

Ocean-Bound Plastics

From Leakage Risk to Circular Opportunity



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Key trends and knowledge from the water and environmental sector

Executive Summary

Ocean-bound Plastic (OBP) are a land-based leakage challenge before they become a marine pollution problem. Plastic waste becomes ocean-bound when it escapes waste-management systems and enters rivers, canals, stormwater systems, harbour areas, shorelines or flood zones where it can be transported toward the sea.

The pressure is increasingly moving upstream. Once plastic reaches the marine environment, it becomes harder to recover, more difficult to trace and less likely to retain material value. Earlier intervention is therefore critical.

Urban areas are central to the challenge. Riverfront activity, tourism, events, outdoor dining, ports, stormwater runoff and sewer overflow pathways all create points where plastic can move from land to water. Small urban rivers are particularly important because they connect dense public activity directly to coastal environments.

For municipalities, utilities, ports and waste operators, OBP creates growing operational and governance pressure which requires documentation of where leakage occurs and which interventions work.

At the same time, OBP is creating **new market opportunities** across the full value chain:

- Hotspot mapping and monitoring
- Leakage prevention and public-space interventions
- Collection and interception systems
- Sorting, cleaning and material preparation
- Testing, validation and circular product development

For Clean, the opportunity is to connect public-sector needs with companies that can deliver practical solutions. OBP are not solved by one technology, but by value chains that link prevention, collection, documentation and material reuse.

What Are Ocean-bound Plastic and Why Do They Matter?

Ocean-bound Plastic (OBP) refers to plastic waste at risk of entering seas and oceans. Unlike plastic already dispersed in the marine environment, OBP is still located where interception is possible: in cities, rivers, shorelines, ports, stormwater systems, flood zones and other leakage pathways. This makes OBP a strategic systems challenge. The issue is not only plastic in the water, but the failure of urban systems to prevent waste from moving from land to sea.



Main Categories of OBP

Ocean-bound Plastic can be understood through four main categories:

- **Potential OBP:** Mismanaged plastic waste located near coastlines.
- **Waterways OBP:** Plastic located in or near rivers, streams and drainage systems.
- **Shoreline OBP:** Plastic waste found close to beaches, coasts and riverbanks.
- **Fishing-related plastic:** Used fishing gear, plastic bycatch and other marine activity-related plastics.

These categories show that OBP is not one uniform waste stream. It is found across different environments and requires different prevention, collection and treatment approaches.

Why It Matters

OBP matters because it connects environmental risk with operational, regulatory and market pressure.

- **Environmental pressure:** Plastic leakage contributes to marine litter, microplastic formation and biodiversity impacts.
- **Urban pressure:** Litter affects public spaces, waterfront quality, tourism and recreational areas.
- **Operational pressure:** Municipalities, ports, utilities and waste operators face higher costs for cleaning, maintenance and monitoring.
- **Market pressure:** Recyclers and producers need cleaner, better documented plastic streams to support circular material use.

At the same time, OBP can become a secondary material stream if collected early enough and treated correctly. Collection alone is not enough. Sorting, cleaning, quality control and application-specific testing determine whether recovered plastic can move from waste to feedstock.

The strongest opportunity is therefore upstream. Preventing and collecting plastic close to the source can reduce leakage, improve material quality and create stronger circular value chains.



From Land to Sea: Sources, Pathways and Leakage Dynamics

Plastic becomes ocean-bound when waste escapes ordinary urban systems. A cup left near a riverfront, packaging blown from an overflowing bin, or litter washed into a storm drain during heavy rain can all become part of the same leakage pathway.

The challenge is therefore not only where plastic originates, but how it moves.

Typical Leakage Pathway

Consumption

- Mismanaged waste
- Wind, rain, stormwater or flooding
- River, drain, canal or harbour
- Coastal waters
- Marine environment

This pathway shows why OBP should be treated as a leakage-management issue. Each step creates a point for prevention, monitoring or interception.

Common Sources and Pathways

Key sources include:

- Land-based litter and mismanaged public waste
- Stormwater runoff and sewer overflow pathways
- Riverfront activity, tourism, recreation and events
- Wind, rainfall and flooding
- Ports, shipping, fishing and coastal activities
- Small urban rivers connecting cities directly to marine environments
- Industrial plastic pellet loss from production, transport, storage and handling sites

In urban areas, leakage is closely linked to everyday activity.

Outdoor dining, nightlife, commuting, events and tourism increase the concentration of lightweight packaging near waterways. Items such as cups, bottles, caps, food wrappers, bags and cigarette-related waste can quickly move from public spaces into rivers and drains.

Stormwater increases the risk.

During rainfall, accumulated litter can be mobilised from streets, pavements and riverbanks into gutters, drains and waterways. Flooding and overflow events can accelerate this movement and remobilise plastic already stored in vegetation, sediment or harbour structures.

Small urban rivers are especially important. They often pass through dense public areas before discharging into coastal waters. Their short distance to the sea makes them critical transport routes, but also practical intervention points for monitoring and collection.

This makes OBP diffuse and event-driven. Leakage changes with weather, season, public activity, tourism intensity, river conditions and stormwater flows. Without monitoring, municipalities and utilities risk investing in generic cleanup rather than targeted prevention.

The shift is therefore **from downstream cleanup to upstream control**: identifying hotspots, documenting flows, intercepting material and preventing plastic from entering marine environments in the first place. OBP is increasingly treated as an infrastructure and governance issue.



Policy and Market Pressure: From Prevention to Accountability

Ocean-bound Plastic is becoming more relevant because **policy, public expectations and market demand are moving in the same direction**: from cleanup toward prevention, documentation and circularity.

At EU level, plastic pollution is addressed through policies on single-use plastics, packaging, waste management, marine litter and circular economy. This creates stronger pressure to reduce leakage and improve documentation of how plastic products are collected, managed and kept out of the environment.

For public authorities, this means plastic leakage is no longer only a cleanliness issue. It is increasingly linked to **environmental accountability, public-space management and evidence-based intervention**.

For companies, the pressure is also growing. Brands and producers are expected to reduce virgin plastic use, improve packaging design, document recycled content and demonstrate credible circular-economy performance.

This creates demand for solutions that make plastic flows more visible, controllable and reusable:

- Monitoring and hotspot mapping
- Smart bins and public-space prevention
- Stormwater screening and interception
- River and harbour collection systems
- Sorting, washing and material testing
- Traceability and recycled-content documentation

OBP is therefore becoming a policy-driven market space.

Who Is Under Pressure — and Who Needs Solutions?

Ocean-bound Plastic creates pressure across several stakeholder groups. Each group faces different risks and needs different solutions.

Stakeholder	Pressure	Likely need	Possible solution providers
 Municipalities	Visible litter, public complaints, compliance, tourism pressure	Prevention, monitoring, public-space interventions, collection	- Waste ApS - Race for Oceans Technology ApS - ODrone - NORDSENSE ApS - All In On Green ApS
 Utilities / water managers	Stormwater and overflow pathways, water quality, operational risk	Data, source tracking, interception, reporting	- Omnimem ApS - Aquasense ApS - WaterCare Guard - NORDSENSE ApS - NLIR ApS
 Waste operators	Mixed and contaminated plastic streams	Sorting, treatment, logistics, quality control	- MARIUS PEDERSEN A/S - STENA RECYCLING A/S - DAKA ReFood - BAKKEGAARD RECYCLING A/S - RETEC MILJØ ApS
 Recyclers	Poor feedstock quality and inconsistent material	Cleaning, polymer separation, QA, testing	- Genplast A/S - NG Nordic Denmark A/S - AVK PLAST A/S - Trioworld Nyborg A/S - AAGE VESTERGAARD LARSEN A/S
 Brands / producers	ESG, circularity, recycled-content claims	Verified recycled materials, traceability, product development	- SMALLrevolution ApS - RE-BAG A/S - Trioworld Nyborg A/S - NORDIC HOUSEWARE GROUP A/S - Genbrugsplast ApS
 Ports and tourism areas	Operational and reputational risk	Local cleanup, documentation, visitor-area interventions	- Race for Oceans Technology ApS - ODrone - All In On Green ApS - Waste ApS - Omnimem ApS
 Technology providers	Emerging demand, need for reference cases	Pilots, demonstrations, partnerships, buyers	- Omnimem ApS - NLIR ApS - Aquasense ApS - ODrone - Race for Oceans Technology ApS

This stakeholder landscape shows that OBP is not only an environmental issue. It is a procurement, documentation and value-chain challenge.

Finding and Capturing OBP: Hotspots, Monitoring and Collection

Ocean-bound plastic cannot be managed effectively unless leakage risk is first located.

Hotspot mapping provides the first layer of intelligence by identifying where public activity, river proximity and weak waste infrastructure overlap.

Relevant hotspot indicators include:

- Restaurants, cafés, bars and outdoor dining areas
- Parks, paths, bridges and recreational spaces
- Event locations and tourism zones
- Harbours, piers and waterfront gathering areas
- Stormwater outlets and flood-prone areas
- Riverbanks, reed zones and accumulation points

Monitoring then turns risk into evidence. Different methods capture different parts of the system: floating litter, stranded litter, reed-retained litter, riverbank litter or material captured in booms and barriers.

Collection systems must be site-specific. Rivers differ in width, flow, depth, access, vegetation, boat traffic, safety needs and maintenance capacity. A barrier that works in one canal may not work in a wider or faster-flowing river.

Effective OBP collection should serve two purposes:

1. Reduce environmental leakage before plastic reaches the sea.
2. Create a documented material stream that can be sorted, cleaned and potentially reused.

This connection to downstream use is important. OBP can remain mechanically usable, but reuse potential depends on quality control, cleaning, sorting, oxidative stability, processing behaviour and application requirements

Monitoring and collection should therefore also support decisions about source, polymer type, contamination level and material potential.

From Waste to Feedstock: Cleaning, Sorting and Material Readiness

Collection is not the same as recycling. Once OBP has been removed from a river, harbour or shoreline, it remains an uncertain waste stream until it has been sorted, cleaned, dried, tested and matched to a realistic end use.

Collected OBP is often:

- Wet
- Dirty
- Mixed
- Degraded
- Contaminated with organic matter, sediment, labels, oils or residues

A typical preparation chain includes:

1. Removal of non-plastic material
2. Polymer identification
3. Sorting
4. Shredding
5. Washing
6. Rinsing and drying
7. Quality control
8. Material testing

Cleaning is a value-creating step. Water alone is often insufficient. Depending on contamination and polymer type, washing may require surfactants, alkaline treatment, ultrasonic washing or other controlled cleaning methods.

Material readiness depends on more than visible cleanliness. Recovered plastic must be assessed for polymer type, degradation, melt behaviour, thermal stability, oxidative stability and application requirements.

Some fractions may be suitable for **direct recycling**. Others may require blending, stabilisation, compounding or lower-risk applications. The key point is that OBP only becomes valuable when uncertainty is reduced.

For companies, this creates opportunities in polymer identification, washing systems, drying, flake handling, testing, compounding and product development.

Technology Responses and Business Opportunities

The Ocean-bound plastic market is not defined by one technology. It is a systems market where different solutions must connect across the value chain. For Clean, the opportunity is to connect existing capabilities into practical OBP value chains.

Key opportunity areas include:

Company	Business areas / OBP value chain									
	Source mapping	Monitoring	Collection	Sorting	Cleaning	Mechanical recycling	Advanced recycling	Material testing	Reuse / products	Prevention / policy
1. All In On Green ApS			•							•
2. MARIUS PEDERSEN A/S			•	•	•	•			•	•
3. Omnimem ApS				•	•	•			•	•
4. SMALLrevolution ApS			•	•	•	•			•	
5. NG Nordic Denmark A/S			•	•	•	•				•
6. DANSK AFFALDSMINIMERING ApS				•	•	•				•
7. Genplast A/S				•	•	•			•	
8. WasteControl ApS		•	•		•					•
9. Waste ApS		•		•				•		•
10. STENA RECYCLING A/S			•	•		•				•
11. Quantafuel Skive ApS						•	•		•	•
12. ALS DENMARK A/S		•			•			•		
13. Birdie Scandinavia ApS		•				•			•	
14. BLUE NORTH ApS	•	•								•
15. Cirqle R&D ApS					•				•	•
16. Combi-Therm Consumer A/S						•			•	•
17. DANREC A/S						•			•	•
18. Dansk Emballage A/S					•				•	•
19. DANSK RETURSYSTEM A/S				•					•	•
20. GEMIDAN A/S				•	•					•
21. GreenCup ApS					•				•	•
22. KROGHS FLASKEGENBRUG A/S				•	•				•	
23. LETBEK A/S						•			•	•
24. MILJØSKÆRM ApS			•						•	•
25. Newretex				•					•	•
26. NUR ApS		•		•				•		
27. NORDIC HOUSEWARE GROUP A/S					•	•			•	
28. NORDSENSE ApS	•	•	•							
29. Race for Oceans Technology ApS		•	•			•				
30. RE-BAG A/S								•	•	•

Circular Ocean-bound Plastic: Building the South Baltic Evidence Base

Circular Ocean-bound Plastic (COP) is an Interreg South Baltic project dedicated to addressing plastic pollution in the South Baltic Sea region. The project focuses on ocean-bound plastic waste: plastic at risk of entering the sea through rivers, urban waterways, harbours, stormwater pathways and coastal environments.

COP takes a **value-chain perspective**: understanding where plastic comes from, how it enters aquatic systems, how it can be collected, and whether the recovered material can be treated and reused.

A central part of the project is to test **practical approaches in coastal cities** across the South Baltic region. Pilot activities are used to explore waste collection technologies, investigate sources of ocean-bound plastic and build knowledge on how plastic moves from land-based activities into rivers and marine environments.

COP also works with the **business potential of recovered plastic**. The project investigates recycling properties, treatment options and possible uses for collected ocean-bound plastic waste. This is especially important because plastic recovered from water can degrade quickly.

Engaging SMEs is a key part of the project, as they can help develop new solutions for collection, treatment, recycling and circular product development.



COP is structured around four main work areas:

1. Capacity-building and knowledge collection:

Gathering information on ocean-bound plastic waste streams, legislation and business opportunities.

2. Data analysis and demonstration:

Understanding sources and pathways of litter entering rivers, and testing monitoring and collection methods.

3. Utilisation of ocean-bound plastic waste: Investigating technical solutions for recycling and reusing collected plastic.

4. Mitigation measures:

Developing prevention methods, engaging communities and sharing results through workshops, events and exhibitions.

For Clean, the project provides a practical platform for turning the OBP challenge into concrete market opportunities. By linking municipalities, research institutions, SMEs, recyclers and technology providers, COP helps move the issue from awareness to action: from identifying leakage risks to testing solutions and building circular value chains for recovered plastic.



How Clean Can Support the Ocean-bound Plastic Market

Ocean-bound Plastic require coordination across sectors that do not always work together. Municipalities manage public spaces, utilities understand stormwater pathways, waste operators handle collection, recyclers need predictable feedstock, and brands need credible recycled materials.

Clean can support this market by acting as a connector between these groups through:

1. **Market framing:** Translating OBP into demand areas across monitoring, prevention, collection, cleaning, recycling and circular products.
2. **Partner matchmaking:** Connecting municipalities, utilities, ports, waste operators, recyclers, technology providers and manufacturers.

3. **Pilot development:** Helping companies test and document solutions in relevant river, harbour and coastal environments.

4. **Value-chain building:** Linking collected material with cleaning, testing, compounding and product-development pathways.

5. **Funding and visibility:** Supporting project development, funding opportunities, knowledge sharing and market positioning.

OBP is not only a cleanup challenge. It is an emerging market for documentation, prevention, material recovery and circular product development. Clean can help companies understand where they fit, who they need to work with, and how their solution contributes to the OBP value chain.

Get Involved

Ocean-bound Plastic require collaboration across the full value chain.

Companies, municipalities, utilities, recyclers, product developers and technology providers interested in monitoring, preventing, collecting, cleaning or reusing OBP can engage with Clean to explore partnerships, pilot opportunities and circular business cases.

Clean brings together companies, municipalities, utilities, and knowledge institutions to support innovation, testing, and implementation within areas such as stormwater management, water reuse, and climate adaptation.

Through projects, pilots, and international cooperation, Clean helps translate emerging challenges into concrete action.

If the topics explored in this report are relevant to your organisation, there are opportunities to engage through ongoing projects, knowledge exchange, and future initiatives.

Learn more about Clean's activities
and how to get involved at

cleancluster.dk

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