

White paper

Europe cannot deliver a circular plastics economy without enabling innovation

How innovation in technologies demonstrates the need to modernise Europe's recycling framework

Europe has set ambitious circular economy, recycled content and climate objectives. For plastics, these objectives can help reduce waste to landfill and incineration, strengthen resource efficiency, and support a more resilient European industrial base. Yet Europe faces a striking contradiction. It calls for innovation, but too often regulates the circular economy through frameworks designed only around technologies that already operate at scale.

Chemical recycling is a clear example of this structural challenge and should be understood as complementary to, rather than a substitute for, mechanical recycling. Mechanical recycling remains the backbone of plastics recycling and must continue to grow through investment in recycling capacity and innovations. However, many waste streams are mixed, contaminated or technically difficult to recycle with mechanical recycling systems. As a result, more than two thirds of collected plastics waste still go to landfill or incineration, while only around one third of collected plastics waste is converted into recycled-plastics output¹. Treating these linear routes as economically comparable to recycling undermines the waste hierarchy, diverts valuable feedstock away from recycling and keeps the cost of sorted plastic waste unnecessarily high.

A truly circular economy therefore requires complementary recycling solutions that are matched to the characteristics of available waste inputs, enabling the production of recycled outputs that meet the requirements of the final products.

However, the transition to a circular economy for plastics is taking place in an increasingly challenging environment. Growing import pressures and regulatory uncertainty continue to weigh on investment decisions, while many recycling projects struggle to establish a robust business case. The impact is already visible across the recycling sector. Europe's annual growth in recycled plastics production, including post-consumer output from mechanical and chemical recycling, declined sharply from 12.3% during 2018-2022 to just 1.9% during 2022- 2024, resulting in 8.1 Mt of post-consumer recycled plastics output in 2024 (or 14.7% of total European production in 2024)². By contrast, annual growth in global recycled plastics production has accelerated from 4.4% during 2018-2022 to 7.8% during 2022-2024, reaching 41.5 Mt of output in 2024 (or 9% of total global production in 2024).

¹ [The Circular Economy for Plastics report, 2026](#)

² Ibid.

These trends are increasingly evident in the investment landscape. European mechanical recyclers are facing plant closures, while several chemical recycling projects have been delayed, cancelled, or put on hold due to weak demand, high costs, import pressures and unresolved regulatory uncertainty³.

The central question is not whether one recycling technology should replace another. Rather, it is whether Europe can create the conditions for all circular solutions to scale. **Today, several barriers continue to hinder the deployment and scaling of circular solutions, particularly innovative recycling technologies. These barriers directly affect investment decisions: without a credible business case, large-scale investments in recycling capacity will not happen in Europe. This, in turn, puts Europe's recycled-content and circular economy ambitions at risk. Targets can only be achieved if they are supported by sufficient market demand, reliable feedstock access and the investment needed to develop the industrial capacity required to meet them.**

1. Legal recognition comes too late for investment decisions

New circular technologies require investment before they can operate at scale. Yet in Europe, regulatory recognition often arrives only after years of debate. For chemical recycling, this includes for example: (a) the recognition of recycled content derived from circular feedstocks through appropriate credit-based mass balance accounting methods, (b) the treatment and end-of-waste status of such feedstocks, and (c) the ability to easily move suitable waste streams to centralised recycling facilities across the Single Market. For mechanical recycling, regulatory recognition depends on the approval of novel technologies that enable the uptake of materials into food contact applications.

The absence of legal recognition creates uncertainty at precisely the point when companies must decide whether to commit capital to first-of-a-kind or early commercial-scale plants. If investors lack clarity on whether and how outputs will contribute to recycled-content claims and targets, whether feedstocks can be supplied legally and reliably, or whether the environmental value will be recognised in commercial products, the business case becomes difficult to justify. As a result, these uncertainties reduce downstream value chain confidence in recycled materials and delay, downsize or divert chemical recycling projects to regions with clearer market signals. A stable regulatory framework is therefore essential. Once rules are established, they should provide long-term predictability and avoid revision clauses that undermine investment certainty.

2. Europe regulates technologies instead of outcomes

³ The [Fraunhofer Institute identified 65 chemical recycling projects in Europe](#), but only 18 were operational at the time of its assessment.

Circular economy policies should be measured against outcomes: increased use of recycled materials, reduced landfill and incineration, lower systemic GHG emissions, substitution of primary raw materials, improved resource efficiency and stronger European industrial resilience. Yet policy discussions increasingly focus on comparing and ranking recycling technologies rather than establishing clear baseline performance requirements and enabling all solutions that meet them to contribute effectively to the circular transition while strengthening the competitiveness of European plastics industry.

This hinders innovation. Established technologies benefit from decades of regulatory support, standards and market acceptance, whereas emerging technologies must repeatedly prove their legitimacy. For investors, this creates an additional regulatory risk premium. Investors are more likely to commit capital where policy is technology-neutral, rewards the desired outcome, and provides a clear route to market. In the case of chemical recycling, this means **recognising and incentivising the use of plastic waste as a feedstock**, rather than creating a framework that implicitly disadvantages one recycling technology over another.

3. Innovation is penalised by “proof before scale”

Industrial innovation requires scale-up to generate reliable operational data. Given that the operational performance of recycling technologies is closely linked to their development stage, such data should be expected to evolve and be updated over time, particularly as technologies reach commercial-scale operation and the final phases of industrial scale-up. Yet European policymaking often expects emerging technologies across different Technology Readiness Levels (TRLs) to provide evidence of performance that can only be confirmed after commercial deployment. Questions on life-cycle performance, energy use, environmental performance and process efficiency are legitimate. But if they are applied in a way that requires commercial-scale evidence before commercial scale is possible, innovation is trapped in a self-reinforcing barrier.

The investment effect is significant. First movers already face technology, feedstock, construction and market risks. When regulatory acceptance also remains unresolved, the cost of capital rises, and final investment decisions become harder to reach. Instead of accelerating learnings and performance improvements, Europe risks preventing promising technologies from reaching the scale needed to demonstrate their full potential. Therefore, a phased approach to evidence requirements should be adopted, allowing technologies to demonstrate performance progressively as they mature and scale up.

4. Circular economy legislation remains fragmented

Chemical recycling is affected by multiple legislative files simultaneously, including rules on packaging and contact-sensitive applications, single-use plastics, end-of-life vehicles, waste, food-contact materials and industrial emissions. Each file may send a different signal on recycled-content eligibility, accounting, sustainability criteria, authorisation, waste status, shipment or permitting.

For investors, such fragmentation creates cumulative uncertainty. A project may appear viable under one policy framework while remaining exposed to risks under another. For example, a positive

demand signal for recycled-content can be undermined by uncertainty over feedstock availability, lengthy permitting processes, unclear end-of-waste criteria, or unresolved product authorisations. Large-scale circular investments require a coherent and predictable framework across the entire value chain, rather than isolated positive signals within individual files. Where environmental benefits have been demonstrated and verified, regulatory frameworks should recognise them rather than creating uncertainty through fragmented or overlapping requirements.

5. Value chain development remains insufficient, while import pressures continue to grow

Regulations require a significant increase in recycled material production capacity. Yet demand for recycled materials remains insufficient to justify the investments required. A dedicated market support framework is therefore needed to stimulate demand for recycled materials in the period before recycled content targets take effect. Companies cannot commit to large-scale investments in recycling technologies if the implementation timeline for recycled content obligations, or the methodology used to calculate recycled content, may change after a final investment decision has been taken. Adding to this challenge, targets alone may not provide sufficient investment certainty when they are accompanied by review clauses that allow for future reassessments and potential changes to targets, timelines or other key requirements.

Growing import pressures present a further challenge to the development of Europe's circular plastics value chain. Increasing volumes of materials and products placed on the EU market are not always subject to equivalent requirements or enforcement standards. As Europe advances its circular economy agenda, it is important to avoid repeating challenges observed in greenhouse gas emissions regulations, where obligations affecting European industry have not always applied equally to imported products. A successful circular economy requires robust protection against unfair competition from non-EU operators. Circular economy legislation should guarantee a level playing field for European businesses and be effectively enforced at its borders.

A strategic choice for Europe

The issue is not unique to innovative technologies such as chemical recycling. It reflects a broader European challenge: Europe has become highly effective at regulating technologies once they exist but often struggles to create the conditions for new technologies to emerge, scale and compete on a level playing field. The same pattern can be observed across other advanced production processes and recycling technologies, such as dissolution, as well as in related sectors, including low-carbon feedstocks, carbon capture storage or utilisation, industrial electrification, bio-manufacturing and hydrogen deployment.

Europe will not achieve its circular economy ambitions by optimising today's technologies alone. It needs a regulatory framework that is technology-neutral, innovation-friendly, outcome-based and investment-enabling. Minimum eligibility benchmarks are necessary, but they must not become mechanisms that prevent new solutions from improving, scaling up and contributing to Europe's industrial transformation. This is particularly important in view of the ambitious sustainability objectives set by the European Union itself, which should be accompanied by an enabling regulatory framework capable of supporting the industrial transformation required to achieve them.

If Europe wants to deliver on its ambitious circularity targets and regain global leadership, it must make circular innovation investable in Europe. This means recognising innovations in recycling **regardless of their current scale**, establishing **workable accounting rules for emerging technologies**, developing **coherent and simplified legislation** that focusses on outcomes rather than differentiating technologies, enabling **efficient permitting of novel technologies**, ensuring a **functioning Single Market for waste and secondary raw materials**, without hampering the **scaling up of the national industrial assets**, and creating the conditions for a **fair and competitive market**, including **effective enforcement of circular economy requirements for imported products**.

Without these conditions, Europe risks losing not only recycling capacity, but also its global relevance for the next phase of the circular economy.