

1 **The need to align European Commission Directives**
2 **to properly address Riverine-Marine Litter:**
3 **A Contribution to EU Mission “Restore our Ocean and Waters”**
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26 **Abstract:** The European Mission "Restore our Ocean and Waters" is focused on researching,
27 innovating, and investing to address this issue, with a specific emphasis on reducing plastic
28 pollution. Marine litter (ML) negatively affects both ecosystems and human health and has
29 become a top priority on national and international agendas. Currently, EU policies on litter
30 pollution in coastal and marine environments do not properly consider the role of rivers and
31 transitional waters in transporting litter items from land to the sea. This gap has led to an
32 insufficient understanding and regulation of litter, especially plastic items, in rivers and
33 reservoirs, compared to ML. As a result, awareness and action are lacking in areas where they
34 are most needed: near pollution sources. The present policy brief recommends including
35 riverine litter in the Water Framework Directive (WFD) for comprehensive implementation of
36 the assessment of the water quality in freshwater and transitional environments and effective
37 strategies. Aligning policies for inland and marine waters and adopting standardized monitoring
38 methods are crucial. Six recommendations are proposed, aiming to enhance policy
39 interventions, promote sustainable technologies, and engage stakeholders to tackle litter
40 pollution across all aquatic environments.

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42 **Keywords:** Riverine-Marine Litter; Water Framework Directive; Plastic Pollution; One Health;
43 Multidisciplinary Recommendations

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52 **1. Introduction/Background**

53 Anthropogenic pollution has become a serious threat to ecosystems and
54 human health, being a topic of global concern that is widely studied. The world's oceans and
55 estuaries are the last places where a vast range of substances generated by anthropogenic
56 activities, either deliberately or accidentally, end up. This pollution has deleterious effects, such
57 as endangering human health, harming living resources and ecosystems, and impairing or
58 interfering with amenities and other legitimate uses of the environment (Derraik et al., 2022;
59 Iglesias et al., 2023). This is a severe problem that needs to be urgently addressed in a global
60 joint effort to implement effective strategies based on policies and regulations targeting priority
61 sources of pollution, the transition to renewable energy sources, and an effective shift to a
62 circular economy (Landrigan et al., 2020).

63 The European Mission "Restore our Ocean and Waters" aims to protect and restore the ocean
64 and waters through research and innovation, citizen engagement, and blue investments,
65 inspiring new and concrete solutions to a diverse array of threats to the aquatic environment.
66 This ambitious approach addresses ocean and inland waters as one unity, opening new
67 opportunities to face challenges from sources to the sea (European Commission, 2022).

68 One of those challenges is to reduce the plastic pollution in the aquatic environment, which
69 represents the predominant material within riverine and/or marine litter worldwide. The impact
70 of litter on the loss of biodiversity and the decrease of ecosystem functions and services,
71 affecting both ecosystems/human health has been widely acknowledged (Derraik et al., 2022).

72 This induces multifaceted threats to ecosystems, including physical harm to aquatic wildlife,
73 through entanglement or ingestion, habitat destruction, spread of invasive species, introduction
74 of adsorbed toxic chemicals into the food webs, and the ocean's reduced capability to absorb
75 carbon (Trouwborst, 2011, Shen et al., 2020, Lincoln et al., 2022). Among the aesthetical effects,
76 marine litter reduces water quality. It is important to consider that marine litter, especially
77 plastics, can adsorb different organic and inorganic pollutants, introducing toxic chemicals into

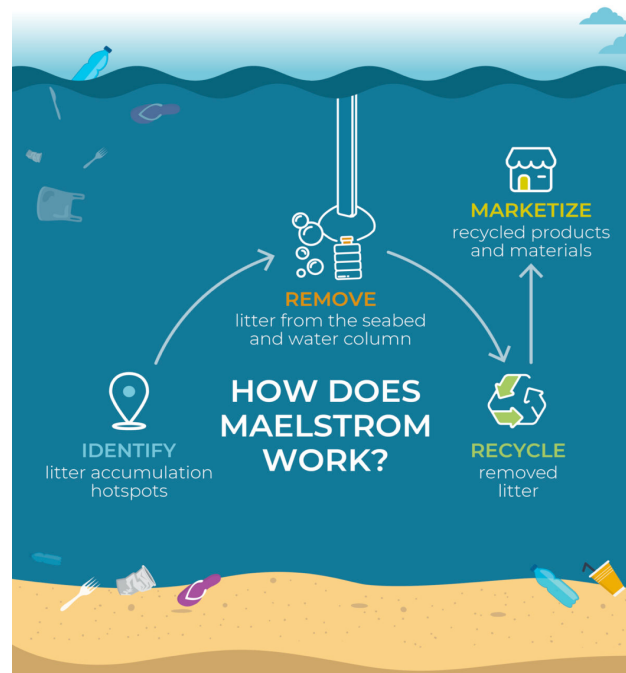
78 the marine food webs (Alberghini et al., 2023; Trouwborst, 2011). The impacts on the
79 ecosystems results in economic losses for the fishing and aquaculture sectors, as well as the
80 shipping industry and tourism sectors (McIlgorm et al., 2022, Iglesias et al., 2023). Moreover,
81 although coastal communities are the ones most immediately impacted, the spiral of
82 consequences reaches far beyond.

83 The environmental issue of marine litter has become a priority of national and international
84 agendas (González-Fernández et al., 2021). This issue is already been acknowledged and
85 addressed by many EU Directives, such as the EU Integrated Maritime Policy (European
86 Commission, 2007) the Marine Strategy Framework Directive (MSFD, Directive 2008/56/EC3),
87 the European Biodiversity Strategy for 2030 (European Commission, 2020) as well as the
88 Directive on the reduction of the impact of certain plastic products on the environment
89 (Directive 2019/9045). The MSFD includes the descriptor 10 on Marine Litter (Beach Litter,
90 Floating Litter, Seafloor Litter, and Litter in Biota and Microlitter) in the assessment of Good
91 Environmental Status for European marine waters. More recently, in the framework of the
92 European Green Deal actions, the EU Action Plan Towards Zero Pollution for Air, Water, and Soil
93 has set two targets for 2030 related to plastic pollution: i) reducing by, at least, 50 % plastic litter
94 at sea; and ii) reducing by, at least, 30 % microplastics released into the environment. On the
95 other hand, the Environmental Quality Standards of the EU Water Framework Directive (WFD)
96 do not include litter as a pollutant. Litter is currently not even being included in the upcoming
97 Directive's "Watch List" since it's absent from the European Commission's Joint Research Centre
98 (JRC) report (Gomez Cortes et al., 2022), written after the last revision.

99 The present policy brief presents different arguments to support the inclusion of riverine-marine
100 litter in the WFD metrics for the implementation of the assessment of the water quality in
101 freshwater and transitional environments. This brief was developed under the scope of the
102 European co-funded project MAELSTROM project (Smart Technology for MARinE Litter
103 SusTainable RemOval and Management, H2020 Ref: GA_101000832; [4](https://www.maelstrom-</p></div><div data-bbox=)

104 h2020.eu/). This project aims to implement innovative multi-level solutions for the sustainable
105 removal and recycling of marine litter in coastal environments, supporting the global efforts
106 being done to address the marine litter issue (Fig. 1.). It resonates with the objectives set forth
107 by the United Nations Decade of Ocean Science for Sustainable Development, the EU Mission
108 Restore Our Oceans and Waters, and the United Nations Sustainable Development Goals,
109 particularly with the Goal number 14: Life Below Water. MAELSTROM is a project that integrates
110 the EU Mission “Restore our Ocean and Waters”. Extensive environmental assessments have
111 been made in two pilot regions: the Venice Lagoon in the coastal area of Italy and the Ave
112 estuary in Portugal. In both locations, the amount of plastic litter found exceeded considerably
113 the estimation made by recent research, indicating a sharp increase in the presence of litter
114 items in European waters in the last few years. In both pilot areas, it is demonstrated that the
115 lack of data and the absence of an obligation to keep the water clean from litter lead to a lack
116 of action.

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126 **Figure 1.** MAELSTROM main pillars, identifying, removing, sorting and transforming all types of
127 collected marine litter into valuable raw materials (<https://www.maelstrom-h2020.eu/>).

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129 We believe that it is necessary to include riverine litter in the metric to evaluate environmental
130 quality standards within the WFD. This will provide both acknowledgment and ownership of the
131 issue of litter pollution in our waterways and oceans, therefore accelerating the implementation
132 of efficient mitigation strategies including the most up-to-date innovative technologies to
133 reduce pollution.

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136 **2. Identified Issue**

137 There is a strong policy framework in the EU for the state of litter pollution in coastal and marine
138 environments, but no one of them addresses the role of rivers and transitional water bodies in
139 transporting litter items from land to the sea. Therefore, the presence of litter, in particular
140 plastic items, in rivers and reservoirs is understudied and under-regulated compared to marine
141 litter, leading to a lack of awareness and action where those would be mostly needed: close to
142 the sources.

143 The bulk of marine litter is land-based and it is estimated that every year over 600 million floating
144 litter items, corresponding to almost 3,400 tonnes of litter, enter the sea through European
145 rivers (González-Fernández et al., 2021; Kideys et al., 2021; Veiga et al., 2022).

146 Currently, the presence of floating and submerged litter (including plastic) is not addressed as a
147 water quality indicator under the WFD. Indeed, its inclusion in the “Watch List” is not being
148 considered, even for future revisions, since it’s absent from JRC report 6 which supported the
149 proposal for revisions submitted to the European Commission in October last year. However,
150 the proposal of inclusion of microplastics as well as Bisphenol A (BPA) (a chemical produced in
151 large quantities to be used primarily in the production of polycarbonate plastics and epoxy
152 resins) in the WFD is not enough to address the problem. The presence of riverine litter should
153 be included in the WFD to ensure high standards in the evaluation of environmental water
154 quality. Our experience in the field has shown that the general bibliography on the topic does

155 not reflecting the accurate magnitude of the problem, and we strongly encourage following up
156 closely on the evolution of this problem.

157 By including microplastics and not bigger plastic items, the WFD is, in practice, neglecting that
158 these bigger items are the major source of micro and nanoplastics in aquatic environments. If
159 plastic pollution is to be properly addressed and reduced, policies for inland and coastal/marine
160 waters should ideally be aligned. Therefore, from the perspective of coherence alone, it would
161 already be justifiable to include plastic litter in the “Watch List” of the WFD.

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164 **3. Recommendations / Action Plan**

165 Effective policy interventions are essential to mitigate ML impacts and safeguard both
166 ecosystems and human health environments. This policy brief outlines the following key
167 recommendations to address previously identified issues:

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169 **3.1. Policy Recommendation**

170 1. The WFD acknowledges the role that research projects can play in the discussion on the
171 review of the “Watch List”. In this sense, we strongly encourage a dedicated invitation
172 for all EU-funded water-related projects for this debate.

173 2. We support the immediate launch of discussions around the inclusion of litter in the
174 Watch List from the WFD, to have it included in the next review, in 2024/2025.

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176 **3.2. Specific Recommendations**

177 1. We call for a closer alignment between the WFD and the MSFD, by reinforcing common
178 policies and methodologies for litter monitoring in all aquatic environments (inland and
179 coastal).

- 180 2. We reinforce the need for EU-harmonised and standardised methodologies for inland
181 and transitional water bodies for riverine and reservoir litter monitoring, which will set
182 the basis for identifying thresholds on the riverine-estuarine litter abundancies for the
183 different environments.
- 184 3. We call for the establishment of supporting tools for local governments and authorities
185 willing to implement sustainable technologies to retain and remove riverine/estuarine
186 litter, preventing it from reaching the sea.
- 187 4. We suggest a coordinated joint work to promote public awareness and key-
188 multisectoral stakeholder engagement to fight litter pollution in rivers, transitional
189 environments and sea, independent from regulation's enforcement.

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191 Addressing the challenge of marine litter requires a concerted effort from policymakers,
192 stakeholders, and communities worldwide. The policy recommendations outlined in this brief
193 present a holistic approach to addressing the pressing issue of marine litter. By advocating for
194 the inclusion of litter in the WFD's "Watch List" and promoting closer alignment between EU
195 directives, we can enhance litter monitoring and management efforts across all aquatic
196 environments. Standardised methodologies and supporting tools for local governments will
197 facilitate the implementation of sustainable technologies to mitigate riverine and estuarine litter
198 pollution. Additionally, fostering public awareness and stakeholder engagement is crucial for
199 achieving lasting change beyond regulatory enforcement. These recommendations pave the
200 way for effective policy interventions that will safeguard ecosystems and human health from
201 the detrimental impacts of marine litter.

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203 **List of abbreviations**

204 EU - European Union

205 EC - European Commission

206 ML - Marine Litter

207 WFD - Water Framework Directive

208 MSFD - Marine Strategy Framework Directive

209 JRC - Joint Research Centre

210 BPA - Bisphenol A

211 MAELSTROM - Smart Technology for MARinE Litter SusTainable RemOval and Management

212 GA - Grant Agreement

213 H2020 - Horizon 2020 (EU Framework Programme for Research and Innovation)

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215 **Declarations**

216 Not applicable

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218 **Ethics approval and consent to participate**

219 Not applicable

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227 **Competing interests**

228 The authors declare no competing interests.

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