# POLICY BRIEF

## Structuring Innovation Ecosystems to Enable Circular Economy Transitions in Port Regions

### Special Note of the Author

*This policy brief builds on empirical and conceptual research on circular economy transitions in port regions, particularly focusing on the role of innovation ecosystems. It does not aim to provide a definitive model, but rather to identify key mechanisms and policy levers that can support more effective and scalable circular economy dynamics. The arguments are grounded in qualitative evidence and should be further tested across different port contexts. The objective is to support policymakers in designing realistic and context-sensitive interventions.*

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### Introduction: A Structural Policy Blind Spot

Ports are increasingly seen as strategic spaces for circular economy development because they concentrate industrial activities, logistics, and resource flows (de Langen & Sornn-Friese, 2019; Veyssière et al., 2021). Yet, circular economy implementation in port regions remains uneven, often fragmented across projects and stakeholders rather than embedded in a coherent territorial strategy (de Langen et al., 2020; Haezendonck & Van den Berghe, 2020; Roșca-Sadurschi & Ceclu, 2022). This suggests a structural policy blind spot: ports are still too often approached as logistical infrastructures, while circular transitions depend on the coordination of interdependent actors, shared resources, and collaborative governance within an innovation ecosystem (Andriamanantena et al., 2022; Granstrand & Holgersson, 2020). In that sense, the main difficulty is not only technological or financial in nature. It is also organizational and institutional, because circular economy in port regions requires policies that structure ecosystem dynamics rather than support isolated initiatives.

### 2. How Circular Economy Emerges in Port Ecosystems

Empirical evidence from North Sea Port (Belgium and Netherlands) and Dunkirk (France) shows that circular economy initiatives do not emerge primarily from isolated firm strategies, but from interdependent relationships among firms, public authorities, and research organizations (Andriamanantena et al., 2022; Andriamanantena et al., 2025). In port ecosystems, circular transitions rely on several connected functions rather than on isolated firm initiatives (de Langen et al., 2020; Granstrand & Holgersson, 2020; Roșca-Sadurschi & Ceclu, 2022):

- Coordination among stakeholders helps align priorities, reduce duplication, and connect firms, public authorities, and research actors around shared circular objectives.

- Knowledge exchange across sectors allows technical, regulatory, and organizational know-how to circulate between actors that would otherwise remain disconnected.
- Resource integration makes it possible to match industrial inputs and outputs, so that waste, heat, CO2, or by-products from one actor can become resources for another.
- Experimentation with new technologies and business models creates space for pilot projects and testing phases, which are necessary before circular solutions can be implemented at scale.
- Institutional alignment between governance arrangements and circular practices ensures that regulations, planning frameworks, and public support mechanisms do not obstruct circular collaboration.

These functions are not spontaneous. They depend on active facilitation, governance structures, intermediary organizations, and shared infrastructures that help actors move from isolated initiatives to more systemic and scalable forms of collaboration (Andriamanantena et al., 2022; Andriamanantena et al., 2025; Haezendonck & Van den Berghe, 2020). Without these conditions, even technically viable circular solutions remain difficult to implement, coordinate, and scale across the port territory. This suggests that infrastructure and funding alone are not enough; policy must also organize the ecosystem conditions that make circular collaboration possible.

### 3. Structural Barriers to Circular Transitions

If circular economy transitions in port regions depend on coordination, knowledge exchange, resource integration, experimentation, and institutional alignment, the main policy question becomes: **what prevents these functions from operating effectively?** Evidence from North Sea Port and Dunkirk suggests that several structural barriers continue to weaken circular collaboration, even where interest in circular economy is already high (Andriamanantena et al., 2022; Andriamanantena et al., 2025). These barriers are not isolated. They reinforce one another and make circular initiatives harder to implement, connect, and scale across the port territory.

- **Fragmented responsibilities across institutions**

  Circular initiatives often involve port authorities, municipalities, regional bodies, and national regulators, but their roles are not always clearly aligned. This weakens leadership, slows decision-making, and makes long-term coordination more difficult (de Langen et al., 2020; Haezendonck & Van den Berghe, 2020).

- **Regulatory frameworks still shaped by linear logics**

In many cases, rules continue to treat by-products, waste streams, and sector boundaries in ways that complicate reuse and industrial symbiosis. Even when firms identify complementarities, legal and administrative constraints can prevent circular exchanges from being implemented efficiently (Andriamanantena et al., 2025; Roșca-Sadurschi & Ceclu, 2022).

- **High costs and infrastructure dependency**

  Circular practices in port regions often require shared infrastructures, pilot facilities, transport networks, or recovery systems that are expensive and difficult for single actors to finance alone. This slows the transition from promising initiatives to scalable solutions and makes many projects dependent on external support or long-term public commitment (Andriamanantena et al., 2025; Haezendonck & Van den Berghe, 2020).

- **Misaligned timelines and priorities among actors**

  Firms, research institutions, and public authorities do not always operate with the same time horizon or objectives. Industrial actors may prioritize short-term feasibility, while research and policy actors often work on longer-term agendas. This makes collaboration more fragile and can delay the translation of ideas into operational projects (Andriamanantena et al., 2025; Granstrand & Holgersson, 2020).

- **Weak support for coordination and intermediary functions**

  Public action often focuses on visible investments such as infrastructure, technology, or pilot projects, but gives less attention to the organizations and mechanisms that connect actors, build trust, and sustain cooperation over time. Yet, the case studies show that these intermediary and facilitation roles are essential for turning isolated initiatives into a functioning circular innovation ecosystem (Andriamanantena et al., 2022; de Langen et al., 2020).

These barriers show that the difficulty is not simply to launch more circular projects, but to create the institutional and organizational conditions that allow them to interact, stabilize, and expand. The main barriers to circular economy transitions in port regions are structural because they affect how actors coordinate, how resources circulate, and how circular initiatives move from isolated projects to durable ecosystem dynamics.

## 4. Policy Recommendations

To address these structural barriers, regional and national policymakers should focus less on multiplying isolated circular projects and more on strengthening the conditions that allow ecosystem functions to operate over time. Four policy directions appear particularly important to achieve this: (Andriamanantena et al., 2022; Andriamanantena et al., 2025).

- **Establish stable coordination at the port-region level.**

Policymakers should designate a lead coordinating body, support formal multi-stakeholder platforms, and encourage the development of shared circular economy strategies so that public authorities, firms, and research actors can work with clearer roles, priorities, and long-term direction (de Langen et al., 2020; Andriamanantena et al., 2025).

- **Adapt regulatory frameworks to circular practices.**

  Policymakers should simplify procedures for by-product reuse, reduce administrative barriers to industrial symbiosis, and improve alignment between regional and national rules so that potentially valuable resource exchanges are not blocked by legal and institutional arrangements designed for linear systems (Andriamanantena et al., 2025; Roșca-Sadurschi & Ceclu, 2022).

- **Support intermediary and facilitation functions.**

  Policymakers should provide support to cluster organizations, coordination platforms, and other intermediary actors because these organizations help identify complementarities, connect stakeholders, circulate knowledge, and sustain the trust needed for circular collaboration to move beyond isolated initiatives (Andriamanantena et al., 2022; Granstrand & Holgersson, 2020).

- **Invest in experimentation with a pathway to scaling.**

  Policymakers should encourage pilot zones, demonstration projects, and shared testing infrastructures, but they should also connect these efforts to longer-term strategies and funding continuity so that experimentation becomes a bridge to wider implementation rather than an end in itself (Haezendonck & Van den Berghe, 2020; Andriamanantena et al., 2025).

These recommendations suggest that public action should not only finance circular technologies or infrastructures, but also organize the governance, regulatory, and collaborative conditions that make circular economy viable in practice across port regions. Effective policy should emphasis on enabling ecosystem functions, because circular transitions in port regions depend not only on projects or technologies, but on the institutional and organizational conditions that allow them to connect, endure, and scale.

## 5. Implications for Policy Design

The findings point to a necessary shift in policy design. Circular economy in port regions should no longer be approached mainly through sector-specific measures or short-term project support, but through system-oriented strategies that recognize ports as evolving innovation ecosystems (Andriamanantena et al., 2022; Andriamanantena et al., 2025; Granstrand & Holgersson, 2020). This means that policy should connect industrial, environmental, territorial,

and innovation policies so that circular initiatives can develop within a coherent institutional framework (de Langen et al., 2020; Haezendonck & Van den Berghe, 2020).

In practical terms, this shift implies several changes in public action:

- **Integrating policies across sectors**

  Circular transitions in ports involve industry, logistics, energy, waste management, land use, and regional development at the same time, so policy design must reduce fragmentation between these domains rather than address them separately (Andriamanantena et al., 2025; de Langen et al., 2020).

- **Coordinating actors and institutions over time**

  Because circular economy depends on collaboration among firms, public authorities, and research organizations, policy effectiveness requires stable coordination mechanisms that can align different priorities, timelines, and responsibilities (Andriamanantena et al., 2022; Granstrand & Holgersson, 2020).

- **Supporting long-term ecosystem development**

  Circular innovation in ports rarely becomes systemic through one-off interventions; it needs continuity in governance, trust-building, infrastructure planning, and institutional support so that projects can mature and connect with one another (Andriamanantena et al., 2025; Haezendonck & Van den Berghe, 2020).

- **Improving the alignment of existing instruments**

  The evidence does not suggest that policymakers must invent entirely new tools. It suggests, rather, that existing planning, funding, and regulatory instruments should be better aligned with circular economy objectives and ecosystem dynamics (Andriamanantena et al., 2022; Andriamanantena et al., 2025).

- **Giving greater attention to coordination mechanisms**

  Policy frameworks often privilege visible outputs such as infrastructure, subsidies, or pilot projects, but the case studies show that less visible mechanisms, such as facilitation, intermediation, and multi-actor governance, are equally important for making circular strategies work in practice (de Langen et al., 2020; Roșca-Sadurschi & Ceclu, 2022).

The effectiveness of circular economy strategies in port regions depends less on the introduction of new policy instruments. It relies more on the strategic alignment of existing instruments to support ecosystem development, institutional coherence, and sustained collaboration over time.

## Conclusion

This policy brief argues for a change in perspective rather than a simple expansion of action. For regional and national policymakers, the central issue is no longer whether ports matter for circular economy, but how public action can create the conditions under which circularity becomes embedded in territorial development. The evidence drawn from North Sea Port and Dunkirk suggests that ports offer more than industrial density or logistical advantage. They provide a strategic setting in which collaboration, institutional learning, and shared direction can turn circular ambition into durable transformation. The policy value of this perspective lies in its realism: advancing circular economy in port regions does not depend only on major technological breakthroughs, but on the capacity to govern complexity, connect actors with different roles and time horizons, and sustain collective commitment over time. In that sense, the transition is best understood not as a linear implementation challenge, but as a long-term process of territorial organization and strategic coordination.

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