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SOS-ZEROPOL2030

POLICY BRIEF

Towards Zero Pollution in European Seas A Roadmap for Action from Source to Sea

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Table of Contents

HIGHLIGHTS	1
Executive Summary.....	2
1. Europe's Zero Pollution Challenge.....	3
2. A Source-to-Sea Framework for Action	4
3. Towards Zero Pollution in European Seas.....	5
3.1 What Success Looks Like	5
3.2 Top Ten SOS-ZEROPOL2030 Actions	5
3.3 A stakeholder-centred implementation journey from ambition to action	5
4. Nutrients: Towards Sustainable Nutrient Stewardship	7
5. Hazardous Substances: Transitioning Towards Safe and Sustainable-by-Design	8
6. Microplastics: Preventing Emissions at Source.....	9
7. Underwater Noise: Managing an Invisible Pressure.....	10
8. Cross-Cutting Actions Across All Pollutants	11
9. Alignment with the European Ocean Pact	12
Call to Action	13
References	14
Annexes.....	15

HIGHLIGHTS

- Source-to-sea governance
- Four pollutant roadmaps
- Top 10 policy actions
- European Ocean Pact alignment
- 2030–2050 implementation pathway

POLLUTANT AREAS



NUTRIENTS



HAZARDOUS SUBSTANCES



MICROPLASTICS



UNDERWATER NOISE

Executive Summary

Europe's Zero Pollution ambition requires coordinated action across the entire source-to-sea continuum, recognising that pollution generated on land ultimately affects freshwater, coastal and marine ecosystems. Despite significant policy progress, achieving zero pollution by 2050 will require stronger prevention measures, harmonised monitoring, improved governance and closer collaboration between policymakers, industry, researchers and civil society.

Drawing on the scientific evidence and stakeholder engagement undertaken within the SOS-ZEROPOL2030 project, this policy brief presents practical recommendations to reduce pollution from nutrients, hazardous substances, microplastics and underwater noise. The recommendations are based on the project's Strategic Zero Pollution Framework and stakeholder-informed roadmap, which evaluated actions according to their expected environmental impact, implementation costs, policy maturity and technology readiness.

Across all pollutant groups, prevention offers the greatest environmental, economic and societal benefits and should therefore be prioritised over remediation wherever possible. Common priorities include harmonised monitoring and assessment methods, FAIR data management, integrated source-to-sea governance, innovation in pollution prevention technologies and strengthened stakeholder cooperation.

The recommendations presented here provide practical guidance for supporting implementation of the European Green Deal, the Zero Pollution Action Plan, the Marine Strategy Framework Directive, the Water Framework Directive and the European Ocean Pact, while helping accelerate Europe's transition towards a cleaner, healthier and more resilient environment.

1. Europe's Zero Pollution Challenge

European seas remain under pressure from multiple interacting pollutants. Nutrient enrichment contributes to eutrophication, harmful algal blooms and oxygen depletion. Hazardous substances continue to accumulate in environmental matrices and biota. Microplastics are now detected throughout marine ecosystems and food webs. Underwater noise is increasingly recognised as a pressure affecting marine species and ecosystem functioning.

Although substantial legislative frameworks already exist, implementation remains fragmented. Monitoring systems are often disconnected, governance structures are divided between freshwater and marine authorities, and stakeholders frequently operate within sector-specific silos. SOS-ZEROPOL2030 demonstrates that future progress depends less on identifying new environmental objectives and more on implementing existing ambitions through coordinated action.

2. A Source-to-Sea Framework for Action

The source-to-sea governance concept is the foundation of SOS-ZEROPOL2030. Pollution does not respect administrative boundaries. Nutrients, chemicals and plastics released on land can travel through rivers, groundwater, wastewater systems and atmospheric pathways before reaching coastal and marine environments. Effective management therefore requires interventions across the entire source-to-sea continuum.

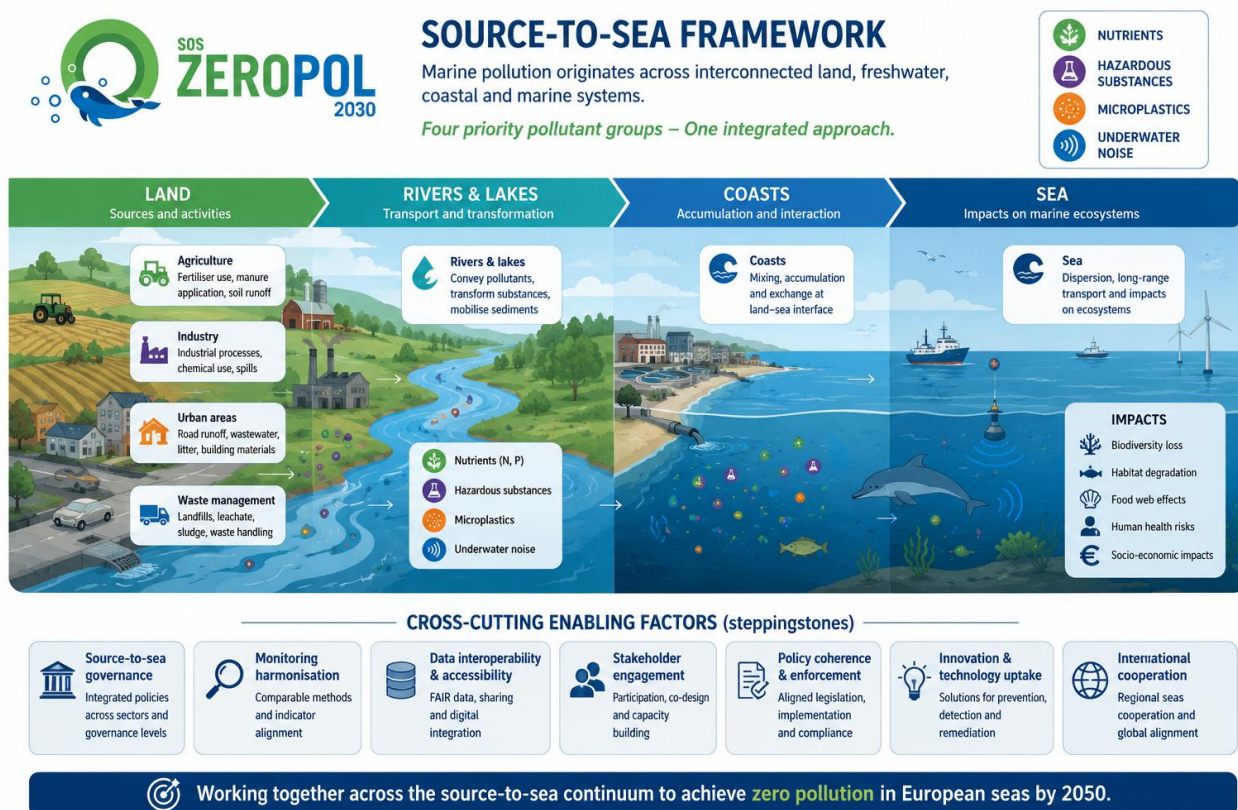


FIGURE 1 – SOS-ZEROPOL2030 Source-to-Sea Framework

SOS-ZEROPOL2030 recommends that source-to-sea governance be adopted as the central principle for future implementation of the European Green Deal, Water Framework Directive, Marine Strategy Framework Directive, European Ocean Pact and related environmental policies.

3. Towards Zero Pollution in European Seas

Delivering zero pollution across European seas will require coordinated action at all levels of governance, supported by science, innovation and stakeholder collaboration. SOS-ZEROPOL2030 identifies a clear implementation pathway that combines ambitious yet achievable milestones with targeted policy actions and practical decision-support tools. This section outlines what success looks like by 2030, 2035 and 2050, highlights the ten priority actions with the greatest potential to accelerate progress, and introduces the stakeholder-centred roadmap developed to support implementation.

3.1 What Success Looks Like

By **2030**, governance mechanisms, monitoring systems and implementation frameworks should be operational. By **2035**, proven solutions should be scaled up and integrated across sectors. By **2040–2050**, Europe should achieve substantial reductions in nutrient losses, hazardous substance emissions, microplastic releases and underwater noise, supported by fully integrated source-to-sea governance.

Success will be reflected in cleaner waters, healthier ecosystems, improved biodiversity, reduced risks to human health, greater resource efficiency and stronger coherence across European environmental policies.

3.2 Top Ten SOS-ZEROPOL2030 Actions

The following actions represent the highest-priority leverage points for delivering measurable reductions in pollution across all four priority pollutant areas.

1. Mainstream source-to-sea governance across environmental policies.
2. Establish integrated river-marine monitoring systems.
3. Harmonise reporting standards and environmental indicators.
4. Create FAIR environmental data platforms.
5. Reform CAP incentives to reward nutrient performance.
6. Accelerate Safe and Sustainable-by-Design principles in the development of chemicals, materials and products.
7. Phase out non-essential PFAS uses and support safer alternatives.
8. Reduce diffuse microplastic emissions at source.
9. Adopt harmonised underwater noise standards.
10. Develop EU-wide pollution dashboards and tracking systems.

3.3 A stakeholder-centred implementation journey from ambition to action

The SOS-ZEROPOL2030 Roadmap is an interactive knowledge and planning tool that translates the EU's Zero Pollution ambition into practical actions across the source-to-sea continuum. Developed through extensive stakeholder engagement, it helps policymakers, industry, researchers, service providers and civil society identify their roles in delivering zero pollution.

Rather than serving solely as a planning document, the roadmap provides a practical framework for implementation by linking strategic objectives with concrete actions,

responsible stakeholders, implementation timelines and expected outcomes. Users can explore actions by pollutant category, stakeholder group, implementation scale, policy maturity and technology readiness.

Implementation is organised around three successive phases:

- **2030 – Enable Change:** Establish the policies, governance arrangements, monitoring systems and enabling conditions needed for implementation.
- **2035 – Scale Solutions:** Accelerate the deployment of proven technologies, strengthen collaboration and mainstream successful approaches.
- **2040–2050 – Transform Systems:** Achieve long-term structural change through fully integrated source-to-sea governance and pollution prevention.

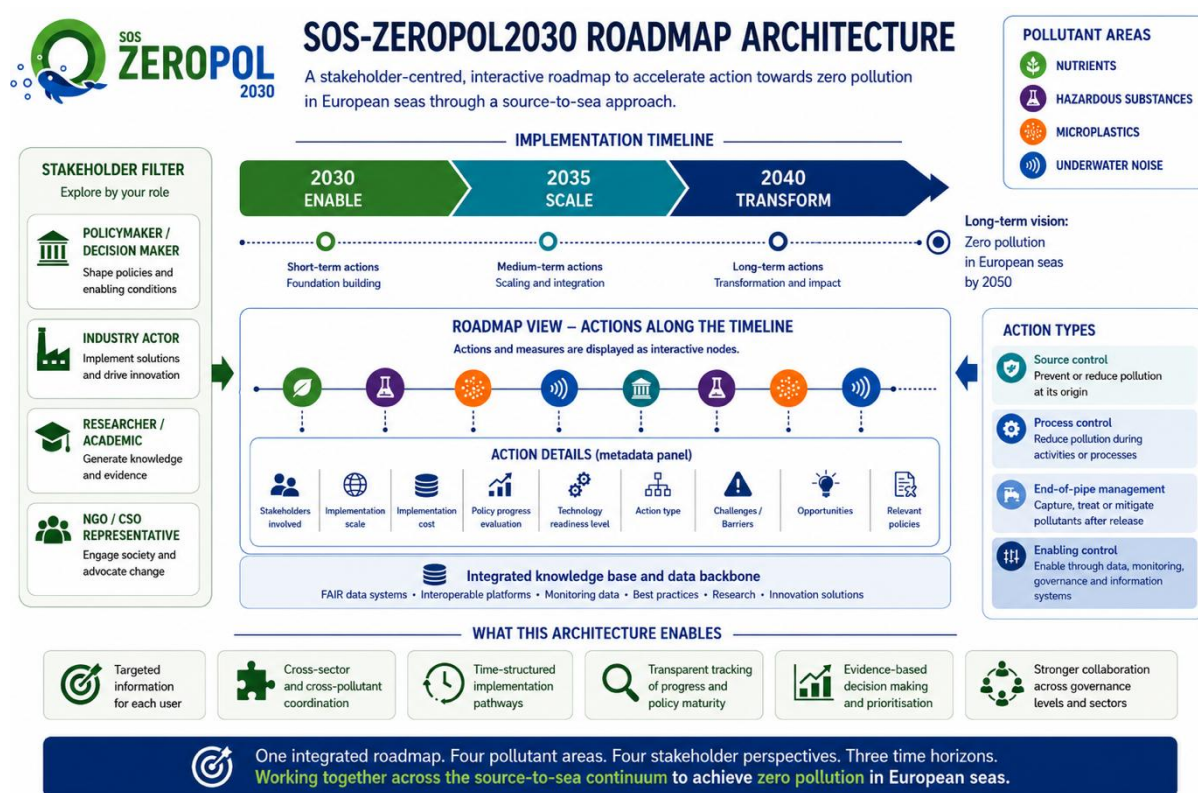


FIGURE 2 – Roadmap Architecture and Timeline

Each recommended action includes information on implementation costs, barriers, opportunities, policy alignment and anticipated environmental, societal and economic benefits, enabling decision-makers to prioritise actions according to their local context and available resources.

Interactive Roadmap: <https://soszeropol2030.eu/roadmap/>

4. Nutrients: Towards Sustainable Nutrient Stewardship

The nutrients roadmap focuses on reducing nutrient losses while supporting resilient agricultural production systems. Key targets include reducing nitrogen losses by 50%, reducing phosphorus losses by 30%, minimising ammonia emissions from livestock systems and improving nutrient recycling.

Priority actions include precision fertilization, nutrient-efficient crops, improved slurry storage, phosphorus-based soil testing, cover crops, buffer strips and low-emission manure spreading. The roadmap also promotes nature-based solutions including constructed wetlands, riparian restoration and catchment-scale nutrient management.

A particularly innovative recommendation is the development of a mandatory EU-wide nutrient footprint labelling system. The roadmap proposes a standardised lifecycle assessment methodology that would support an A-to-G Nutrient Efficiency Label for major food products. This would empower consumers while creating market incentives for nutrient-efficient production systems.

The roadmap also recommends reforming the Common Agricultural Policy so that at least 60% of direct payments are linked to verifiable environmental performance, including nutrient management requirements. Stronger alignment between CAP Strategic Plans, EU Water Resilience Strategy, the Water Framework Directive and the Marine Strategy Framework Directive is identified as essential for achieving source-to-sea nutrient reductions.

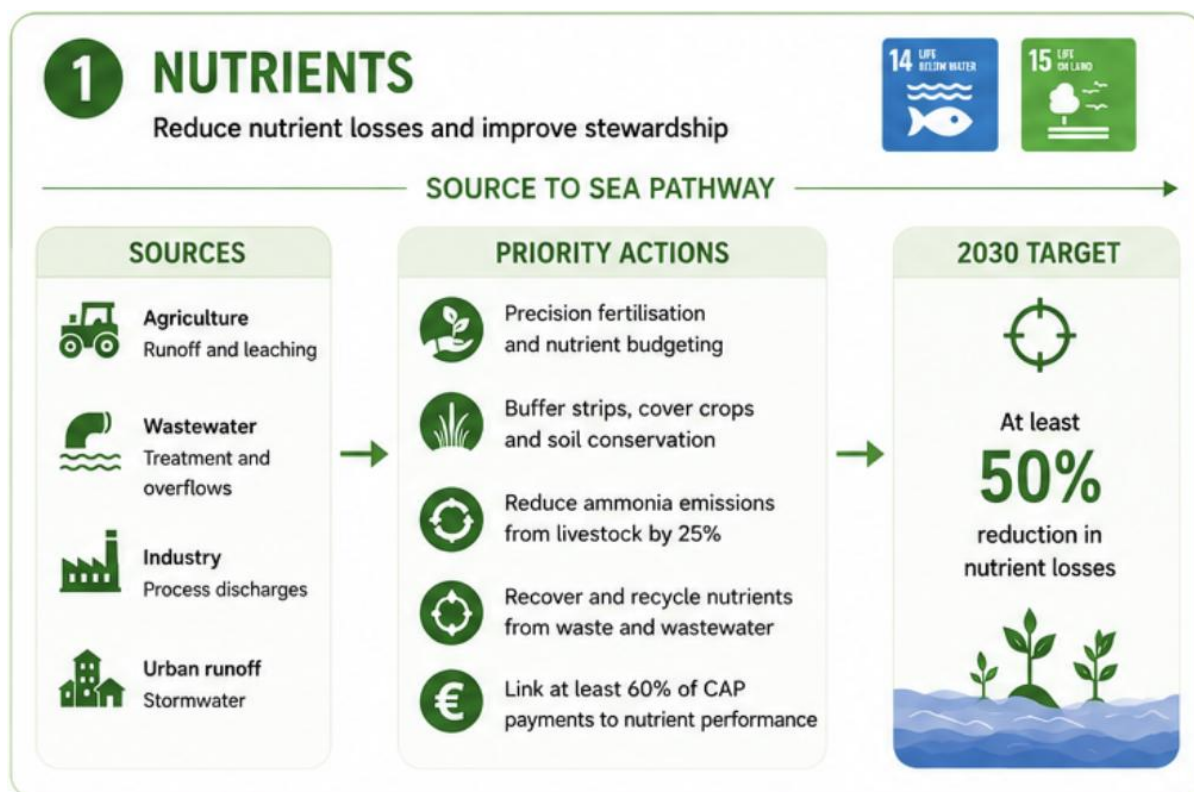


FIGURE 3 –Nutrients: Sources, Priority Actions and Targets

5. Hazardous Substances: Transitioning Towards Safe and Sustainable-by-Design

The hazardous substances roadmap emphasises prevention, transparency and substitution. The roadmap recognises that monitoring and management of chemicals remains fragmented across sectors and environmental compartments. Priority actions include harmonising riverine and marine monitoring programmes, developing interoperable reporting standards and establishing FAIR environmental data platforms. Regular coordination between freshwater and marine monitoring authorities is identified as a key enabling action.

The roadmap strongly supports implementation of Safe and Sustainable-by-Design (SSbD) principles throughout chemical value chains. Recommended actions include secure information-sharing platforms, procurement incentives, clear implementation guidance and stronger support for safer alternatives.

PFAS receive particular attention. The roadmap supports phasing out non-essential uses, developing clear essential-use criteria, accelerating substitution and requiring companies benefitting from derogations to invest in developing alternatives. Significant investment is also recommended for advanced wastewater treatment technologies capable of concentrating and removing PFAS and other persistent contaminants. Public awareness is another major theme. The roadmap proposes development of environmental dashboards, composite indicators and accessible communication tools that allow citizens to understand chemical pollution risks and progress towards policy targets.



FIGURE 4 –Hazardous Substances: Sources, Priority Actions and Targets

6. Microplastics: Preventing Emissions at Source

The microplastics roadmap adopts a prevention-first philosophy. While end-of-pipe solutions remain important, the roadmap concludes that the greatest environmental benefits will come from preventing emissions before they enter the environment.

Priority sources include tyre wear particles, textile fibres, plastic pellets and paint-derived particles. Recommended measures include product redesign, containment requirements, sustainable materials, improved handling procedures and stronger monitoring systems.

The roadmap aligns closely with the EU objective of reducing microplastic releases by 30%. Tyre wear is highlighted as a priority source requiring action through road runoff treatment, low-abrasion surfaces, eco-design requirements and mobility system innovation. Textile-related actions include low-shedding fabrics and filtration systems. Pellet loss prevention measures include traceability systems, mandatory handling procedures and spill reporting mechanisms.

The roadmap also recognises the growing importance of paint-derived particles from infrastructure, maritime coatings and construction materials. Investment in more durable coatings, alternative materials and technologies for the safe removal and recovery of ageing coatings is recommended as part of a long-term prevention strategy to reduce emissions while supporting circular material management.



FIGURE 5 –Microplastics: Sources, Priority Actions and Targets

7. Underwater Noise: Managing an Invisible Pressure

The underwater noise roadmap provides one of the most comprehensive implementation frameworks currently available for Descriptor 11 of the Marine Strategy Framework Directive.

The roadmap aims to reduce shipping-related underwater noise through a combination of operational and technological measures. Priority actions include speed reduction schemes, quieter vessel design, the deployment of electric and hybrid propulsion systems where appropriate, noise performance standards, harmonised monitoring systems, and the integration of underwater noise into marine spatial planning.

Adoption of ISO 23990, ISO 7605 and ISO 17208-3 is strongly recommended. The roadmap also proposes development of a harmonised European Underwater Noise Index capable of supporting port incentives, environmental certification and public reporting.

Protection of low-noise refugia, improved sound mapping and stronger consideration of cumulative effects are identified as priorities for future implementation. By 2050, the roadmap aims to achieve significant reductions in shipping-related underwater radiated noise while supporting sustainable maritime transport.

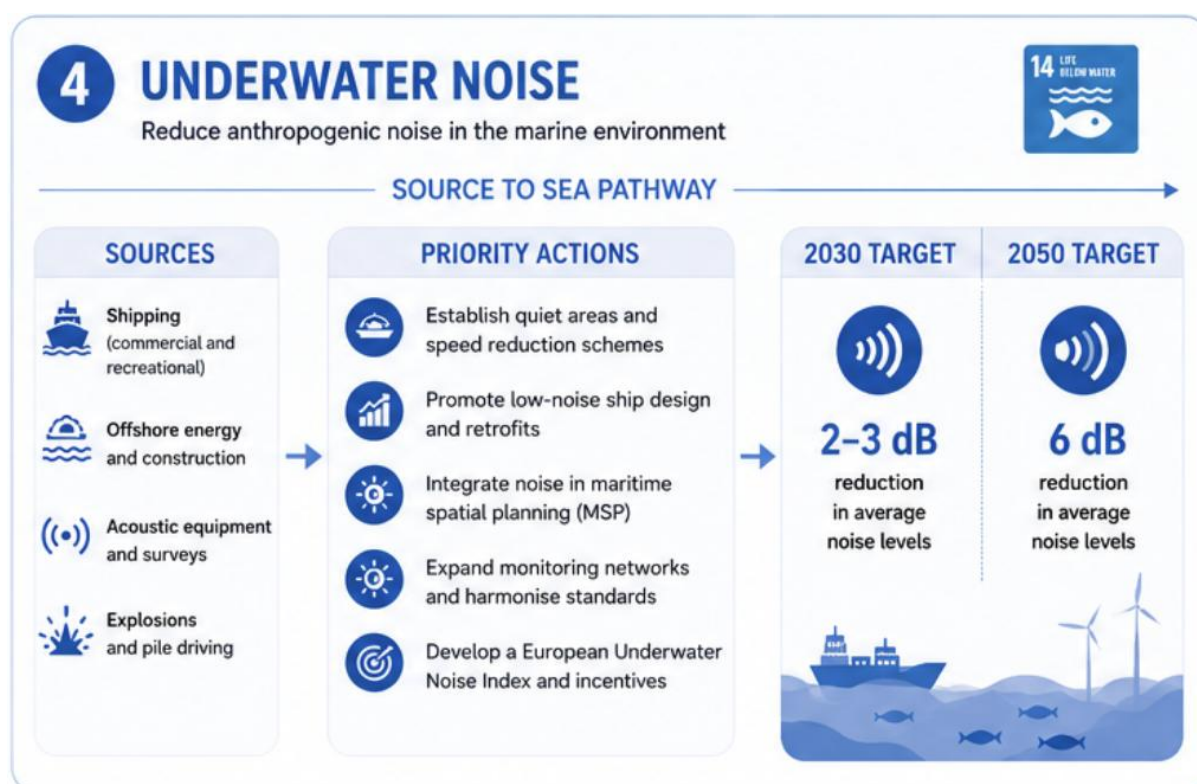


FIGURE 6 –Microplastics: Sources, Priority Actions and Targets

8. Cross-Cutting Actions Across All Pollutants

Several actions consistently appear across all pollutant roadmaps. The roadmaps identify policy makers and researchers to play a leading role in developing and implementing these cross-cutting actions.

- Governance: Establish communities of practice, multi-stakeholder platforms and source-to-sea coordination mechanisms.
- Monitoring: Harmonise methodologies, reporting standards and environmental assessment frameworks.
- Data: Develop interoperable, FAIR environmental data systems and support predictive monitoring approaches.
- Innovation: Invest in research, digital tools, modelling systems and demonstration projects.
- Public Engagement: Create pollution dashboards, risk communication platforms and public information systems.
- International Cooperation: Strengthen European leadership in global pollution governance, including plastics treaty negotiations and international environmental agreements.

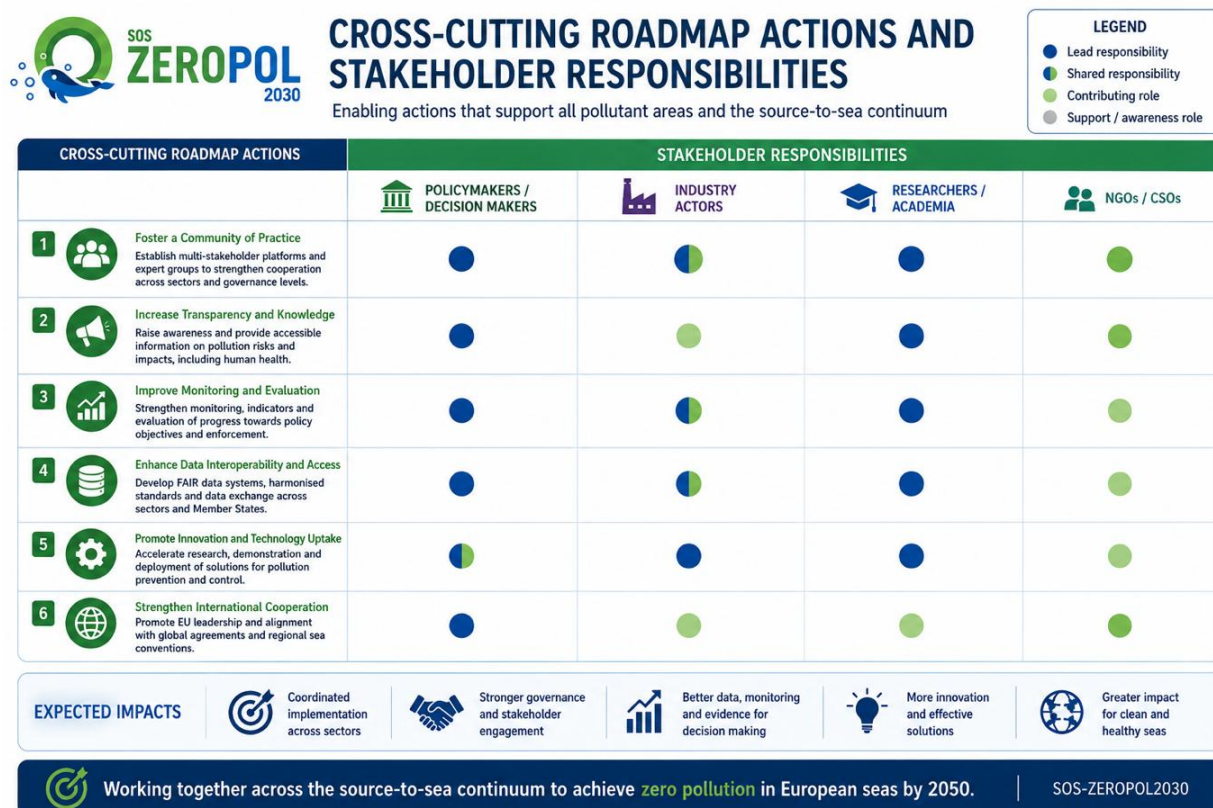


FIGURE 7 – Cross-Cutting Roadmap Actions and Stakeholder Responsibilities

9. Alignment with the European Ocean Pact

The recommendations presented in this policy brief directly support the priorities emerging under the European Ocean Pact, including pollution prevention, integrated governance, monitoring and environmental intelligence, resilience of marine ecosystems and international cooperation. They promote a source-to-sea approach that strengthens connections between freshwater, coastal and marine governance systems, supporting more coherent implementation of existing EU legislation. The accompanying SOS-ZEROPOL2030 Roadmap provides an interactive tool to help stakeholders translate these recommendations into practical action.

Call to Action

Europe already possesses many of the scientific, technical and governance tools needed to significantly reduce pollution. The challenge is no longer knowing what to do, but implementing coordinated action at scale.

The recommendations presented in this policy brief provide a practical pathway for accelerating progress towards the EU's Zero Pollution ambition. Success will depend on continued collaboration between policymakers, industry, researchers, service providers and civil society, working together across the source-to-sea continuum.

The accompanying SOS-ZEROPOL2030 Roadmap supports this process by helping stakeholders identify, prioritise and implement actions according to their responsibilities, capacities and implementation timelines.

The transition to zero pollution begins with decisions taken today. The time to act is now!

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Annexes

Not Applicable