RSC Sustainability

ROYAL SOCIETY OF CHEMISTRY

PERSPECTIVE

View Article Online
View Journal

Cite this: DOI: 10.1039/d5su00746a

Change of tides in European chemical legislation a turning point in European chemicals policy: reconciling green ambitions with the viability of the manufacturing sector in Europe

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In particular since the adoption of the REACH regulation (Regulation (EC) No 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals) in 2006, Europe has established the most stringent chemical control system in the world, a point of pride for many who advocate for even stricter measures. However, a contrasting perspective argues that the extensive European regulatory framework for chemicals has hampered industrial manufacturing, competitiveness, and innovation. This viewpoint attributes the decline to overregulation, excessive bureaucracy, and an overly risk-averse approach. The current European Commission appears to align with this latter perspective, reflecting a broader global re-evaluation of regulatory priorities, particularly among western industrialized nations beyond the EU. This paper examines this evolving landscape and its implications. As industry experts, our goal is to succinctly inform academic researchers about the political process, recognizing its potential impact on research and societal expectations.

Received 12th September 2025
Accepted 11th December 2025

DOI: 10.1039/d5su00746a

rsc.li/rscsus

Sustainability spotlight

This article addresses the ongoing evolution of chemical legislation within the European Union, a domain intrinsically linked to several Sustainable Development Goals (SDGs): notably, the SDGs 3, 6, 8, 9, 12, and 13. This legislative framework safeguards workers and consumers from chemical hazards (SDG 3), protects aquatic ecosystems from contamination (SDG 6), and influences innovation, investment, and job creation (SDGs 8 and 9). Furthermore, it sets certain product standards (SDG 12) and can promote the decarbonization and defossilization of the chemical sector (SDG 13).

Introduction

Throughout our professional careers, we have consistently observed the escalating stringency of chemical and sustainability legislation in the European Union, an evolved framework comprising REACH, CLP, IED, BPR, RoHS, WFD (SCIP), Taxonomy, CSRD, and others (for abbreviations see table). It was as if this development followed a law of nature. This trend is familiar across all legal domains, where it logically stems from civilizational progress, including new technological possibilities, expanding scientific knowledge, and the increasing complexity of human society. Consequently, growing legal requirements and the accompanying complaints from affected parties are not historically anomalous. However, both proponents and opponents of stricter European chemical regulations agree that the European Union has experienced particularly rapid developments in this area of law within the last two decades. Like any historical development, this one will not simply continue at the same pace, but will eventually surpass its peak, subside, and enter a calmer phase. We aim to discuss in this paper whether this is currently happening, and if so, why, and whether there are good or bad reasons for it.

Navigating the crossroads: a perspective on EU chemical legislation, competitiveness, and sustainable growth

To analyze the situation, we address a number of key questions.

Is Europe presently at a turning point in the development of chemicals legislation and broader environmental regulation?

In 2006, the EU adopted the most ambitious chemical legislation on Earth, REACH.[1] In the period after, this regulation was further developed and other related regulations were added or amended, such as CLP[2] and BPR.[3] In 2019, the European Union further sharpened its environmental ambitions with the Green Deal.[4]

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Now 6 years after inaugurating the Green Deal, the EU is undergoing a significant strategic reorientation. Spearheaded by high-level mandates such as the Draghi Report on European Competitiveness[5] and manifested in concrete policies like the 2025 Chemicals Industry Action Plan,[6] the EU seems to be moving towards a new doctrine. This emerging paradigm does not abandon environmental goals but explicitly elevates industrial competitiveness, strategic autonomy, and economic security to co-equal status, creating a more pragmatic, and politically charged, balancing act. The imminent "Environmental Omnibus" (series of measures to simplify environmental legislation concerning the circular economy, industrial emissions and waste management) also exemplifies a new direction in EU chemicals policy.[7] In October, the leaders of the EU countries explicitly called upon the bloc's institutions to accelerate the next phase of their deregulation agenda.[8]

To what extent have European chemical and substance-converting industries experienced a loss in manufacturing, competitiveness, and innovation capacity since the introduction of REACH? (temporal correlation)

While the industry shows a formidable and growing trade surplus and has seen the nominal value of its sales increase, these headline figures mask an underlying trend of deindustrialisation.[9] Physical production volumes have declined, capacity utilisation has fallen to historic lows, and the EU's share of the global chemical market continues to erode.[10] This development, driven largely by price inflation, points to a hollowing out of the foundational bulk chemical sector. Furthermore, a persistent and widening gap in R&D and capital investment intensity compared to competitors in the United States and China signals a significant challenge to the industry's future innovation capacity.[11,12]

What proportion of this decline can be directly attributed to tightened chemical legislation and/or the overall regulatory burden? (causality)

Attributing the cause of this industrial malaise requires a nuanced, multifactorial analysis that moves beyond a simplistic "regulation *versus* economy" dichotomy. The EU's regulatory framework, while delivering substantial health and environmental benefits, imposes significant and quantifiable costs, creating a chronic drag on operational efficiency and contributing to an investment-unfriendly perception. As industry experts, we see the burden on industry caused by regulatory requirements primarily in the accumulative effect of so many different requirements, each of which alone appears to be negligible in terms of its cost impact – at least for the large corporations.

However, the acute crisis of plummeting profitability and widespread plant closures witnessed since 2022 is more directly and powerfully explained by Europe's structural energy cost disadvantage, which was exacerbated by the geopolitical fallout from the war in Ukraine. Compounding these pressures is the geoeconomic pincer movement from a United States benefiting from low-cost shale gas and a China leveraging massive state-led industrial policy.

Beyond regulatory and administrative burdens, what other factors have contributed to the decline in chemical manufacturing and competitiveness in Europe over the past two decades?

The decline is a result of multiple intertwined factors, making it difficult to isolate the effect of any one element. Key factors are according the Cefic and Advancy (2025)[9] and McKinsey & Company (2024):[13]

- Energy and feedstock costs,
- Increased global competition,
- Economic cycles and recessive demand,
- Weak innovation, and also
- Regulatory burden (direct compliance costs).

The Draghi report[5] argues that the economic model that sustained European prosperity in the post-cold war era is now defunct. The foundational pillars of that model—cheap energy from Russia, unfettered access to Chinese markets, and the security umbrella of the United States—have crumbled. The report's analysis suggests that the EU's previous focus on internal market perfection and regulatory harmonisation, while valuable, is insufficient to meet the challenges of a world defined by geoeconomic competition.

Were there measurable health and environmental benefits from highly evolved regulatory controls on chemical substances, and if so, do these benefits reasonably outweigh the associated costs?

The answer is: it is complicated. Not surprisingly, studies commissioned by the European Chemical Agency (ECHA) and the European Consumer Organisation (BEUC) conclude that the benefits significantly outweigh the costs.[14] The benefits of these regulations are often complex to quantify but are evident in several key areas such as reduced exposure to harmful substances, lower rates of illness and disease, improved worker safety, reduced pollution, biodiversity protection, waste management. The political debate remains contentious due to controversial basic assumptions and the inherent asymmetry of the equation: the costs are immediate, concentrated, and borne by specific companies, while the benefits are diffuse, long-term, and spread across the entire population, and hard to exactly quantify. Furthermore, an important factor is ignored: the adverse impact that lower economic growth could have on healthcare and social health.

We do not wish to question the benefits of environmental legislation here, but rather to point out the importance of the proportionality of the means required in state measures, which must always be renegotiated in a democratic society. And, obviously, the superiority of systems is demonstrated by their ability to adapt to new conditions for the long-term good and resilience of the community.

Did strict chemical legislation, particularly REACH, yield any advantages for innovation and competitiveness?

Here too, the answer on the size of the benefit depends on who you ask.

Some economic theories and empirical evidence suggests that strict, well-designed environmental regulation can act as

a catalyst for innovation and, in some cases, enhance competitiveness (Porter Hypothesis).[15] Here, of course, the emphasis is on "well-designed".

While strict chemical legislation has not been a panacea for the industry's broad competitiveness challenges, it can stimulate targeted eco-innovation and force a shift in R&D focus and create a foundation upon which a future competitive advantage, based on leadership in green chemistry, could be built. However our own previous analysis[16] shows that such environmental legislation should primarily focus on promoting environmentally friendly technological innovations rather than exerting pressure on existing products and industrial processes to substitute for them. To effectively foster sustainable development, we would advocate for prioritizing a strategy of fiscal support for disruptive innovation over a further escalation of regulatory requirements. Subsequent generations of products and processes demonstrate advancements not only in performance but also in sustainability. Governments can leverage various financial incentives, such as tax relief, research funding, infrastructure development (*e.g.*, for hydrogen and CO_2 transport), and public procurement, to foster environmentally friendly technologies.

What constitutes the true competitive advantage of countries and regions vying with the EU in the chemical sector?

The regulatory pressure on Europe's most important strategic competitors is of course different in detail but can be indisputably assessed as lower. The latter will certainly be confirmed without much thought by any internationally active regulatory affairs expert. How beneficial this lower regulatory pressure is for competitors in detail is of course difficult to quantify.

The regulatory pressure is of course only one piece of the bigger picture. The United States have a structural energy and feedstock advantage, whereas China has a systemic state-directed advantage: subsidies, state-led development, and a managed currency.

What about other countries with REACH-like legislation?

The European Union intended for the REACH Regulation, its philosophy, and its technical infrastructure, such as the IUCLID IT platform, to serve as a global model. While other countries have since adopted or are developing new chemical legislation, they have at best only partially followed the EU model. These new frameworks are often referred to, rather simplistically, as "REACH-like," but a closer look reveals they are, across the board, less complex and demanding. Specifically, the announced chemical legislation plans in several important emerging economies are not expected to reach the depth and complexity of the EU's regime. Furthermore, in most of these countries, there is a tendency to assign lower priority to environmental protection due to numerous other challenges and priorities. This observation holds worldwide, with the main exception being countries seeking EU membership, which are consequently implementing similar legislation. The United Kingdom represents a special case, having implemented the REACH regulation when it left the European Union and now working to adapt it to its national priorities.

To what extent does the contentious debate surrounding the EU PFAS restriction exemplify the perceived culmination of overregulation and the mounting industry resistance?

The EU's restriction on per- and polyfluoroalkyl substances (PFAS) was first proposed in January 2023 when five member state authorities jointly submitted a proposal to the European Chemicals Agency (ECHA). The initiative to ban the "forever chemicals" was spearheaded by Denmark, Germany, the Netherlands, Norway, and Sweden.[17] The proposal has sparked a debate about potential consequences for the economy, industry, and the environment because a blanket ban may lead to significant challenges to replace PFAS-based materials for environmental transition, as well as in medical devices and everyday products.[18] Addressing the issue of PFAS restrictions can serve as a litmus test here. The contentious and high-profile issue of regulating PFAS serves as a crucial case study for the new EU regulatory doctrine in practice. The Commission's approach to PFAS demonstrates a clear attempt to navigate the complex trade-offs between environmental protection, public health, and industrial competitiveness, embodying the new model of "strategic compromise".

We personally believe that a long-term phase-out of PFAS makes perfect sense. However, the aggressive approach demonstrated by some member state authorities with the original REACH restriction proposal for PFAS was at least partially disproportionate. Banning as many hazardous substances as possible in the shortest time is not an end in itself. A targeted, step-by-step approach as it has just been proposed with the now updated PFAS restriction proposal[16] is far more effective for environmental protection and avoids dramatic economic consequences. Appropriately considering the risk (and not the hazard) will further inform the matter (see next section).

Should EU chemicals legislation in the future be based more strongly on the consideration of hazard or risk?†

The debate over reforming chemical legislation has reignited a familiar conflict: whether the focus should be more on hazard or risk. On one side, industry proponents – as always – advocate for a risk-based approach. On the other side are non-governmental organizations and public health advocates who reflexively favor a hazard-based focus.

It is time for both sides to reassess their stances. The risk-based approach, traditionally favored by industry, has often resulted in additional (exposure) data collection and reporting, ultimately creating bureaucratic burdens – for industry. On the other hand, the hazard-based approach is often leading to disproportionate measures and frequently struggling to meet practical needs. The central question is therefore not 'hazard or

† For those unfamiliar with these terms: hazard is the intrinsic property of a chemical to cause harm, *e.g.*, toxicity. Risk is the probability that this harm will actually occur under specific exposure conditions (or protection level). The relationship is often simply expressed as: risk = hazard × exposure.

risk', but rather what best serves societal needs, which will vary based on the specific case.

A move toward greater pragmatism, less radicalism, and a better understanding of each other's concerns would be mutually beneficial. Self-righteousness, legal battles and aggressive public campaigns may boost the profiles and careers of a few and make interesting headlines, but they worsen societal polarization and ultimately do not improve prosperity and health.

What viable pathways exist for fostering sustainable growth within the EU's chemical and related industries?

The EU's policy pivot is a rational response to the constellation of threats. The focus on simplification of regulations is the most politically tractable lever available to policymakers.[19,20] However, the ultimate success of this new strategy is precarious. It hinges on the EU's ability to execute a comprehensive and well-funded industrial policy that addresses the deep-seated structural challenges of energy costs and innovation funding, not just the politically visible issue of regulatory burden.

On 8 July 2025, the European Commission announced its European Chemicals Industry Action Plan. This initiative aims to boost competitiveness and growth by concentrating on four key areas: securing global competitiveness, maintaining a strong European production base, and facilitating a clean and circular economy transition.

Our proposition advocates for the stabilization of current high-level achievements in environmental and health protection, while simultaneously streamlining and rationalizing redundant or excessive regulatory frameworks. This of course necessitates a societal and political shift towards a more audacious and risk-tolerant approach. Crucially, Europe should resist nostalgic attempts to reclaim past industrial production capacities and instead prioritize the establishment of novel, high-technological manufacturing (including however basic products) with ambitious sustainability objectives.[21]

Moreover we would also recommend that a divisive ideological hardening of fronts, as observed in the USA, should be avoided in the EU. This requires goodwill and understanding from both sides. This requires that companies should stay open to the concerns of society. Companies should neither seek salvation solely through the relocation or outsourcing of production, which may appear advantageous in the short term. When it comes to technology, it's not about preserving the ashes, but about passing on the flame. The legislators should more carefully examine how unnecessary bureaucratic burdens can be avoided or reduced and ensure reliable legal certainty that facilitates long-term investments in modern, sustainable technologies.

Is this the end of corporate chemical sustainability?

No, it isn't the end. Neither in Europe nor elsewhere – even under conditions of political counterpressure. However, we anticipate a recalibration. In particular for companies that have already achieved a high level of sustainability, the focus will shift towards a more targeted approach to increasingly complex challenges, encompassing multiple dimensions: climate protection, energy efficiency, biodiversity, water stewardship, chemical footprint, durability, product performance, and material intensity, among others. While existing processes could be refined and optimized to yield increasingly harder to achieve gains, the companies should shorten their innovation cycles to come up with significantly better and more sustainable products and services.

We also observe that sustainability is already deeply ingrained within many companies, and organizations are voluntarily striving to make their solutions as sustainable as possible.[22] Above all, also because the majority of their employees want this.

What conclusions can an academic researcher developing new chemical technologies draw from the political process described?

In considering the political processes described, academic researchers developing new chemical technologies or products should acknowledge that the significance of regulation and sustainability will persist and even grow in the long term, albeit with evolving priorities. It is therefore crucial for them to thoroughly familiarize themselves with both regulatory and economic imperatives. They must recognize that the EU's political landscape is shifting towards a more pragmatic equilibrium between environmental protection and industrial competitiveness. This evolution could create fertile ground for disruptive innovations that are not merely environmentally beneficial but also economically viable, strategically autonomous, and supportive of a new wave of sustainable, high-tech manufacturing within Europe, rather than merely relying on outdated industrial paradigms. In our experience, many academic researchers do not yet adequately factor in regulatory and economic considerations, nor the current state of regulation and sustainability. The latter, in particular, demands comprehensive cradle-to-grave life cycle assessments (LCAs) for any nascent technological option. Only through a comparison of the outcomes from a state-of-the-art LCA can the genuine contribution of a novel technology to sustainable development be ascertained.‡

Researchers should also familiarize themselves with the EU's Safe and Sustainable by Design (SSbD) framework, established in Commission Recommendation (EU) 2022/2510.[23] SSbD is a proactive, pre-market approach that guides the innovation of chemicals and materials to be inherently safer and more sustainable across their entire life cycle. It integrates both safety (minimizing human health and environmental hazards/exposure) and sustainability (addressing environmental, social, and economic impacts, such as circularity and resource efficiency) considerations from the initial design phase. Providing a framework with guiding principles and an assessment procedure, SSbD helps evaluate and continuously improve a material's performance beyond mere regulatory compliance.

‡ Current life cycle assessment (LCA) data has unfortunately often significant limitations, particularly in its frequent failure to differentiate between production methods for substances or materials. This lack of detail, such as not distinguishing between fossil and non-fossil raw material origins, renders the data insufficiently informative and urgently requires correction.

Crucially, it prevents regrettable substitutions by mandating comprehensive safety and sustainability assessments throughout the life cycle, ensuring alternatives meet a broad set of criteria, not just the hazard of the substance they replace.

Conflicts of interest

There are no conflicts to declare.

Abbreviations

BPR	Biocidal Products Regulation, Regulation (EU) No. 528/2012
Cefic	European Chemical Industry Council (from its former French name Conseil Européen des Fédérations de l'Industrie Chimique) is the main European trade association for the chemical industry, https://cefic.org
CLP Regulation	Regulation on Classification, Labelling and Packaging of substances and mixtures, Regulation (EC) No. 1272/2008
CSRD	Corporate Sustainability Reporting Directive, Directive (EU) 2022/2464
IED	Industrial Emissions Directive, Directive 2010/75/EU
LCA	Life Cycle Assessment
PPWR	Packaging and Packaging Waste Regulation, Regulation (EU) 2025/40
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals, Regulation (EC) No 1907/2006
RoHS	Restriction of Hazardous Substances Directive, Directive 2011/65/EU
SCIP	Substances of Concern In Products database – according to Article 9(1)(i) of the EU Waste Framework Directive (EU WFD), https://echa.europa.eu/scip
SSbD	EU's Safe and Sustainable by Design framework, established in Commission Recommendation (EU) 2022/2510
Taxonomy	EU Taxonomy for sustainable activities, Regulation (EU) 2020/852
WFD	Waste Framework Directive, Directive 2008/98/EC

Data availability

The only data we discuss in the article "Change of Tides in European Chemical Legislation" by Eva Ujaczki, and myself is presented in previously published literature. All data can be found in the works cited in the reference list.

Acknowledgements

We would like to thank Linda Bergsten of F. Hoffmann-La Roche Ltd for her valuable comments and suggestions which improved this manuscript.

References

1 *Regulation (EC) No. 1907/2006 of the European Parliament and of the Council of 18 December 2006 on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), An official website of the European Union*, https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=celex%3A32006R1907, accessed Sept. 2025.
2 *Regulation (EC) No. 1272/2008 of the European Parliament and of the council of 16 December 2008 on classification, labelling and packaging of substances and mixtures (CLP), An official website of the European Union*, https://eur-lex.europa.eu/legal-content/DE/TXT/?uri=celex:32008R1272#, accessed Sept. 2025.
3 *Regulation (EU) No. 528/2012 of the European Parliament and of the Council of 22 May 2012 concerning the making available on the market and use of biocidal products (BPR), An official website of the European Union*, https://eur-lex.europa.eu/eli/reg/2012/528/oj/eng, accessed Sept. 2025.
4 *Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions: The European Green Deal (COM(2019) 640 final), An official website of the European Union*, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52019DC0640, accessed Sept. 2025.
5 M. Draghi, *The future of European competitiveness: a competitiveness strategy for Europe*, 2024, An official website of the European Union, https://commission.europa.eu/document/97e481fd-2dc3-412d-be4c-f152a8232961_en, accessed Sept. 2025.
6 *Directorate-General for Communication, Plan for stronger EU chemical industry, An official website of the European Union*, 2025, https://commission.europa.eu/news-and-media/news/plan-stronger-eu-chemical-industry-2025-07-08_en, accessed Sept. 2025.
7 *Directorate-General for Communication, Commission invites feedback on future environmental legislation simplification, An official website of the European Union*, 2025, https://environment.ec.europa.eu/news/feedback-request-simplification-environmental-legislation-2025-07-22_en, accessed Sept. 2025.
8 G. Gavin, *EU leaders to double down on deregulation drive*, Politico, 2025, https://www.politico.eu/article/eu-leaders-double-down-deregulation-drive/, accessed Oct. 2025.
9 Cefic and Advancy, *The Competitiveness of the European Chemical Industry*, Cefic, 2025, https://cefic.org/app/uploads/2025/05/Cefic-Advancy-study-The-Competitiveness-of-the-European-Chemical-Industry.pdf, accessed Sept. 2025.
10 Cefic, *Facts and figures of the European chemical industry*, Cefic, 2024, https://cefic.org/facts-and-figures-of-the-european-chemical-industry/, accessed Sept. 2025.
11 McKinsey Global Institute, *Investment: Taking the pulse of European competitiveness*, McKinsey & Company, 2024, https://www.mckinsey.com/mgi/our-research/investment-

taking-the-pulse-of-european-competitiveness, accessed Sept. 2025.

12 N. Grassano, H. Hernandez Guevara, P. Fako, E. Nindl, A. Georgakaki, E. Ince, L. Napolitano, F. Rentocchini and A. Tuebke, *The 2022 EU Industrial R&D Investment Scoreboard*, Publications Office of the European Union, 2022, https://iri.jrc.ec.europa.eu/sites/default/files/contentype/scoreboard/2022-12/EURDScoreboard2022FINALonline_0.pdf, accessed Sept. 2025.

13 McKinsey & Company, *The State of the Chemicals Industry: Time for Bold Action and Innovation*, McKinsey & Company, 2024, https://www.mckinsey.com/industries/chemicals/our-insights/the-state-of-the-chemicals-industry-time-for-bold-action-and-innovation, accessed Sept. 2025.

14 European Chemicals Agency (ECHA), *Socio-economic impacts of REACH authorisations, a meta-analysis of the state of play of applications for authorisation*, 2021, DOI: 10.2823/375828, ISBN: 978-92-9481-725-9.

15 T. Frohwein and B. Hansjürgens, Chemicals Regulation and the Porter Hypothesis, A Critical Review of the New European Chemicals Regulation, *J. Bus. Chem.*, 2005, **2**(1), 19–36.

16 É. Ujaczki, V. Stark-Rogel, M. Olbrich, M. Fluetsch and J. Backmann, Experiences and consequences of phasing out substances of concern in a multinational healthcare company, *Environ. Sci. Eur.*, 2022, **34**, 101, DOI: 10.1186/s12302-022-00678-0.

17 European Chemicals Agency, *ECHA Publishes PFAS Restriction Proposal*, 2023, https://echa.europa.eu/de/-/echa-publishes-pfas-restriction-proposal, accessed Sept. 2025.

18 A. Ritscher, H. Pehlke and M. Scheel, Per- and polyfluoroalkyl substances (PFAS) in European medical devices and everyday products, *Int. J. Env. Res. Public Health*, 2023, **22**(9), 721, DOI: 10.3390/toxics1109072.

19 European Council, *European Council conclusions on competitiveness and twin transition*, 2025, https://www.consilium.europa.eu/en/press/press-releases/2025/10/23/european-council-conclusions-on-competitiveness-and-twin-transition/, accessed Oct. 2025.

20 European Council, *Report from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on Simplification, Implementation and Enforcement*, https://news.cefic.org/storage/media/2364/COM_2025_871_1_EN.pdf?utm_campaign=PolicyBreakfast22October&utm_medium=email&utm_source=Mailjet, accessed Oct. 2025.

21 Cefic, *Policy Requirements for a Circular, Competitive and more Autonomous EU Chemical Industry*, Cefic, 2025, https://cefic.org/resources/cefic-position-policy-requirements-for-a-circular-competitive-and-more-autonomous-eu-chemical-industry, accessed Sept. 2025.

22 J. Makower, *No, corporate sustainability is not dying*, Trellis, https://trellis.net/article/corporate-sustainability-is-not-dying/, accessed Sept. 2025.

23 *Commission Recommendation (EU) 2022/2510 of 8 December 2022 establishing a European assessment framework for 'safe and sustainable by design' chemicals and materials*, European Commission, 2022, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32022H2510, accessed Dec. 2025.