at scale by 2035, which could help alleviate this issue. Chemical recycling is a promising solution for addressing difficult-to-recycle plastics. Further investment in chemical recycling technologies is recommended, as they offer a promising route for managing these materials, despite current cost barriers.
- **Incentivise investment in recycling infrastructure:** Investments in Europe's recycling infrastructure have decreased in recent years, causing both uncertainty in the market and a shortage of locally sourced high-quality recyclates for the circular economy. Investments in recycling infrastructure in Europe will support the development and effective implementation of the circular economy.



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- **Curb cigarette butt pollution:** The Single Use Plastics Directive requires Member States to implement Extended Producer Responsibility schemes to collect cigarette butts, however allows each Member State to determine how these schemes will be implemented. While this is a positive initiative and a step forward in addressing cigarette butt pollution, additional, supporting actions should be implemented to more holistically address the issue. Banning of smoking in densely used public spaces, such as parks and beaches, is a potential solution to addressing cigarette butt pollution. Designated smoking areas could be determined, with available receptacles/ashtrays. Positive results have been observed in areas where this has been implemented.¹³⁷ Much like other single-use plastic items, reduction targets could be set for cigarette butt/filter waste containing plastics. However, care should be taken to ensure that such targets do not inadvertently result in the replacement of conventional cigarettes with other potentially equally or more harmful products. Instead, these waste reduction targets could be associated with the mandatory awareness-raising campaigns that can go one step beyond inappropriate disposal to promoting healthy habits by encouraging people to quit smoking. Finally, Extended Producer Responsibility could be extended to other tobacco-related products such as e-cigarettes and vapes, which are becoming increasingly more frequent during beach litter surveys.
- **Optimise the management of ship-generated waste:** Evidence shows that waste reception and handling plans developed by European Union ports do not reflect the application of the waste management hierarchy generally and waste prevention specifically. Furthermore, there are often inconsistencies and incompatibilities in the way that waste is collected on board vessels and how waste is collected and managed at ports, which can result in suboptimal waste sorting and thus the reduced quality of potential recyclates. Furthermore, often ports fail to consider and implement practices that facilitate circularity.¹³⁸ Port authorities should be supported and incentivised to incorporate more circular approaches in their operations and ensure that waste collected at ports is managed in accordance with the requirements of the waste hierarchy. Importantly, the fees imposed by ports for the receipt of waste vary between Member States and even between ports. This could result in vessels selecting where to dispose of their waste based on cost, rather than on the quality of the waste management operations at ports. While mandating a uniform fee would be practically impossible, a combination of a waste management optimisation rating system for port reception facilities and incentives to vessels to use high-ranking systems, could help address this issue. Importantly, the European Union should use its role as a Party to the Regional Sea Conventions to ensure that any such actions taken at EU level are replicated at regional level.

10.3 Marine Litter

- **Improve data collection, sharing and interoperability:** Data on marine litter distribution, composition, and movement patterns is still fragmented across Member States. Furthermore, challenges related to data standardisation, interoperability, and accessibility hinder effective knowledge sharing. Standardised data collection and sharing mechanisms at the EU level would significantly enhance efforts to tackle marine pollution. Open-access, harmonised databases on marine litter should be supported, and guidelines for data-sharing protocols should be provided. Further effort and emphasis should also be placed on the collection of seabed marine litter data

¹³⁷ Ariza & Leatherman (2012). *Journal of Coastal Research*, 28 (1A): 143–147.

<https://doi.org/10.2112/JCOASTRES-D-10-00137.1>

¹³⁸ Loizidou et al. (2024). Optimizing waste management for green shipping: industry commitment through participatory processes in Cyprus. *J. shipp. trd.* 9, 10. <https://doi.org/10.1186/s41072-024-00168-x>



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and its sharing with the scientific community, policy makers and the public to raise awareness and incentivise action.

- **Mandate seabed litter monitoring and removal:** Currently, there is no consistent obligation across Member States for any specific entity – whether port authorities, maritime agencies, or tourism and environmental ministries – to allocate resources for systematic seafloor litter removal. Without clear regulations and dedicated funding mechanisms, the large-scale deployment of solutions for marine litter remediation will remain limited. We therefore recommend that (i) responsibilities for funding and implementing regular seafloor cleanup efforts are defined, (ii) dedicated financial mechanisms to support seabed cleanups are established, and (iii) seabed litter monitoring and removal is integrated into existing marine environmental policies, such as for example the Marine Strategy Framework Directive, to ensure that seabed marine litter is treated with the same urgency as other marine protection and restoration measures. These actions would help meet objective 1(d) of Mission Ocean: “Contribute to relevant upcoming marine nature restoration targets including degraded seabed habitats and coastal ecosystems.”
- **Tackle abandoned, lost or discarded fishing gear (ALDFG):** The fishing community, particularly artisanal fishers in the Mediterranean, is faced with declining fishing stocks that severely impact their livelihoods. This problem is exacerbated by climate change, increased pressures by invasive species and marine pollution. Fishers bear daily witness to the devastating impacts of marine plastic pollution, including abandoned, lost or otherwise discarded fishing gear (ALDFG), on their catch and their boats. Unfortunately, current waste management practices often do not support the appropriate disposal of fishing gear once it has reached its end of life. Appropriate disposal facilities are not always available at ports or fishing shelters. As such, fishers are often required to transport their waste fishing gear long distances and are sometimes required to pay for its disposal. Furthermore, even where fishing gear is collected, the options that are used to manage them are not always in line with the principles of the waste hierarchy, let alone those of the circular economy. The provision of the Single-Use Plastics Directive for the creation of fishing gear collection and management systems through the principle of Extended User Responsibility should help address this problem. However, actions must be taken urgently. Undoubtedly, at least some fishing gear will always be lost in the environment. Development and implementation of technologies and mechanisms for locating and safely and timely retrieving this gear should be supported by policy. Further research is also necessary for the development of alternative fishing materials that will have proven, reduced impacts if they are lost in the environment. Importantly, the use of these materials and resulting products should not disproportionately burden fishers, either through increased purchase or management costs, or by reducing their catch.

10.4 Technological Innovation

- **Harmonise cross-border regulation of autonomous marine technologies:** The deployment of autonomous marine technologies, such as those developed by SeaClear2.0, can be hindered by inconsistent regulatory frameworks across Member States. Diverging rules on waterborne autonomous vehicle operations, drone usage, and licensing create obstacles to scaling up innovative solutions. We recommend that maritime regulations, particularly regarding deploying autonomous robotic systems for environmental monitoring and clean-up activities, should be harmonised. A unified regulatory framework would facilitate innovation, cross-border collaboration, and the widespread adoption of new technologies in ocean protection.
- **Enable small and medium enterprises (SMEs) and start-ups to scale innovative marine solutions:** The transition to sustainable ocean management requires not only technological innovation but also effective pathways for commercialising and scaling solutions. Dedicated funding mechanisms should be established for SMEs and startups developing ocean-protection technologies, ensuring



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that promising innovations can move beyond the pilot stage. Key recommendations include the earmarking of funding for ocean technology scale-up, simplifying regulatory pathways for testing and deploying new marine innovations, and facilitating market entry and widespread adoption of solutions through public-private partnerships. Supporting SMEs in this way will enhance Europe's leadership in marine environmental technologies while driving economic growth in the blue economy.

10.5 Next Steps

As part of the policy work implemented within the SeaClear2.0 project, participatory workshops will be implemented in 11 cities around Europe and the Mediterranean where the project's pilots and demonstrations will take place and where the SeaClear2.0 Associated Region projects are being implemented: Hamburg (DE), Marseille (FR), Limassol (CY), Venice (IT), Dubrovnik (HR), Tarragona (ES), Kristiansund (NO), Kungshamn (SE), Skyros (GR), Samandag (TR), and Poti (GE). These workshops will convene stakeholders from local government, industry, academia, and civil society to identify marine litter challenges specific to each context and co-develop actionable, locally grounded solutions.

The workshops will follow a structured methodology that facilitates open dialogue and collective intelligence, ensuring that policy recommendations are not only technically sound but also socially accepted and feasible. The co-development approach will ensure that the resulting recommendations reflect the practical realities, regulatory needs, and innovation potential at the local level while maintaining alignment with broader European Union policy goals.

The outputs from the workshops will be synthesised and analysed to identify additional recommendations for policy improvement or development at the local and/or European level, which will be integrated into those presented in this report. To ensure strategic impact, the resulting recommendations will be validated through an international policy roundtable in the final year of the project. This roundtable will bring together high-level policymakers, regulators, researchers, and civil society organisations to refine and endorse the proposals.

The final policy output will be a Policy White Paper, to be published by the end of SeaClear2.0 (December 2026), that reflects the co-created recommendations and positions them within key emerging policy processes. In particular, the recommendations will seek to inform the development and implementation of the European Ocean Pact, a forthcoming umbrella framework for EU ocean policy, where the SeaClear2.0 consortium has already provided input during the call for evidence phase.

In parallel, the project will seek to contribute to ongoing global policy developments, including negotiations under the United Nations Plastics Treaty, by sharing findings and recommendations related to marine litter monitoring, remediation technologies, and regulatory harmonisation for autonomous systems. By engaging with both European and international frameworks, SeaClear2.0 aims to ensure that its innovations and insights will shape the next generation of marine protection policies at all levels.

