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SPECIAL SECTION

REGULATORY CHALLENGES IN SUSTAINABLE MARKETS

The Impact of Regulation (EU) 2024/1781 on European Competitiveness

Abstract

Regulation (EU) 2024/1781 marks a significant development in the European Union's commitment to sustainable product governance. This article analyses its impact on market competitiveness, legal coherence, and innovation, with particular attention to small and medium-sized enterprises. The discussion explores the intersection between ecodesign criteria and sector-specific technical standards, highlighting the regulatory complexities that emerge from overlapping legal frameworks. Methodologically, the research adopts a multidisciplinary perspective, combining doctrinal analysis, comparative legal review, and economic policy assessment. Attention is given to the interaction between EU legislation and global supply chains, assessing the capacity of the Regulation to address disparities in regulatory environments. The article identifies areas where implementation gaps and compliance burdens may affect the achievement of sustainability objectives. The paper concludes with policy recommendations focused on differentiated regulatory pathways and adaptive governance structures to promote effective, inclusive, and competitive green transitions within the EU's internal market.

JEL CLASSIFICATION: K32, K33, Q56, L51, F18

SUMMARY

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1 Introduction

Regulation (EU) 2024/1781 constitutes one of the most ambitious legislative instruments within the European strategy for the transition towards a green economy, reflecting a broader trend in which national and European courts have increasingly recognised and enforced environmental principles such as the precautionary principle, non-regression and climate responsibility[1]. Recent jurisprudence[2]—ranging from the German Federal Constitutional Court's landmark ruling on climate law to the French *Conseil d'État's* orders on climate action—demonstrates the growing judicial enforceability of sustainability obligations[3]. Recent scholarship has emphasised that this

[1] Maria Lee, *EU Environmental Law, Governance and Decision-Making* (2nd edn, Hart 2014) ch 4.

[2] The Regulation (EU) 2024/1781 is part of the broader European Green Deal, a strategic initiative launched by the European Commission in December 2019, aimed at achieving climate neutrality by 2050. It follows the Circular Economy Action Plan and builds on previous legislative instruments, introducing legally binding ecodesign obligations applicable beyond energy-related products. See, among others: Commercial Court No 2 of Santander, Judgment No 12/2025, dismissing the existence of misleading advertising due to greenwashing; High Court of Justice of Extremadura, Judgment 479/2022, distinguishing between green economy and circular economy criteria for fiscal benefit purposes; Spanish Supreme Court, Judgment of 22 March 2023, Case RC 1451/2022, recognising the principle of non-regression in environmental protection within urban planning; High Court of Justice of Galicia, precautionary suspension orders in various wind farm cases, based on risk of irreversible environmental damage; Bundesverfassungsgericht, Judgment of 24 March 2021, 1 BvR 2656/18, declaring the Federal Climate Protection Act unconstitutional for lack of intertemporal safeguards; Conseil d'État (France), Commune de Grande-Synthe, Judgment of 1 July 2021, ordering the State to adopt concrete anti-climate change measures; *Case C-366/10 Air Transport Association of America v Secretary of State for Energy and Climate Change* [2011] ECLI:EU:C:2011:864, upholding inclusion of international aviation in the EU Emissions Trading System; *Case C-723/17 Craeynest and Others* [2019] ECLI:EU:C:2019:533, affirming judicial enforceability of air pollution obligations; *Case C-752/18 Deutsche Umwelthilfe eV* [2020] ECLI:EU:C:2020:572, on effective environmental sanctions in cases of governmental inaction. The evolution of European jurisprudence converges on the recognition that sustainability is no longer a merely programmatic principle but a legally enforceable obligation. Both in the case law of Germany and France, as well as in the rulings of the CJEU and various Spanish courts, particular emphasis is placed on the practical effectiveness of the precautionary principle, the prohibition of regression, and climate responsibility. This same background underpins Regulation (EU) 2024/1781, which enshrines circularity and traceability criteria as binding legal obligations. The commonalities reveal a shift from policy-making to the judicialisation of climate action and sustainability, thereby consolidating enforceable normative standards. The new Regulation thus positions itself within a European jurisprudential architecture that has already set the course for strengthening the coherence and binding force of the ecological transition. At the same time, this evolution demonstrates that environmental protection is no longer treated as a secondary policy objective but as a structural condition of market integration. National courts, following the reasoning of the Bundesverfassungsgericht and the Conseil d'État, have required legislative and administrative bodies to adopt concrete measures rather than abstract commitments. This resonates with the architecture of Regulation (EU) 2024/1781, which translates sustainability into operational product-level obligations, making the internal market an instrument of ecological governance. Furthermore, the Spanish jurisprudence on precautionary suspensions and the recognition of non-regression highlights the readiness of national judges to intervene when regulatory inertia risks undermining environmental protection. These dynamics reflect a broader trend in which courts act as guardians of intergenerational equity, ensuring that sustainability commitments are not eroded by economic expediency. From this perspective, the Regulation should be understood as part of a broader normative continuum shaped by judicial interpretation. Its one-size-fits-all model nevertheless raises questions of proportionality that recall earlier CJEU rulings such as *Vodafone and Commission v Hungary*, reminding us that enforceability must be tempered by adaptability. In this sense, the judicialisation of sustainability provides legitimacy while simultaneously imposing constraints: it compels compliance and, at the same time, requires that EU regulation reconcile ambition with fairness across diverse economic sectors.

[3] Juliane Kokott and Christoph Sobotta, 'The Effectiveness of EU Environmental Law: The Role of National Courts' (2020) 32 Journal of Environmental Law 1.

evolution reflects a doctrinal redefinition of climate responsibility and the increased justiciability of the precautionary principle in environmental law.

This Regulation, which focuses on the mandatory integration of environmental sustainability criteria into the design and commercialisation of products, marks a turning point in the legal-industrial framework of the European Union[4]. The Regulation builds upon the policy foundations of the European Green Deal and the Circular Economy Action Plan, introducing product-level obligations that go beyond previous sectoral directives, and aligning EU law with academic calls for a systemic shift towards sustainability-oriented governance[5].

Its cross-cutting application throughout value chains alters both the technical parameters of manufacturing, distribution, and consumption, and the structure of legal, economic, and regulatory relations within the internal market, by imposing structural requirements concerning product durability, traceability, resource efficiency and circularity[6].

From a doctrinal standpoint, the ESPR's shift (Ecodesign for Sustainable Products Regulation) to product-level sustainability obligations operationalises an impact-based regulatory strategy that prioritises measurable outcomes such as durability, reparability and data-enabled traceability over process-based compliance[7]. This approach hinges on the Digital Product Passport (DPP) as a vehicle for standardised, interoperable information flows across supply chains, enabling conformity assessment, market surveillance and circularity services[8]. To ensure legal soundness and effectiveness, scholarship and institutional analyses stress the need to align DPP data models with existing EU reporting architectures (notably ESRS under the CSRD)[9] and with harmonised technical standards

[4] On the evolution of the European legal-industrial framework towards sustainability, see: European Commission, 'The European Green Deal' COM(2019) 640 final; European Commission, 'Communication on the Sustainable Products Initiative' COM(2022) 140 final; Ellen Vos, 'EU Green Deal and Regulatory Governance: From Sectoral to Systemic Innovation?' (2022) 59 Common Market Law Review 621 and Case C-366/10 *Air Transport Association of America v Secretary of State for Energy and Climate Change* [2011] ECLI:EU:C:2011:864, upholding the validity of extraterritorial environmental measures. This Case constituted a landmark in upholding the inclusion of international aviation within the European emissions trading scheme, thereby confirming the validity of environmental measures with extraterritorial effects. The CJEU emphasised that climate protection may justify regulatory restrictions in the face of external commercial interests. This judgment paved the way for a more robust deployment of EU law in transnational contexts. Consequently, it anticipates the normative framework of the Green Deal, wherein sustainability is projected beyond the confines of the internal market.

[5] Elisa Morgera, 'The European Green Deal and the Integration of Sustainability in EU Law' (2021) 30 European Energy and Environmental Law Review 2.

[6] Veerle Heyvaert, 'Governing Circularity: Rethinking EU Product Regulation for the Green Transition' (2022) 35 Journal of Environmental Law 401.

[7] Anne-Christin Mittwoch, 'The Digital Product Passport of the Ecodesign Regulation – Passport to a Successful Twin Transformation in Product Law?' (2024) 45(3) Business Law Review 62–67.

[8] Otto Handle (CEN/CENELEC), "Standardizing the Digital Product Passport: Foundation Set, Implementation Approaching" (interview, CEN/CENELEC, 8 July 2025) <https://wiot-group.com/think/en/articles/otto-handle-cen-cenelec-on-eu-digital-product-passport/> accessed 15 September 2025.

[9] European Financial Reporting Advisory Group (EFRAG), 'ESRS and Data Interoperability: Connectivity with Product-Level Information' (2024); Ł Matuszak, "Assessment of the Compliance of Environmental Disclosures with ESRS Indicators" (2025) 17 Sustainability 3380.

(CEN/CENELEC)[10], thereby reducing duplication, ensuring legal certainty, and making product metrics auditable across jurisdictions and value-chain tiers.

As a matter of EU legal theory, the adoption of this Regulation necessitates a critical assessment of its consistency with the existing body of EU law[11], its conformity with the principles of legal certainty and proportionality[12], and its effectiveness as a harmonisation tool in a global context characterised by significant regulatory asymmetries. The new Regulation does not emerge in a legal vacuum; rather, it integrates into an already dense framework of directives and regulations governing the production, marketing and traceability of goods within the European internal market.

Notably, the Ecodesign Directive for energy-related products (2009/125/EC) remains in force for certain product categories[13], the Corporate Sustainability Reporting Directive (CSRD) has redefined non-financial disclosure obligations[14], and the proposed Directive on Corporate Sustainability Due Diligence (CSDDD) will introduce binding supply chain governance duties for large companies[15].

The overlap and lack of formal repeal clauses, or interpretative guidance by the Commission, risks producing cumulative administrative burdens and legal uncertainty, especially for small and medium-sized enterprises that may lack the resources to navigate parallel reporting and documentation regimes[16].

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[10] Thomas Knothe, '*DPP Presentation-JTC 24*' (UNECE, 27 February 2025) <https://unece.org/sites/default/files/2025-02/DDP%20Presenation%20-%20JTC24%20-%20Dr%20Thomas%20Knothe.pdf> accessed 15 September 2025; Henten A, "Digital Product Passport—EU Sustainability and Circularity…" [2025] Preprints <https://www.preprints.org/manuscript/202504.1765/v1> accessed 15 September 2025.

[11] Paul Craig, *EU Administrative Law* (3rd edn, OUP 2018).

[12] Tridimas T, *The General Principles of EU Law* (3rd edn, OUP 2020).

[13] This integration into an already dense legal ecosystem reflects the European Union's layered regulatory approach, where sector-specific directives (e.g., Directive 2009/125/EC establishing a framework for the setting of ecodesign requirements for energy-related products) coexist with transversal instruments like the Corporate Sustainability Reporting Directive (CSRD). The coexistence of overlapping regimes may raise legal tensions in implementation, particularly in the absence of formal repeal clauses or interpretative communications by the Commission.

[14] Directive (EU) 2022/2464 of the European Parliament and of the Council of 14 December 2022 on corporate sustainability reporting [2022] OJ L 322/15. This directive redefined the non-financial disclosure framework in the Union. It obliges large undertakings and listed SMEs to disclose information on environmental, social and governance risks, thereby integrating sustainability into the corporate reporting regime and enhancing market transparency.

[15] Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products [2009] OJ L 285/10. The Proposal for a Directive on Corporate Sustainability Due Diligence (CSDDD) COM(2022) 71 final aims to impose mandatory human rights and environmental due diligence obligations on large EU and non-EU companies with operations in the internal market. It formalises the legal duty to prevent and mitigate adverse impacts across global supply chains, aligning private governance with public sustainability goals.

[16] European Commission, 'An SME Strategy for a Sustainable and Digital Europe' COM(2021) 350 final. SMEs in the EU represent over 99% of all businesses and account for two-thirds of private sector employment. Despite this economic centrality, they face structural disadvantages in regulatory compliance, including lack of technical staff, limited legal expertise, and restricted access to EU financing. The Ecodesign Directive (2009/125/EC), originally focused on energy-related products, remains applicable alongside Regulation (EU) 2024/1781, raising potential questions of legal hierarchy and duplication of obligations in areas such as durability, reparability and energy performance. The Corporate Sustainability Reporting Directive (CSRD), meanwhile, mandates entity-level disclosures on sustainability risks and impacts, whereas the new Regulation imposes product-level information duties, including digital product passports. Without clear guidance, inconsistencies may arise in reporting thresholds, data granularity and verification standards. The proposed Directive on Corporate Sustainability Due Diligence (CSDDD) introduces further obligations regarding supply chain governance and human rights, potentially overlapping with traceability and life-cycle requirements under

Doctrinal commentary emphasises that the ESPR's systemic ambition requires explicit coordination techniques to ensure legality and effectiveness across overlapping regimes[17]. In particular, practical guidance on lex specialis/posterior and horizontal coherence, together with interoperability between ESRS reporting and DPP traceability via harmonised standards (CEN/CENELEC), are identified as necessary to avoid duplication, enhance legal certainty, and make durability, reparability and circularity metrics auditable across Member States[18].

In parallel, the international context imposes structural constraints on the effectiveness of any environmental measure adopted unilaterally. The increasing openness of global trade, the transnational fragmentation of supply chains, and the persistence of more permissive regulatory frameworks in third countries limit the European Union's ability to enforce ambitious standards without triggering distortions of competition[19]. This tension is further compounded by the rise of protectionist industrial strategies in non-EU economies, which consolidate domestic production capacities through subsidies, lenient standards or selective tariff measures[20]. Within this scenario[21], the EU's aspiration to function as a normative power — shaping international standards through its internal legislation — encounters growing material limitations.

Without adequate coordination between Regulation (EU) 2024/1781, compensatory mechanisms, sector-specific incentives and coherent governance structures, its transformative potential risks being undermined by adverse outcomes such as strategic

the new Regulation. The absence of an integrated implementation framework across these instruments may lead to cumulative compliance burdens, especially for SMEs lacking the capacity to navigate parallel reporting and documentation regimes.

[17] Mittwoch (n 7).

[18] Koen Lenaerts and José A Gutiérrez-Fons, 'The General System of EU Environmental Law Enforcement' (2011) 30 Yearbook of European Law 3.

[19] Regulation (EU) 2023/956 of the European Parliament and of the Council of 10 May 2023 establishing a Carbon Border Adjustment Mechanism [2023] OJ L 130/52. See also Case C-366/10 Air Transport Association of America and Others ECLI:EU:C:2011:864, para 127 (validating the extraterritorial reach of EU environmental law, provided proportionality is maintained); and Case C-358/14 Poland v European Parliament and Council ECLI:EU:C:2016:323, 78–81 (upholding climate legislation despite industrial impact, reinforcing environmental objectives as legitimate in an open economy). Case C-358/14 represented a direct confrontation between the industrial interests of Member States heavily reliant on coal, such as Poland, and the Union's climate objectives. In paragraphs 78–81, the CJEU reaffirmed that emission reduction measures form part of the Union's essential commitments under Article 191 TFEU and that their legitimacy is not undermined by the economic impact they may generate in certain sectors. The Court stressed that the principle of proportionality must be assessed in light of the overarching goal of energy transition, thereby reinforcing the primacy of environmental protection over short-term industrial concerns. This line of case law consolidates the view that economic development within the internal market is legally conditioned by climate sustainability, anticipating what is now embodied in instruments such as the Carbon Border Adjustment Mechanism (Regulation (EU) 2023/956). In sum, the Poland case confirms that EU law has embraced sustainability as a structural limit on economic growth and as a foundation for extraterritorial regulatory action.

[20] See United States, Inflation Reduction Act, Public Law 117–169 (16 August 2022), which introduces major tax credits and subsidies for domestic clean energy; China, Industrial Green Development Plan (2021–2025), issued by the Ministry of Industry and Information Technology. For the EU response, see European Commission, 'A Green Deal Industrial Plan for the Net-Zero Age' COM(2023) 62 final; and Commission Communication on the Temporary Crisis and Transition Framework for State Aid, OJ C 101/03, 17 March 2023.

[21] Ian Manners, 'Normative Power Europe: A Contradiction in Terms?' (2002) 40(2) Journal of Common Market Studies 235.

offshoring, erosion of the European industrial base, and reduced economic resilience among the Union's more vulnerable operators.

Recent legal analysis[22] has highlighted that the absence of synchronisation between this Regulation and existing financial and industrial instruments —such as InvestEU[23] and the Innovation Fund— poses a systemic risk to its effective implementation, particularly in highly competitive or capital-constrained sectors. Both official impact assessments and scholarly commentary underline that, without integrated fiscal and governance support[24], the viability of ambitious sustainability frameworks remains empirically limited for most operators[25], especially for SMEs[26].

From a methodological perspective, this research is situated within a comprehensive analytical framework[27] that treats Regulation (EU) 2024/1781 not as an isolated legal instrument but as part of a complex normative architecture[28]. The analysis considers its structural impact on the European legal ecosystem, its interaction with the dynamics of international trade, and its redistributive effects across economic actors, with particular emphasis on small and medium-sized enterprises. Within this context, the study pursues four core objectives: (i) to identify internal regulatory tensions that hinder the coherent and uniform application of the Regulation; (ii) to assess the legal and economic burdens that affect operators differently depending on their size and operational capacity; (iii) to examine the implications of the new framework in terms of competitiveness, innovation and market access; and (iv) to formulate regulatory proposals that align environmental sustainability goals with criteria for economic viability and normative equity.

This approach is grounded in a critical review of the key provisions of Regulation (EU) 2024/1781, supplemented by an analysis of other relevant legal instruments[29], the case law of both the Member States and the Court of Justice of the European Union (CJEU),

[22] Marjan Peeters, Mariolina Eliantonio, Kati Kulovesi, Suvi-Tuuli Puharinen and Annalisa Savaresi, 'Greening the EU and the Rule of Law: Reflections on Opportunities and Limits of the EU's Legal Powers' Maastricht University Working Paper 2025 <https://cris.maastrichtuniversity.nl/ws/portalfiles/portal/262716895/Prepublication_draft_chapter_ssrn-5315459.pdf> accessed 15 September 2025.

[23] Regulation (EU) 2021/523 of the European Parliament and of the Council of 24 March 2021 establishing the InvestEU Programme and amending Regulation (EU) 2015/1017 [2021] OJ L 107/30. For discussion on the fiscal-operational gap in green regulatory implementation, see European Commission, 'The Innovation Fund: Climate Action through Technology' <https://climate.ec.europa.eu/eu-action/funding-climate-action/innovation-fund_en> accessed 15 September 2025.

[24] OECD, 'SMEs in a Green Recovery' (OECD Publishing 2021). See also Manners (n 21). For further judicial and regulatory context, see Case C-366/10 Air Transport Association of America (n 7); and Regulation (EU) 2023/956 (n 7), both illustrating the challenge of maintaining industrial competitiveness while enforcing high internal environmental standards.

[25] Manners (n 21).

[26] Yuri Bokov, Sergei Katsuba, Tatiana Kvasnikova and Viktor Shestak, 'Liability for Violation of Environmental Legislation in the EU' (2021) 30 European Energy and Environmental Law Review 9.

[27] Jolanta Malinauskaite, 'Competition Law and Sustainability: EU and National Approaches' (2022) 13(5) Journal of European Competition Law & Practice 336.

[28] Aude-Solveig Epstein, 'EU Environmental Law in the Digital Age: A Critical Outlook on the Twin Transition's Legal Structure' (2025) 1 European Journal of Risk Regulation 1–17.

[29] Michael Uffer, 'Competition Law' in Leonie Reins and Joris Thijssen (eds), *Sustainability through Product Policy* (Brill 2023) ch 9.

and leading doctrinal contributions[30] addressing the interplay between environmental, economic and competition law.

In this respect, the research is situated within the tradition of systemic legal analysis[31], focusing on the internal coherence, functional architecture and effectiveness of complex regulatory regimes. Rather than employing a law-and-economics approach[32], this study draws on interdisciplinary methods to examine how Regulation (EU) 2024/1781 interacts with existing legal frameworks, administrative practices, and technical standards across the European Union. Emphasis is placed on evaluating the Regulation's operationalisation within the broader EU legal and governance ecosystem, paying particular attention to regulatory overlaps, coordination challenges, and the implications for different categories of economic operators, especially SMEs. This systemic perspective is informed by leading scholarship on the interaction of multi-level norms, legal adaptation in evolving policy fields, and the practical mechanisms required to secure regulatory coherence, proportionality and legal certainty in the sustainable product agenda.

Likewise, the practical relevance of this study should not be underestimated. The effective implementation of Regulation (EU) 2024/1781 entails strategic decisions for national governments, regulatory bodies, multinational corporations, and small local entities alike. The legal uncertainties arising from its interpretation, combined with the technical and documentary compliance requirements[33], may result in barriers to market access, litigation due to non-compliance, and even instances of "regulated greenwashing"[34], where obligations are confined to formal requirements without producing verifiable material impact.

[30] On the dual methodological framework combining law and economics with legal systemic analysis, see the distinction articulated in EU scholarship between incentive-based assessment and normative coherence in the integration of fragmented regimes. The former focuses on behavioural and efficiency outcomes, while the latter examines the internal logic and interaction of legal instruments within complex governance systems. These perspectives are particularly valuable when analysing legislation such as Regulation (EU) 2024/1781, which operates across multiple regulatory layers and affects both economic performance and institutional consistency.

[31] Niklas Luhmann, *Law as a Social System* (Oxford University Press 2004); Lenaerts and Gutiérrez-Fons (n 18); Aude-Solveig Epstein (n 28); European Commission, Commission Staff Working Document: Impact Assessment Accompanying the Proposal for a Regulation on Ecodesign for Sustainable Products SWD(2022) 89 final, vol I, 12–14.

[32] Richard A Posner, *Economic Analysis of Law* (9th edn, Wolters Kluwer 2014); Guido Calabresi, *The Costs of Accidents: A Legal and Economic Analysis* (Yale University Press 1970); Damien Gerard, 'EU Competition Law and Environmental Protection: The Economic Approach' (2021) 17(2–3) European Competition Journal 473; Niklas Luhmann (n 31); Miguel Poiares Maduro, 'Three Claims of Constitutional Pluralism' in Gareth Davies and Matej Avbelj (eds), *Legal Pluralism in European Law* (Hart 2012) 67. For the institutional perspective, see European Commission, Commission Staff Working Document: Impact Assessment Accompanying the Proposal for a Regulation on Ecodesign for Sustainable Products, SWD(2022) 89 final, vol I, 12–14.

[33] European Commission, Proposal for a Directive on substantiation and communication of explicit environmental claims (Green Claims Directive), COM(2023) 166 final.

[34] Regulated greenwashing refers to the institutionalisation of sustainability claims within legal compliance frameworks that are formally satisfied without producing substantive environmental outcomes. This risk is heightened when indicators are self-reported or lack independent verification. The European Commission has addressed this issue in its proposal for a Green Claims Directive (COM(2023) 166 final), which introduces standardised assessment methods and mandatory third-party verification. See also European Court of Auditors, 'Special Report 18/2021: The EU's Sustainable Finance Strategy – Ambitious Plans Require Stronger Oversight' (2021), which highlights how formalised compliance may dilute material impact. For a normative reference, see Regulation (EU) 2024/1781, recital 45, which warns against unnecessary regulatory burdens but may itself be interpreted in ways that compromise environmental integrity.

In light of this complexity, a technical analysis is essential to anticipate key pressure-points[35] within the Regulation and to propose corrective mechanisms aimed at streamlining the system, protecting the most vulnerable actors, and reinforcing the European Union's leadership in environmental governance[36].

In sum, this research argues that Regulation (EU) 2024/1781 represents a historic opportunity to reorient the European production model towards a more sustainable paradigm. However, this opportunity is contingent upon the ability of legislators and legal practitioners to formulate regulatory, institutional, and technical solutions that reconcile environmental sustainability with economic efficiency, legal certainty, and fairness among market actors. This fundamental tension between regulatory ambition and operational feasibility will serve as the guiding thread for the analysis developed in the sections that follow.

To guide the reader through its analytical progression, this article is organised into eight substantive sections. Following this introduction, Section 2 examines the principal regulatory challenges in industrial sectors, with attention to technical complexities, intra-EU asymmetries, interoperability issues, barriers to innovation, and the relationship between ecodesign obligations and green fiscal policy. Section 3 analyses the specific impact on small and medium-sized enterprises, highlighting structural vulnerabilities, disproportionate burdens and comparative insights from other regulatory systems. Section 4 addresses the challenges of harmonising the new framework with existing legislation, while Section 5 focuses on supply chain responsibilities and the regulatory gaps they expose. Section 6 assesses the implications for European industrial competitiveness, and Section 7 explores the socioeconomic and consumer dimensions of the Regulation. Finally, Section 8 synthesises the main findings and offers a forward-looking regulatory outlook. Throughout, the analysis implicitly addresses two central research questions, namely: to what extent is Regulation (EU) 2024/1781 effective and coherent in achieving sustainable product governance framework within the EU internal market, and, secondly, what are the legal and economic consequences of its implementation?

[35] Institute for European Environmental Policy, 'External Impacts of New EU Sustainable Product Standards' (IEEP 2025) <https://ieep.eu/wp-content/uploads/2025/04/External-impacts-of-new-EU-sustainable-product-standards-IEEP-2025.pdf> accessed 15 September 2025.

[36] The tension between normative ambition and operational feasibility has long characterised EU environmental regulation. A comparable dynamic occurred during the implementation of the GDPR (Regulation (EU) 2016/679), where stringent obligations initially overwhelmed small entities with limited capacity. See Paul Craig and Gráinne de Búrca, *EU Law: Text, Cases, and Materials* (7th edn, Oxford University Press 2020) 1016–1035. Similar concerns have been raised in relation to Regulation (EU) 2024/1781. The European Commission's Sustainable Products Initiative (COM(2022) 140 final) acknowledges the risk of disproportionate burdens, particularly for SMEs. Recital 45 of the Regulation highlights the need to minimise administrative burdens, yet fails to specify exemption criteria or adaptive mechanisms. The European Economic and Social Committee has echoed these criticisms in its Opinion INT/973 (2022). See also Dirk Schoenmaker, 'Greening the EU Financial System: From Ambition to Implementation' (2022) 24(3) Environmental Law Review 189.

2 Regulatory challenges in industrial sectors

2.1 Technical complexities in the application of general ecodesign criteria

Regulation (EU) 2024/1781 adopts a cross-sectoral approach aimed at harmonising sustainability criteria across all stages of a product's life-cycle[37], from its design to its disposal or reuse. However, this normative transversalism—while desirable from an integrated ecological perspective—comes into direct tension with the specific technical requirements that define certain industrial sectors. In the absence of detailed specifications or a framework for adaptive regulation, a conflict arises between the guiding principles of ecodesign and the technical operability of sectors already governed by existing sector-specific legislation[38].

The design of products in sectors such as biomedical technology, aerospace, or microelectronics is subject to safety, sterility, or energy-efficiency standards that are not always compatible with the new requirements for durability, modularity, or reparability imposed by Regulation (EU) 2024/1781[39]. In particular, medical devices regulated under Regulation (EU) 2017/745 on medical devices must comply with strict requirements concerning structural integrity and sterility, which in many cases preclude the incorporation of mechanisms for repair or reuse. This regulatory incompatibility is further exacerbated by the absence of explicit technical exemption clauses or sector-specific impact-assessment procedures within the Ecodesign Regulation itself[40].

In turn, the information requirements concerning the use of hazardous substances—such as those established under Regulation (EC) No 1907/2006 (REACH)—impose traceability obligations on producers that are not adequately integrated with the Digital Product Passport system set out in Article 10 of Regulation (EU) 2024/1781. This leads to duplicated documentation, incompatibility between databases and technical barriers that affect the operability of value chains, particularly in sectors already subject to stringent

[37] Regulation (EU) 2024/1781 of the European Parliament and of the Council of 13 June 2024 establishing a framework for setting ecodesign requirements for sustainable products [2024] OJ L 202/1. See also Article 114 TFEU as the legal basis for internal market approximation measures.

[38] See Regulation (EU) 2017/745 of the European Parliament and of the Council of 5 April 2017 on medical devices [2017] OJ L117/1; and Regulation (EU) 2018/1139 of the European Parliament and of the Council of 4 July 2018 on common rules in civil aviation [2018] OJ L 212/1. On tensions with ecodesign obligations, see European Commission, 'Staff Working Document Accompanying the Proposal for a Regulation on Ecodesign for Sustainable Products' SWD(2022) 89 final, 28 March 2022.

[39] See Regulation (EU) 2017/745 on medical devices, art 5 and Annex I. For aviation, see Regulation (EU) 2018/1139 and EASA technical certification requirements. For electronics, see Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment [2011] OJ L 174/88. These sectoral regimes illustrate potential incompatibilities with the generalised obligations introduced by Regulation (EU) 2024/1781.

[40] Regulation (EU) 2024/1781, art 16. On regulatory gaps in high-risk sectors, see European Commission, 'Staff Working Document Accompanying the Proposal for a Regulation on Ecodesign for Sustainable Products' SWD(2022) 89 final, 28 March 2022. See also Regulation (EU) 2017/745, Annex I. Stakeholder consultation reports under the Commission's Better Regulation agenda have flagged the need for delegated acts to reconcile sector-specific requirements with horizontal sustainability goals.

monitoring, such as fine chemicals, automotive manufacturing and semiconductor production[41].

It is not sufficient to impose general ecodesign criteria without simultaneously establishing a technical framework for regulatory coordination[42], sectoral adaptation[43] and digital interoperability[44]. It is necessary to develop mechanisms that ensure compatibility between the Regulation and existing sector-specific technical frameworks, as well as to introduce a general coordination clause that prevents the overlap or contradiction of obligations that are functionally, legally or economically incompatible.

2.2 Internal regulatory asymmetries and intra-EU competitiveness

One of the most notable side-effects of Regulation (EU) 2024/1781 is the emergence of regulatory disparities among Member States, arising not only from differences in institutional capacity[45], but also from divergent legal traditions and productive structures[46]. The practical implementation of the Regulation largely depends on the existence of national authorities capable of issuing interpretative guidelines, monitoring compliance, and effectively enforcing sanctions. This capacity varies significantly across countries, thereby exacerbating existing regulatory asymmetries within the Union.

The principle of mutual trust between national legal systems, as affirmed by the CJEU, is undermined when the same product can circulate freely within the Union despite having been subject to entirely different environmental or traceability requirements in its Member State of origin. This leads to distortions of competition within the internal market, where economic operators do not compete under equal conditions. In legal terms, this constitutes an indirect breach of the level-playing-field principle and of the principle of non-discrimination, both of which are essential to the legitimacy of Union law.

These divergences also translate into differentiated effects on corporate tax strategies, logistics and investment planning. While Germany and the Nordic countries benefit from advanced systems of eco-labelling, green taxation, and public support for ecological innovation, other Member States continue to operate carbon-intensive industrial models with limited infrastructure for implementing structural changes in their production

[41] Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) [2006] OJ L 396/1, arts 7 and 33. See also ECHA, 'SCIP Database'<https://echa.europa.eu/scip> accessed 15 September 2025· On interoperability concerns, see European Commission, SWD(2022) 89 final.
[42] Lee (n 1).
[43] Patrick Thieffry, *Manuel de droit européen de l'environnement et du climat* (4e éd, Bruylant 2024).
[44] Sean Whittaker, 'Exploring a Right to Submit Environmental Information Under International Environmental Law' (2023) 35(3) Journal of Environmental Law 401–418.
[45] Suzanne Kingston, Veerle Heyvaert and Aleksandra Čavoški, *European Environmental Law* (Cambridge University Press 2017).
[46] Regulation (EU) 2024/1781, recital 5. See also Regulation (EU) 2019/1020 of the European Parliament and of the Council of 20 June 2019 on market surveillance and compliance of products [2019] OJ L 169/1. European Court of Auditors, 'Special Report 18/2021: EU Action on Product Safety' <https://www.eca.europa.eu> accessed 15 September 2025.

processes. The combination of regulatory requirements and uneven compliance capacities has led to "internal regulatory relocation", whereby companies move operations within the EU in search of more favourable—albeit less sustainable—regulatory environments[47].

From the perspective of competition law, this situation may also encourage practices of covert forms of environmental dumping or tax-optimisation strategies based on fragmented regulatory compliance. The European Commission should intervene through interpretative communications or delegated acts to harmonise minimum conditions for the Regulations's application, thus ensuring regulatory coherence and the proper functioning of the internal market.

2.3 Lack of interoperability with existing technical standards

One of the most significant obstacles to the effective implementation of Regulation (EU) 2024/1781 is its insufficient interoperability with existing technical standards[48] at both European and international levels. Although the Regulation refers to the establishment of sustainable design requirements based on life-cycle analysis, it fails to provide clear mechanisms for integrating these requirements with frameworks such as ISO 14006 (environmental management systems for ecodesign), ISO 20400 (sustainable procurement), or the sector-specific standards issued by the European Committee for Standardisation (CEN)[49].

This regulatory disconnect creates a paradox: operators that have already adopted international sustainability standards may be compelled to alter processes to comply with a new, less detailed yet formally binding framework. This duplication discourages voluntary self-regulation and undermines the principle of mutual recognition that has long characterised European technical law.

In the construction sector, for example, Directive 2010/31/EU on the energy performance of buildings already sets advanced technical standards on materials, passive design, and emissions reduction. The simultaneous application of Regulation (EU) 2024/1781, without specific technical-integration guidelines, creates operational incompatibilities and interpretative uncertainty. Similarly, in the field of energy-related

[47] Regulation (EU) 2021/1056 of the European Parliament and of the Council of 24 June 2021 establishing the Just Transition Fund [2021] OJ L 231/1. See also European Commission, 'The European Green Deal' COM(2019) 640 final; and 'Green Deal Industrial Plan for the Net-Zero Age' COM(2023) 62 final. On regulatory arbitrage and intra-EU relocation, see OECD, 'Regions in Industrial Transition' (2023) <https://www.oecd.org/en/publications/regions-in-industrial-transition-2023_5604c2ab-en.html> accessed 15 September 2025.

[48] Thieffry (n 43) 589–612.

[49] Regulation (EU) 1025/2012 on European standardisation encourages alignment with international standards, including those developed by ISO and CEN. However, Regulation (EU) 2024/1781 does not incorporate explicit cross-references to ISO 14006 (ecodesign), ISO 20400 (sustainable procurement), or the CEN/TC 350 standards on sustainability in construction. Articles 10 and 13 refer broadly to life-cycle criteria and conformity requirements, but lack operational guidance on harmonisation. This omission may hinder consistency across certification schemes and obstruct the mutual recognition of compliance tools, especially in sectors already regulated by technical standards. It also raises concerns about legal certainty for manufacturers operating within international supply chains.

products, Directive 2009/125/EC already sets binding ecodesign requirements, yet its relationship with the Regulation's criteria remains legally undefined.

To avoid fragmentation, dynamic technical annexes should explicitly refer to harmonised standards and internationally recognised norms. This technique, already employed in the regulation of chemical products under the CLP Regulation (EC) No 1272/2008 and in product energy-labelling rules, reduces regulatory burdens and enhances legal certainty. Additionally, producers should be allowed to demonstrate compliance with the Regulation's requirements through equivalent certifications issued by bodies accredited under ISO/IEC 17065[50].

2.4 Barriers to technological innovation

Sustainability and technological innovation are, in theory, complementary concepts. However, Regulation (EU) 2024/1781 imposes requirements that may, in practice, act as barriers to the development of emerging or disruptive technologies[51]. By enforcing uniform criteria for durability, reparability, and recyclability without accounting for the specificities of frontier technologies[52], the Regulation creates a legal environment that discourages experimentation[53] and restricts industrial design freedom.

This problem is particularly pronounced in highly competitive sectors such as consumer electronics and automotive manufacturing, where innovation cycles are short and design decisions are driven more by technological obsolescence than by functional deficiency. In such contexts, the obligation to ensure the availability of spare parts for a minimum number of years becomes a disproportionate burden for products whose competitive value lies in their capacity to integrate continuous improvements.

Moreover, applying these criteria to pre-commercial or prototype-phase products—such as those based on artificial intelligence, advanced robotics, or nanotechnology—may

[50] The absence of normative interoperability risks fragmenting the internal market, penalising early adopters, and weakening the EU's regulatory influence abroad. Without dynamic annexes and equivalence mechanisms, divergent compliance models may foster intra-EU relocation, distort competition, and reduce the credibility of EU green standards in global trade negotiations and supply chain governance.

[51] Jolanta Rzepecka, Anna Fuksiewicz, Federica Squillante and others, 'The Impact of EU Legislation in the Area of Digital and Green Transition, particularly on SMEs' (2024) PE 754.213, European Parliament <https://www.europarl.europa.eu/RegData/etudes/STUD/2024/754213/IPOL_STU(2024)754213_EN.pdf> accessed 15 September 2025.

[52] Frontier technologies refer to advanced, rapidly evolving innovations with the potential to disrupt existing systems and generate significant economic, social, or environmental impact. According to UNCTAD, 'Technology and Innovation Report 2021', these include artificial intelligence, robotics, nanotechnology, and biotechnology. In the EU context, the Horizon Europe programme classifies these as "high-risk/high-reward" technologies requiring flexible regulatory frameworks and early-stage testing environments. Regulation (EU) 2024/1781 does not currently provide tailored provisions for such technologies, raising concerns about overregulation and delayed market access.

[53] The concept of "regulatory paralysis" has been analysed by the OECD in 'Overcoming Barriers to SME Participation in Sustainability Policy' (2021), which notes that excessive or poorly calibrated regulatory frameworks can delay innovation by diverting resources from research and development to compliance. The European Court of Auditors similarly warned of such effects in 'Special Report 14/2020' on energy efficiency, highlighting risks of innovation stagnation caused by legal uncertainty.

impede market entry for high-impact environmental innovations, simply because they do not comply with parameters conceived for standardised consumer goods.

From the perspective of Union law, this conflict clashes with the principles of proportionality and innovation as recognised in Article 114 TFEU and further developed in the case law of the Court of Justice of the European Union. In Vodafone and Others (Case C-58/08), the Court reiterated that legislative intervention must strike a balance between objectives of general interest and the need to avoid hindering technological development and the free movement of goods[54].

A plausible solution would be to incorporate flexibility clauses into the Regulation, similar to those provided under Regulation (EU) 305/2011 on construction products, which allow for the issuance of European Technical Assessments for innovative products that do not conform to harmonised standards. In addition, "regulatory sandboxes" could be established for emerging green technologies, following the model recently implemented by the Commission in the field of sustainable digital financial products.

2.5 Disconnection between regulation and green fiscal policy

One of the most widely criticised aspects of Regulation (EU) 2024/1781 is its lack of alignment with the fiscal and financial instruments that should support the transition to ecodesign. Sustainability, understood as a structural transformation of the production model, cannot rely solely on regulatory obligations without adequate backing in the form of economic incentives, accessible financing, and competitive advantages.

Ecological design requires significant upfront investment in R&D, product redesign, material substitution, and the transformation of industrial processes. However, the Regulation remains silent on potential support mechanisms, creating a "sunk-cost"[55] scenario for producers seeking to anticipate future regulatory demands. This omission stands in contrast to other EU initiatives, such as the European Green Deal or the Green Deal Investment Plan, which do provide for specific financial instruments, including the Innovation Fund and the Just Transition Mechanism.

The lack of coordination between technical regulation and green taxation also produces adverse effects: more sustainable yet more expensive products may be penalised in the

[54] Article 114 TFEU underpins the internal market and requires that harmonisation measures respect the principles of proportionality and innovation. In C-58/08 Vodafone and Others [2010] ECLI:EU:C:2010:321, the Court of Justice of the European Union held that EU legislation must not disproportionately restrict technological progress or distort the free movement of goods. The Vodafone judgment illustrates how Article 114 TFEU operates as both an enabling and limiting provision: it allows EU harmonisation to address new market realities, while requiring that such measures avoid undue restrictions on innovation. The Court confirmed that harmonisation may legitimately pursue objectives beyond market efficiency, provided proportionality is respected. This reasoning reinforces a balance between regulatory intervention and technological progress within the internal market.

[55] In economic terms, a "sunk cost" refers to an investment that cannot be recovered once made. In regulatory contexts, it describes the risk borne by firms that adopt sustainable practices ahead of formal incentives or harmonised requirements. Without financial support, early movers internalise costs that later competitors may avoid, distorting competitive neutrality and slowing innovation diffusion.

market when compared to non-sustainable alternatives, simply due to the absence of tax relief or subsidies. This situation undermines the principle of horizontal coherence[56] in EU law and weakens the effectiveness of the Regulation itself.

It is necessary to integrate the implementation of the Regulation with the State-aid framework authorised by the Commission for the circular economy, in accordance with the Guidelines on State aid for Climate, Environmental Protection and Energy (2022/C 80/01). Furthermore, the development of harmonised fiscal mechanisms should be encouraged, such as ecodesign tax credits or reduced VAT rates for products bearing a digital product passport, as foreseen in Directive 2022/542/EU.

2.6 Proposal for sector-specific soft law frameworks

Given the difficulty of establishing binding criteria that are equally effective across all sectors, a viable alternative lies in the development of sector-specific soft law instruments. These could take the form of guidelines, codes of practice or technical verification protocols developed jointly by the European Commission, sectoral agencies (such as ECHA, EFSA or ENISA), and representatives of private industry[57].

The use of soft law has been a recurrent feature in the development of Union law, particularly in areas such as competition, public procurement and banking regulation. Its advantage lies in its flexibility to adapt to evolving technical realities and its capacity to build regulatory consensus without the need for lengthy or rigid legislative procedures. In the context of ecodesign, such instruments would provide "authoritative interpretations"[58] on how to apply the Regulation's criteria to specific products, including household appliances, technical textiles, hybrid vehicles or complex packaging[59].

[56] The horizontal coherence principle requires EU policies and legal instruments to function consistently across sectors and objectives. While not codified explicitly, it derives from Articles 7 and 11 TFEU, mandating integration of environmental and sustainability considerations in all Union policies. The principle has been affirmed by the Court of Justice in C-379/98 PreussenElektra [2001] ECLI:EU:C:2001:160 and by the European Court of Auditors in Special Report 21/2022 on policy coherence for sustainable development. See Paul Craig and Gráinne de Búrca, *EU Law: Text, Cases, and Materials* (8th edn, Oxford University Press 2024). In PreussenElektra, the CJEU upheld German renewable energy support schemes against internal market challenges, recognising environmental protection as a legitimate Union objective. The judgment illustrates how sustainability can justify regulatory intervention even where it affects competition or free movement. By affirming the integration of environmental aims, the Court gave early substance to the horizontal coherence principle. This line of reasoning directly anticipates the logic of Regulation (EU) 2024/1781, where sustainability permeates market harmonisation.

[57] The European Union frequently relies on soft law instruments to provide technical clarity and sectoral adaptation, particularly where harmonised rules are unavailable. Examples include the EU Guidelines on State aid for environmental protection and energy (2022/C 80/01), the ECHA Guidance on REACH and CLP, and ENISA's cybersecurity recommendations. Though non-binding, these instruments play a key role in consistent implementation, legal interpretation, and reducing regulatory uncertainty across Member States. Their legitimacy is grounded in Article 292 TFEU and frequent endorsement by specialised EU agencies and expert groups.

[58] Sasha Garben, *Soft Law in the European Union: the Changing Landscape of Governance* (Hart Publishing 2021).

[59] In environmental and product regulation, soft law instruments often serve as de facto interpretative standards. The 2012 Commission Recommendation on common methods for measuring and communicating environmental performance of products (2013/179/EU) and the Product Environmental Footprint (PEF) guidelines exemplify such use. These tools, while not legally binding, have guided conformity assessment and market practices. In ecodesign, similar instruments could bridge regulatory gaps until delegated acts under Article 16 of Regulation (EU) 2024/1781 are adopted.

In addition, the development of sectoral soft law would help address the regulatory vacuum left by the absence of delegated and implementing acts, as foreseen under Article 16 Regulation, which has not yet been adopted. In this regard, the Commission could rely on the Technical Committees of CEN/CENELEC to elaborate dynamic technical annexes and periodically revise sustainability requirements in line with technological developments and emerging industrial practices.

These frameworks should not replace binding legislation but should instead act as interpretative complements that enhance uniform application, legal certainty and reduce compliance costs. Ultimately, they would contribute to a more comprehensive, adaptable and functional legal architecture for the Regulation, without compromising its ecological ambition or its coherence with the Union acquis.

3 Impact on Small and Medium-Sized Enterprises (SMEs)

3.1 Introduction: structural vulnerability of SMEs in the ecological transition

The application of Regulation (EU) 2024/1781 on ecodesign requirements for sustainable products gives rise to a series of regulatory tensions that particularly affect small and medium-sized enterprises (SMEs)[60]. Although the legislative text employs a rhetoric of universality and neutrality, its implementation reveals deep structural disparities in compliance capacity between large corporations and smaller economic operators. This regulatory inequality, which may be viewed as an unintended externality of the greening of the internal market, reproduces patterns of economic exclusion that contradict foundational principles of Union law[61].

From a European constitutional perspective, the impact of this Regulation on SMEs must be assessed in light of the principle of proportionality (Article 5 TEU), the principle of equality in competition, and the mandate for economic, social and territorial cohesion set out in Article 174 TFEU. The obligations imposed by Regulation (EU) 2024/1781 — particularly those related to the digital product passport, compliance with reparability and recyclability criteria, and material traceability — entail upfront investments in digital infrastructure, advanced technical knowledge, and redesign of production processes, which often exceed the technical and financial absorption capacity of SMEs[62].

[60] Jolanta Rzepecka and others (n 1) 81–91, 13–32.

[61] Article 3 TEU establishes the Union's objective of promoting a highly competitive social market economy aimed at full employment and social progress, encompassing distributive justice in market regulation. SMEs, which represent the backbone of this economy, are supported through various European Commission communications and strategies, including European Commission, SME Strategy for a Sustainable and Digital Europe, COM(2021) 350 final.

[62] Regulation (EU) 2016/679 (GDPR) explicitly calibrates obligations according to the scale and nature of data controllers (see recital 13 and article 30(5)), contrasting with Regulation (EU) 2024/1781's one-size-fits-all approach. This raises proportionality concerns as developed by the CJEU in Case C-58/08 Vodafone and Others [2010] ECLI:EU:C:2010:321. The Vodafone judgment provides an instructive contrast for assessing Regulation (EU) 2024/1781. In C-58/08, the CJEU upheld EU harmonisation under Article 114 TFEU but stressed that such measures must be proportionate and avoid

Recital 45 of the Regulation refers generically to the need to avoid unnecessary regulatory burdens, yet this recognition has not translated into an operative legal clause, nor into concrete mechanisms of modulation, exemption or progressive implementation. In this regard, the legal text lacks the technical tools necessary to give effect to the principle of proportionality in its economic dimension. Unlike Regulation (EU) 2016/679 on General Data Protection, where the size and nature of the data controller are decisive in determining applicable obligations, the Ecodesign Regulation imposes a uniform standard that disregards business heterogeneity.

Specialised academic literature has warned of this phenomenon, framing it within what has been termed "structural regulatory asymmetry"[63]. In this context, it should be acknowledged that large corporations possess greater compliance capacity and may convert regulatory demands into indirect entry barriers, consolidating market positions through compliance strategies that exclude less resilient competitors[64]. This dynamic has been highlighted in recent reports by the EPRS and the OECD, which highlight how undifferentiated sustainability frameworks tend to concentrate green innovation within large conglomerates, thereby marginalising thousands of smaller operators with transformative potential[65].

At the institutional level, the lack of effective consultation with SME representatives during the drafting process of the Regulation reveal a shortcoming in the participatory-governance model. In other contexts, the European Commission has promoted mechanisms such as the SME Test and the Fit for Future Platform, specifically designed to ensure that new regulations are compatible with the operational reality of SMEs. However, these mechanisms were not consistently applied during the development of Regulation (EU) 2024/1781, raising concerns about the procedural legitimacy of the instrument in relation to the "Think Small First" principle enshrined in the Small Business Act for Europe (COM(2008) 394 final)[66].

imposing excessive constraints on technological development or market freedoms. By comparison, the GDPR embodies this principle through differentiated obligations tailored to the size and risk profile of data controllers, thereby operationalising proportionality. Regulation (EU) 2024/1781, by contrast, adopts a uniform compliance model, raising questions as to whether it sufficiently respects proportionality in light of the burdens it may impose on SMEs and innovative operators. This juxtaposition highlights the tension between effective sustainability regulation and the CJEU's demand that harmonisation balance regulatory objectives with innovation and market access.

[63] Article 5 TEU and Article 174 TFEU impose duties of proportionality and territorial cohesion requiring internal market measures to account for economic disparities among undertakings. The lack of modulated ecodesign obligations risks creating structural asymmetries, undermining the level playing field principle under Article 114 TFEU. See, e.g., European Commission, 'Annual Report on European SMEs' (2022/2023). See Jolanta Rzepecka and others (n 1) 83–84.

[64] The concept of "compliance capitalism" describes how regulatory burdens become strategic assets for dominant firms, effectively raising barriers to market entry. See S Deakin, 'The Legal Construction of the Firm' (2016) 45 Industrial Law Journal 1, 1–29.

[65] The European Parliamentary Research Service has highlighted that SMEs often lack technical and legal capacity to implement new ecodesign criteria, limiting innovation and reinforcing market concentration. See European Parliamentary Research Service, 'The Role of SMEs in the EU's Green Transition' (Briefing PE 698.859, 2022); OECD, 'SMEs in the Green Transition: Policy Highlights' (2021).

[66] The SME Test, part of the Better Regulation Toolbox (Tool 22), assesses EU policy impacts on small businesses in line with the 'Think Small First' principle in the Small Business Act (COM(2008) 394 final). The Fit for Future Platform

From a comparative perspective, other legal systems have developed regulatory models that are more attuned to the limitations of small businesses. For instance, U.S. federal environmental legislation includes systematic reviews of the impact on small entities through the Regulatory Flexibility Act. Similarly, countries such as Germany and Denmark have incorporated partial exemptions or transitional regimes within complex technical regulations, allowing SMEs to gradually adapt to new requirements without compromising their economic viability[67].

The absence of an adaptive implementation architecture in Regulation (EU) 2024/1781 places many European SMEs at a strategic crossroads: either to incur excessive transformation costs that jeopardise their stability, or scale down their operations, outsource parts of the production process or exit the market altogether. This scenario entails economic, ecological and social consequences, as it reduces production diversity, weakens the resilience of local supply chains, and fosters the oligopolistic consolidation of certain industrial sectors.

3.2 Disproportionate burdens and lack of regulatory adaptation

One of the most critical aspects in the implementation of Regulation (EU) 2024/1781 is the uniform and undifferentiated nature of its obligations, which fail to distinguish between large corporations and small and medium-sized enterprises. This replicates a regulatory model that disregards any perspective of distributive justice in regulation. The absence of legal modulation imposes a disproportionate burden on SMEs by subjecting them to technical, documentary and logistical requirements that many cannot fulfil without jeopardising their operational continuity.

In practical terms, compliance with the Regulation's requirements entails a profound transformation of production processes, including the redesign of products in accordance with circularity criteria, the implementation of digital traceability systems, the collection of life-cycle data, and integration into the Digital Product Passport database. These requirements[68], which may represent a strategic reconfiguration for a multinational enterprise, constitute an almost insurmountable compliance barrier for many SMEs.

The direct costs associated with this transformation include the acquisition of specialised software, the hiring of technical and legal consultancy services, staff training,

(Commission Decision (EU) 2020/2103) supports simplification but had limited integration into Regulation (EU) 2024/1781's design.

[67] The US Regulatory Flexibility Act (5 U.S.C. §§ 601–612) requires federal agencies to assess the impact of regulations on small entities and consider less burdensome alternatives. EU Member States such as Germany and Denmark implement SME-friendly transposition measures, including phased compliance and simplified obligations. See OECD, 'Better Regulation Practices across the EU' (2020); European Commission, 'Annual Report on European SMEs' (2022/2023).

[68] The principle of proportionality, enshrined in Article 5(4) Treaty on European Union (TEU), requires that EU measures do not exceed what is necessary to achieve their objectives. Regulation (EU) 2016/679 (General Data Protection Regulation) exempts microenterprises from certain documentation duties (Recital 13; Article 30(5)), exemplifying a differentiated application of obligations. Regulation (EU) 2024/1781, by contrast, applies a uniform approach, raising concerns about compliance feasibility and economic discrimination against SMEs.

and, in many cases, the complete restructuring of the supply chain to align with sustainability criteria. Added to these are indirect opportunity costs: resources diverted from innovation, commercial expansion or operational improvement to regulatory compliance management. This dynamic gives rise to a phenomenon of regulatory "crowding out", whereby SMEs are compelled to prioritise administrative survival over business competitiveness[69].

This situation conflicts with the principle of substantive proportionality, as developed by the CJEU in various rulings, including Vodafone (Case C-58/08)[70], where the Court affirmed that the burden imposed by a legal norm must be justified by a genuine need and assessed in light of the specific capacity of the obliged entity. In the present case, the imposition of identical obligations on entities with radically different structures lacks justification grounded in objective criteria of regulatory reasonableness.

Other Union law instruments have introduced mechanisms to modulate regulatory burdens according to the size or capacity of the operator. Regulation (EU) 2022/2554 on digital operational resilience in the financial sector, the Digital Operational Regualtion (DORA), for instance, provides a more flexible regime for micro-enterprises, allowing for gradual implementation of its requirements. In the environmental field, Directive 2012/27/EU on energy efficiency, permits Member States to establish thresholds for exemptions applicable to small industrial enterprises.

This regulatory asymmetry has also been addressed from the perspective of industrial policy. The Industrial Strategy for Europe (COM(2020) 102 final) explicitly acknowledges that SMEs should receive tailored treatment in the design of green policies, given their structural vulnerabilities and key role in local economies. However, these strategic guidelines have not been concretely reflected in the legal structure of Regulation (EU) 2024/1781[71], revealing a disconnect between strategic policy formulation and legislative output[72].

The problem becomes more acute when considering the interaction between the Regulation and other legal instruments such as the CSRD Directive and the proposed CSDDD Directive, which also impose reporting, due diligence, and supply chain oversight

[69] Regulatory "crowding out" occurs when compliance costs absorb resources otherwise investable in innovation and growth. This effect is documented in OECD, 'SME and Entrepreneurship Outlook' (2023) and European Commission, 'Annual Report on European SMEs' (2022/2023), identifying compliance costs as major barriers in the green transition.

[70] The CJEU affirmed in Vodafone and Others (C-58/08) [2010] ECLI:EU:C:2010:321 that EU legislation must comply with proportionality, especially when obligations unevenly affect operators. Obligations must be appropriate and consider the capacity of subjects. This principle is echoed in recital 9 of GDPR and the Commission's Better Regulation Guidelines (SWD(2021) 305 final). This requirement contrasts with Regulation (EU) 2024/1781, which applies uniform product obligations without sufficient differentiation for SMEs or sectoral capacities. Such an approach risks undermining innovation and competitiveness, raising doubts about its alignment with the proportionality standard articulated in Vodafone.

[71] Susana Borrás and Jakob Edler (eds), The Governance of Socio-Technical Systems: Explaining Change (Edward Elgar 2014).

[72] Case C-343/09, *Afton Chemical* [2010] ECLI:EU:C:2010:419; Case C-293/97, *R v Secretary of State for the Environment, ex parte Standley* [1999] ECLI:EU:C:1999:193. These judgments affirm the necessity of respecting the principle of proportionality and permit the modulation of regulatory obligations according to the operator's capacity.

obligations[73]. The accumulation of requirements, without inter-instrument coordination mechanisms or simplification clauses for SMEs, generates regulatory saturation that may lead to the effective exclusion of thousands of businesses from the ecological transition process[74].

Moreover, the lack of technical and methodological support measures from public authorities prevents SMEs from accessing standardised tools to facilitate compliance. The absence of specific sectoral guidelines[75], simplified digital platforms or voluntary declaration templates obstructs the realisation of the principles of "accessible compliance" and "reasonable transparency" as viable practices[76] for this business segment.

3.3 Comparison with other European and international regulatory models

The lack of differentiated mechanisms in Regulation (EU) 2024/1781 stands in stark contrast to more nuanced regulatory experiences, both within and outside the European Union. In this regard, legal and public policy comparison is essential, not only to highlight the overly uniform character of the model adopted, but also to identify replicable solutions that could enrich its architecture and enhance its systemic legitimacy.

One of the most robust references for differentiated regulatory integration based on company size is the United States framework for assessing regulatory impacts on small businesses, established by the Regulatory Flexibility Act (RFA) of 1980 and subsequently strengthened by the Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996[77]. This legislation obliges federal agencies to conduct early-stage assessments of how proposed rules will affect small businesses, including the requirement to publish an Initial Regulatory Flexibility Analysis (IRFA) and in certain cases to consult with sector-specific small business advisory panels. This preventive logic reduces the risk of generating regulatory asymmetries and promotes a culture of inclusive rulemaking from the outset[78].

In the European context, instruments such as Directive 2011/83/EU on consumer rights provide simplified regimes for operators who do not engage in distance selling or mass

[73] Beate Sjåfjell and Christopher M Bruner (eds), *The Cambridge Handbook of Corporate Law, Corporate Governance and Sustainability* (CUP 2019).
[74] Directive (EU) 2022/2464 on corporate sustainability reporting (CSRD); Proposal for a Directive on Corporate Sustainability Due Diligence (CSDDD), COM(2022) 71 final. These instruments impose progressive obligations based on company size, although with few exemptions for SMEs, thereby increasing complexity and administrative duplication with Regulation (EU) 2024/1781.
[75] Giacinto Della Cananea, Jean-Bernard Auby (eds), *General Principles and Sector-Specific Rules in European Administrative Laws* (Oxford University Press 2024).
[76] European Commission, Better Regulation Toolbox, Tool 23; OECD, SME and Entrepreneurship Outlook 2023. Tailored support for SMEs is recommended to ensure proportional implementation and facilitate participation in sustainability frameworks.
[77] Cary Coglianese, *Achieving Regulatory Excellence* (Brookings Institution Press 2017).
[78] The Regulatory Flexibility Act, 5 U.S.C. §§ 601–612 (1980), strengthened by the Small Business Regulatory Enforcement Fairness Act (SBREFA) (1996), establishes the assessment of regulatory impact on small entities and incorporates judicial review and review panels to ensure proportionality in regulatory drafting.

marketing techniques[79]. The REACH Regulation (EC) No 1907/2006, despite its technical complexity, allows for staggered compliance based on the tonnage of chemical substances handled by operators, indirectly benefiting many micro-enterprises in the chemical and cosmetics sectors. Similarly, the Unfair Commercial Practices Directive (2005/29/EC) has served as a basis for simplified protection mechanisms for small businesses facing unfair contract terms in B2B relationships[80].

Several national legal systems offer more SME-sensitive regulatory models. In Germany, the Act to Improve Regulatory Impact Assessment requires justification for any additional burden imposed on small businesses, grounded in the principle of proportionality. France's PACTE Act establishes exemption thresholds for certain accounting and environmental obligations applicable to micro-enterprises. Denmark has established a Business Regulation Assessment Council that conducts *ex ante* reviews of proposed legislation to evaluate its administrative impact on SMEs[81].

By contrast, Regulation (EU) 2024/1781 applies a uniform compliance model, without differentiation based on company size, turnover or economic sector. This rigidity penalises the structural diversity of the internal market and disregards longstanding recommendations from the European Economic and Social Committee, which has consistently called for substantive proportionality tailored to actual operational capacities.

Even within the EU legal framework, more inclusive precedents exist. Regulation (EU) 2021/1056 establishing the Just Transition Fund sets differentiated eligibility criteria for SMEs in regions vulnerable to ecological transition. The European Commission's Communication COM(2021) 350 final, outlining the SME Strategy for a Sustainable and Digital Europe[82], explicitly prioritises the integration of sustainability without compromising operational viability.

Regulation (EU) 2024/1781, however, remains anchored in a one-size-fits-all logic. A structural revision is therefore urgently needed—one that incorporates modulation clauses, phased compliance regimes, and simplified procedures. Only through such reforms can the ecological transition become truly fair, inclusive and capable of activating the full transformative potential of the European economic ecosystem—not merely its most consolidated actors.

[79] Lee (n 1).
[80] Directive 2011/83/EU, arts 3(3) and 6; Regulation (EC) No 1907/2006 (REACH), art 23; Directive 2005/29/EC; and Commission Staff Working Document SWD(2020) 163 final, provide for exemptions or phased compliance measures that facilitate SMEs' conformity and enhance protection against unfair practices in B2B contracts.
[81] Germany, Gesetz zur Verbesserung der Rechtsetzung (2000); France, Loi PACTE n° 2019-486, art 55; Denmark, Business Regulation Assessment Council (Erhvervsreguleringsrådet) (2017). These legal frameworks establish ex ante obligations to assess regulatory impact on small businesses, promoting proportionality and administrative simplification.
[82] Andrea Biondi, Piet Eeckhout and Stefanie Ripley (eds), *EU Law After Lisbon* (Oxford University Press 2012).

3.4 Barriers to Accessing Finance and Incentives

One of the most decisive factors exacerbating the vulnerability of SMEs under Regulation (EU) 2024/1781 is their lack of effective access to financing instruments tailored to their structural characteristics. Compliance with the regulation requires significant upfront investment in clean technologies, product redesign, digital traceability systems, and specialised training. For many SMEs, these costs represent an structuraly phohibitive entry barrier[83],particularly in contexts of limited liquidity, restricted access to credit and minimal financial leverage.

Although the European Union has developed various programmes to support sustainable innovation—such as Horizon Europe, the Innovation Fund, InvestEU and the Just Transition Mechanism[84]— most of these instruments pose technical and procedural barriers that limit SME participation. Competitive calls based on scalable impact, excellence in innovation, and consortium-based structures[85] often exclude smaller firms that lack dedicated technical staff or experience in complex EU applications.

From a normative perspective, Regulation (EU) 2024/1781 fails to include any explicit linkage to existing financial support mechanisms or to introduce compensatory measures aligned with enterprise size and capacity. It also lacks cross-references to Regulation (EU) 2021/523 establishing InvestEU, despite its stated objective of facilitating the green transition for SMEs[86]. In comparative terms, this disconnect becomes more pronounced when contrasted with national frameworks such as France's tax credits for ecodesign investment, and Germany's KfW public financing for sustainable technologies in medium-sized businesses[87].

The absence of a supportive financial infrastructure undermines the material equity principle enshrined in Article 3 TEU and conflicts with the broader goals of territorial cohesion and social justice within the single market[88]. Without accessible financial support[89], regulatory compliance ceases to function as a lever for transformation and instead becomes a vector of exclusion. Reframing the Regulation with a financial

[83] Danny Busch, Emilios Avgouleas and Guido Ferrarini (eds), *Capital Markets Union in Europe* (Oxford University Press 2018).
[84] Regulation (EU) 2021/695 establishing Horizon Europe; Commission Implementing Regulation (EU) 2020/1001 establishing the Innovation Fund under the EU Emissions Trading System; Regulation (EU) 2021/523 establishing InvestEU. See European Court of Auditors, 'Special Report 02/2023: EU Support to SMEs in the Green Transition' (2023); European Investment Bank, 'EIB Investment Survey 2023'; European Commission, COM(2021) 372 final.
[85] Veerle Heyvaert, *Transnational Environmental Regulation and Governance: Purpose, Strategies and Principles* (Cambridge University Press 2018).
[86] Niamh Moloney, *EU Securities and Financial Markets Regulation* (4th edn, Oxford University Press 2023).
[87] French General Tax Code, Article 244 quater B; KfW Mittelstandsbank, 'Energieeffizienzprogramm' and 'Umweltprogramm'; see European Commission, 'SME Green Compliance Incentives in EU Member States' (2022).
[88] Treaty on European Union (TEU) art 3; Treaty on the Functioning of the European Union (TFEU) arts 174–178; Regulation (EU) 2021/523 arts 3, 7 and Annex II; Regulation (EU) 2021/1056 on the Just Transition Fund; European Commission, COM(2021) 350 final ('SME Strategy for a Sustainable and Digital Europe').
[89] Sacha Garben and Inge Govaere (eds), *The Division of Competences between the EU and the Member States: Reflections on the Past, the Present and the Future* (Hart Publishing 2017).

dimension is not merely advisable — it is essential for its normative effectiveness and social legitimacy.

3.5 Impact on Local Innovation and Regional Productive Ecosystems

The impact of Regulation (EU) 2024/1781 on SMEs must not be assessed solely through the lens of compliance costs. Its structural consequences on local innovation capacity and regional productive ecosystems—critical components of the European economy—are equally significant[90]. Innovation does not occur exclusively within major research centres or multinational corporations; it also emerges from territorially rooted SME networks that develop decentralised, adaptive and sustainable solutions.

The Regulation's one-size-fits-all architecture risks triggering innovation stagnation among SMEs. These firms often operate in low-margin sectors, rely on tacit knowledge, or engage in incremental innovation and inter-firm cooperation. Excessively rigid requirements may deter technical investment, redirect resources toward procedural compliance, and lead to "regulatory paralysis", where uncertainty discourages experimentation.

Sectors dependent on manual labour, traditional knowledge or short production chains—such as artisanal manufacturing[91], local agroindustry or light industrial clusters—are particularly vulnerable. Regulation (EU) 2024/1781 imposes universal technical standards without accounting for cultural, regional, or sectoral specificities, threatening the viability of diverse economic sectors essential to Europe's plural productive fabric.

The territorial[92] consequences may be severe. Peripheral and rural regions rely heavily on SMEs for employment, innovation, and sustainable practices. Misaligned regulation could accelerate business closures and regional decline, exacerbating centre-periphery imbalances and contradicting Article 174 TFEU, which upholds territorial cohesion[93].

The qualitative impact on innovation is equally troubling. By concentrating adaptability in large operators, the Regulation risks homogenising[94] innovation and eroding localised, context-sensitive approaches. Many key advances in circular economy models have

[90] Annalisa Savaresi, 'Rights-based litigation in the climate emergency' (2022) 13(1)Journal of Human Rights and the Environment 7.
[91] Katharina Pistor, *The Code of Capital: How the Law Creates Wealth and Inequality* (Princeton University Press 2019).
[92] Giuliano Amato, Enzo Moavero-Milanesi, Gianfranco Pasquino and Lucrezia Reichlin (eds), *The History of the European Union: Constructing Utopia* (Hart Publishing 2019).
[93] Treaty on the Functioning of the European Union (TFEU) art 174; European Commission, COM(2017) 583 final; Case C-491/01, *Berlusconi and Others* [2003] ECLI:EU:C:2003:567. In Berlusconi and Others (C-491/01), the CJEU emphasised that the principles of legality and proportionality require sanctions to be clear, foreseeable, and not retroactive to the detriment of the accused. Applied to Regulation (EU) 2024/1781, this reasoning implies that penalties for non-compliance with ecodesign and digital product passport obligations must be transparent and proportionate. The parallel demonstrates that, as in criminal law, legal certainty is a prerequisite for regulatory effectiveness. Read together with Article 174 TFEU, which enshrines economic, social, and territorial cohesion, this suggests that sustainability regulation must calibrate sanctions so as not to impose disproportionate burdens on less competitive regions or smaller operators.
[94] Joseph Stiglitz and Bruce Greenwald, *Creating a Learning Society: A New Approach to Growth, Development, and Social Progress* (Columbia UP 2014).

emerged from agile SMEs and cooperatives. If regulatory frameworks penalise such flexibility, a key engine of transformative innovation is lost.

This tension signals a breach of the EU principle of internal coherence. As developed by the CJEU in *Vodafone* (Case C-58/08), measures must pursue their objectives without generating self-defeating effects[95]. Some scholars advocate the introduction of experimental regulatory clauses—such as "regulatory sandboxes"—to allow innovative SMEs to comply through tailored pathways[96]. Others propose decentralised implementation through agreements between the Commission, Member States, and regions, enabling the development of technically equivalent standards adapted to local realities[97].

True sustainability[98] requires legal frameworks that nurture, rather than suppress, innovation at the margins. Supporting local resilience, diversity, and bottom-up innovation must be a cornerstone of effective ecodesign regulation.

3.6 Regulatory Proposals for the Effective Inclusion of SMEs in European Ecodesign

Revising the architecture of Regulation (EU) 2024/1781 to incorporate SME-specific provisions is not merely a matter of distributive fairness but rather a structural requirement for the viability of Europe's green transition. SMEs account for over two-thirds of private employment and play a crucial role in key sustainability sectors such as construction, recycling, agroindustry, urban mobility and light manufacturing. A regulatory framework that overlooks their centrality risks implementation failure.

A first step would be to introduce a tiered compliance regime based on company size, turnover or sector. This would allow for proportional obligations, as successfully implemented under Regulation (EU) 2016/679 (General Data Protection Regulation - GDPR[99]). By adapting the intensity of regulatory requirements, the burden on less capitalised firms could be reduced without diluting the core sustainability objectives.

Another vital mechanism involves temporary exemptions or deferred application for SMEs facing regional or sector-specific vulnerabilities. Similar transitional regimes[100] exist in EU legislation on industrial emissions and single-use plastics[101]. These tools offer firms the time needed to adapt without immediate exclusion from the market.

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[95] Case C-58/08 *Vodafone and Others* [2010] ECLI:EU:C:2010:321; see also P Craig and G de Búrca, EU Law: Text, Cases, and Materials (7th edn, OUP 2020) 85–90.
[96] European Commission, COM(2020) 103 final ('Digital Finance Strategy'); European Commission Joint Research Centre, '*Testing the Future: Regulatory Sandboxes for Sustainable Innovation*' (2022).
[97] Regulation (EU) 2021/1060 on Common Provisions for Cohesion Policy; see European Commission, 'Guidance on Partnership Agreements and Programmes' (2022).
[98] Benjamin J Richardson, *Time and Environmental Law: Telling Nature's Time* (Cambridge University Press 2017).
[99] Regulation (EU) 2016/679 (General Data Protection Regulation) art 30(5), recital 13. See Orla Lynskey, *The Foundations of EU Data Protection Law* (Oxford University Press 2015).
[100] Lee (n 1).
[101] Directive 2010/75/EU on industrial emissions art 64; Directive (EU) 2019/904 on single-use plastics.

Sector-specific delegated acts, authorised by Article 290 TFEU[102], would also enhance regulatory precision. These could tailor ecodesign obligations to productive contexts dominated by SMEs—such as small-scale agro-processing, artisanal manufacturing or microelectronics workshops—ensuring feasibility without sacrificing ambition.

Institutional innovation is equally essential. A permanent European platform for structured dialogue[103] between SMEs, regulators and standardisation bodies (e.g. CEN/CENELEC)[104] would enable anticipatory governance and harmonised interpretative guidance, while supporting legal certainty and coherence.

Technical support instruments[105] are another priority: compliance manuals, diagnostic software, simplified sustainability templates, and stepwise certification schemes should be developed and deployed through local actors—chambers of commerce, regional innovation centres, and development agencies[106]—explicitly recognised in the Regulation.

Finally, economic incentives[107] must accompany legal obligations. Tax credits for ecodesign investment, public guarantees for green loans and bonus points in public procurement could align regulatory compliance with competitive advantage, replicating successful models from national environmental policies[108].

These proposals do not weaken the Regulation's aims; they reinforce them through inclusion, operational realism and economic resilience. SMEs are not marginal actors; they are the operational core of Europe's green industrial future and must be treated accordingly in policy and regulatory design.

4 Challenges of Harmonisation with Existing Legislation

The introduction of Regulation (EU) 2024/1781 on sustainable product design into the EU's legal framework has triggered a series of systemic frictions. These challenges do not stem merely from formal inconsistencies between texts, but from functional overlaps among legislative instruments pursuing similar sustainability objectives while operating under different technical, temporal and administrative logics. The resulting misalignments[109] risk undermining the Regulation's effectiveness, legal clarity, and institutional legitimacy.

A primary area of conflict[110] arises with Directive 2009/125/EC on ecodesign for energy-related products. While the new Regulation seeks to broaden the scope of sustainable

[102] Treaty on the Functioning of the European Union (TFEU) art 290; Regulation (EU) 2017/1369 on energy labelling.
[103] Gráinne de Búrca and Joanne Scott (eds), *Law and New Governance in the EU and the US* (Hart Publishing 2006.
[104] European Circular Economy Stakeholder Platform; European Economic and Social Committee; EU Industrial Forum.
[105] OECD, 'SME and Entrepreneurship Outlook 2023' (OECD Publishing 2023).
[106] Regulation (EU) 2021/1056 arts 7–8; Regulation (EU) 2021/1060 Art 8.
[107] Benjamin J Richardson and Stepan Wood (eds), *Environmental Law for Sustainability: A Reader* (Hart Publishing 2006).
[108] Italian Budget Law 2017 (super-deduction scheme); French General Tax Code art 244 quater B; EU Green Public Procurement Criteria.
[109] Craig and Gráinne de Búrca (n 95).
[110] Ludwig Krämer, *EU Environmental Law* (8th edn, Sweet & Maxwell 2015).

design obligations across product categories, it has not formally repealed the earlier Directive, nor has it repealed its implementing measures. This regulatory coexistence creates uncertainty—particularly in sectors such as household appliances—where both instruments contain partially overlapping provisions on durability, labelling and energy efficiency but lack a clear hierarchy or coordination mechanism.

Additional tensions arise in relation to Regulation (EC) No 1907/2006 (REACH)[111], particularly concerning the management of hazardous substances and material traceability. While REACH imposes stringent requirements for the registration and authorisation of chemical, Regulation (EU) 2024/1781 introduces product-level transparency obligations through the Digital Product Passport[112]. The resulting dual compliance burden is compounded by a lack of digital interoperability between the two regimes, leading to administrative inefficiencies and duplicated information flows.

Further complications arise with Directive 2022/2464/EU (CSRD)[113], which mandates corporate-level environmental disclosures, whereas Regulation (EU) 2024/1781 focuses on product-specific metrics[114]. The absence of alignment between methodologies and indicators increases the risk of reporting redundancies and inconsistent data across frameworks.

The proposed Corporate Sustainability Due Diligence Directive (CSDDD)[115] adds another layer of complexity. It mandates human rights and environmental due diligence across value chains[116] but lacks explicit articulation with the ecodesign obligations, despite addressing overlapping material and procedural concerns. Without coordinated implementation, fragmentation between responsibility and design criteria may occur.

From a technical perspective, the Regulation does not yet align with existing harmonised standards issued by bodies such as CEN and CENELEC[117]. This gap[118] diminishes legal certainty and reverses progress made under the presumption-of-conformity principle that has long facilitated technical compliance in the EU internal market.

Conflict also arises with EU waste legislation[119], including the Waste Framework Directive (2008/98/EC), the Packaging Directive (2018/852/EU), and sector-specific rules. Requirements on product end-of-life introduced by Regulation (EU) 2024/1781 sometimes

[111] Maria Weimer, 'Risk Regulation and Deliberation in EU Administrative Governance: GMO Regulation and its Reform' (2015) 21(5) European Law Journal 622.
[112] Regulation (EC) No 1907/2006 (REACH); European Chemicals Agency SCIP database; European Commission SWD(2022) 89 final.
[113] Beate Sjåfjell and Irene Lynch Fannon (eds), *Creating Corporate Sustainability: Gender as an Agent for Change* (Cambridge University Press 2018).
[114] Directive (EU) 2022/2464 on Corporate Sustainability Reporting (CSRD); European Sustainability Reporting Standards (ESRS); Regulation (EU) 2024/1781.
[115] Geert Van Calster and Leonie Reins, *EU Environmental Law* (Edward Elgar Publishing 2017).
[116] Corporate Sustainability Due Diligence Directive (CSDDD), COM(2022) 71 final.
[117] Regulation (EU) 1025/2012 on European standardisation.
[118] Harm Schepel, *The Constitution of Private Governance: Product Standards in the Regulation of Integrating Markets* (Hart Publishing 2005).
[119] Nicolas de Sadeleer, *EU Environmental Law and the Internal Market* (Oxford University Press 2014).

contradict or duplicate existing obligations, particularly in recycling processes based on material separation technologies.

Finally, the proliferation of environmental labels[120]—resulting from overlaps with Regulation (EU) 2017/1369, the proposed Green Claims Regulation[121] and other initiatives—risks saturating consumers with uncoordinated information and eroding trust in sustainability communications.

To address these issues, proposals include the creation of a horizontal interpretative framework for all sustainability-related instruments and the establishment of a European Agency for Regulatory Coherence on Sustainability. Such mechanisms could prevent regulatory inflation and ensure that sustainable development becomes a unifying, operational legal principle rather than a fragmented legislative agenda.

5 Supply Chain Responsibilities and the Legal Vacuum

Regulation (EU) 2024/1781 introduces novel challenges concerning legal obligations across supply chains. Article 8 attributes responsibility for compliance with ecodesign requirements to the "economic operator placing the product on the market". While seemingly straightforward, this provision fails to reflect the complexity of contemporary transnational production networks and reveals critical regulatory blind spots[122].

Many products placed on the EU market are assembled through global supply chains involving multiple tiers of subcontractors operating under different legal regimes and degrees of traceability. Assigning full responsibility to the final operator neglects the fragmented[123] nature of production and ignores the lack of control that such operators often have over design specifications, materials or the environmental performance of upstream components. The result is a regulatory model that imposes obligations without recognising actual capacity or influence.

This regulatory gap contrasts with more developed EU instruments that apply shared or cascading responsibilities across value chains[124]. Food safety legislation, the REACH Regulation and the proposed Corporate Sustainability Due Diligence Directive (CSDDD) establish tiered duties of care or joint liability structures[125]. The absence of comparable provisions in Regulation (EU) 2024/1781 generates functional asymmetries, undermining

[120] Hans-W Micklitz (ed), *The Making of Consumer Law and Policy in Europe* (Hart Publishing 2023).
[121] European Commission Proposal for a Regulation on Green Claims, COM(2023) 166 final; Regulation (EU) 2017/1369 on energy labelling.
[122] Mark Gibney, Gamze Erdem Türkelli, Markus Krajewski and Wouter Vandenhole (eds), *The Routledge Handbook on Extraterritorial Human Rights Obligations* (Routledge 2021).
[123] Tseming Yang, Anastasia Telesetsky, Lin Harmon-Walker and Robert V Percival, *Comparative and Global Environmental Law and Policy* (Wolters Kluwer 2019).
[124] ibid.
[125] Regulation (EC) No 1907/2006 (REACH); Regulation (EC) No 178/2002; Corporate Sustainability Due Diligence Directive (CSDDD), COM(2022) 71 final.

compliance and potentially incentivising the outsourcing of high-risk production stages to jurisdictions with weaker environmental safeguards.

Article 10 further exacerbates this asymmetry by requiring economic operators to collect and validate product life-cycle data for the Digital Product Passport, yet providing no clear legal tools to compel cooperation from upstream suppliers[126]. This effectively results in a form of strict liability and thereby exposes operators to penalties despite limited audit capacity or contractual leverage.

From a doctrinal perspective, this binary attribution of responsibility marks a departure from international standards such as the OECD Guidelines for Multinational Enterprises and the UN Guiding Principles on Business and Human Rights, which condition responsibility on control, proximity and leverage[127]. By ignoring these categories, the Regulation imposes a rigid and unrealistic model of accountability.

Moreover, the Regulation fails to interface with existing legal instruments—such as the Unfair Commercial Practices Directive, the Construction Products Regulation, or EU public procurement law—that could have supported risk-sharing clauses[128] or model contracts[129]. The lack of standardised frameworks reduces legal certainty, hinders harmonisation of best practices and weakens the preventive function of environmental regulation.

Finally, the absence of institutional mechanisms for intra-supply chain dispute resolution[130] exacerbates legal uncertainty. Unlike other sectors with specialised arbitration or technical mediation bodies, Regulation (EU) 2024/1781 offers no structured forum for resolving conflicts over data access, compliance failure or verification disputes[131].

Addressing these issues will require a dynamic and differentiated model of legal responsibility[132], one that integrates tiered obligations, contractual tools and cooperative incentives to make ecodesign compliance viable, fair and sustainable across the entire supply chain.

[126] Hannah Buxbaum, 'Transnational Regulatory Litigation' (2006) 46 Virginia Journal of International Law 251.
[127] 'OECD Guidelines for Multinational Enterprises' (2011 Edition); 'United Nations Guiding Principles on Business and Human Rights' (2011).
[128] Christopher J S Hodges, *Law and Corporate Behaviour: Integrating Theories of Regulation, Enforcement, Compliance and Ethics* (Hart Publishing 2015).
[129] Directive 2014/24/EU art 18(2); Regulation (EU) 305/2011 on Construction Products.
[130] Jean-Frédéric Morin and Caroline Brandi, *Trade and the Environment: Drivers and Effects of Environmental Provisions in Trade Agreements* (Earth System Governance Elements, Cambridge University Press 2023, Open Access).
[131] Unlike other areas of EU law that benefit from structured mechanisms for technical dispute resolution—such as the Internal Market Information System (IMI), the SOLVIT network, or the European Consumer Centres (ECC)—Regulation (EU) 2024/1781 does not provide a dedicated institutional framework to resolve supply chain conflicts. This absence creates a gap in horizontal enforcement architecture and may increase the risk of fragmented litigation, especially in cross-border contexts involving digital traceability obligations under Article 10 Regulation.
[132] Sabine Schlacke, Karen Pittel, Markus Fischer and others, 'Rethinking Land in the Anthropocene: From Separation to Integration' (WBGU Report 2020, German Advisory Council on Global Change).

6 Impact on European Industrial Competitiveness

Regulation (EU) 2024/1781 represents a structural shift in the European Union's approach to industrial sustainability. By establishing binding technical requirements for the design, production and marketing of sustainable products, it redefines market access conditions and the very parameters of competitiveness[133] for EU-based industries. While the Regulation offers a pathway toward a resilient, long-term green economy, it also raises critical concerns regarding Europe's global industrial standing—particularly in relation to third countries that maintain less demanding regulatory frameworks or apply no comparable standards[134].

Competitiveness[135] in this context must be conceptually redefined. Historically linked to cost efficiency, productivity, innovation and trade openness, industrial competitiveness now expands to include environmental performance, circularity and traceability. This evolution compels European firms to internalise new layers of economic, administrative and technological costs simply to retain market access. The concern intensifies when these obligations are not mirrored by international competitors, creating a structural asymmetry in the global playing field[136].

Unlike instruments such as the Carbon Border Adjustment Mechanism (CBAM)[137], Regulation (EU) 2024/1781 does not include explicit border adjustment clauses or compensatory mechanisms. The lack of equivalent obligations for imported products allows goods manufactured under looser environmental regimes to enter the EU market under more favourable conditions, thus putting compliant European producers at a disadvantage[138].

Global supply chain dynamics[139] further complicate this scenario. Many EU companies depend on complex networks of non-EU suppliers. The Regulation's requirements for

[133] Panagiotis Delimatsis and Leonie Reins (eds), *Trade and Environmental Law* (Edward Elgar Publishing 2021).
[134] Regulation (EU) 2023/956 establishing the Carbon Border Adjustment Mechanism (CBAM) aims to level the playing field by internalising the carbon cost of imported goods, but Regulation (EU) 2024/1781 lacks equivalent frontier adjustment tools. The absence of such mechanisms exacerbates regulatory asymmetries between EU-based producers and foreign competitors, potentially undermining Article XX GATT, which permits environmental exceptions only under strict non-discrimination conditions. This regulatory gap raises concerns about compatibility of EU sustainability rules with WTO obligations and coherence of the Union's trade-environment interface.
[135] Reinhilde Veugelers, Simone Tagliapietra and Cecilia Trasi, 'Green Industrial Policy in Europe: Past, Present, and Prospects' (2024) 24 Journal of Industry, Competition and Trade 371.
[136] Unlike CBAM (Regulation (EU) 2023/956), which equalises carbon costs for imports in emissions-intensive sectors such as steel, cement and aluminium, Regulation (EU) 2024/1781 lacks environmental equivalence mechanisms applicable to imports. This omission risks undermining the internal market's green level playing field, enabling goods produced under lower environmental standards to enter more favourably and bypassing burdens borne by EU producers. Such asymmetry weakens internal policy coherence and calls into question the normative reach beyond EU borders.
[137] Matthew C Porterfield, 'Border Adjustments for Carbon Taxes, PPMs, and the WTO' (2019) 41 University of Pennsylvania Journal of International Law 1.
[138] The CBAM introduces a transitional regime from 2023 and a definitive phase from 2026, imposing carbon pricing on imports in specific sectors (cement, steel, aluminium, electricity). Unlike Regulation (EU) 2024/1781, CBAM equalises carbon costs between EU and non-EU producers, addressing carbon leakage risks and restoring competitiveness without breaching WTO rules.
[139] Gary Gereffi, *Global Value Chains and Development: Redefining the Contours of 21st Century Capitalism* (Cambridge University Press 2018).

traceability, recyclability, and full life-cycle data[140] may discourage foreign suppliers from engaging with EU firms due to fear of regulatory exposure. This could lead to supply chain fragmentation, increased transaction costs, and delays stemming from the need for certification, auditing or alignment with EU technical standards.

Strategically, this situation threatens to weaken the EU's position in key industrial sectors[141]—automotive, advanced electronics, machinery and chemicals—by incentivising investment relocation, slowing innovation cycles and shrinking global market share in favour of more flexible competitors.

However, the Regulation does not affect all industries equally[142]. Sectors aligned with sustainable innovation—such as certified green products, recyclable materials and eco-construction—may benefit, positioning themselves as global leaders. In contrast, industries with low profit margins or high exposure to global price competition—such as textiles, low-cost electronics or durable consumer goods—may face disproportionate burdens.

Institutional responses[143] should operate on three fronts: (i) strengthening trade defence tools to prevent environmental dumping; (ii) consolidating green industrial policy through targeted funding, technical support and workforce training; and (iii) embedding environmental equivalence and verification clauses into trade agreements[144].

Sustainability and competitiveness[145] must cease to be treated as antagonistic goals. Regulation (EU) 2024/1781 should be coherently implemented alongside cohesion policy, the EU Industrial Strategy, the Innovation Agenda and external trade policy to ensure that the ecological transition becomes a source of strategic industrial leadership but rather structural vulnerability.

[140] The Regulation's Article 10 on the Digital Product Passport requires verifiable technical data throughout the product life cycle, imposing significant burdens on global suppliers unfamiliar with EU procedures. Without mutual recognition agreements or streamlined conformity protocols, supply chains may reconfigure, favouring vertically integrated or already compliant operators, reducing sourcing flexibility and diversification.

[141] David Bailey, Keith Cowling and Philip Tomlinson (eds), *New Perspectives on Industrial Policy for a Modern Britain* (Oxford University Press 2015).

[142] Ingmar von Homeyer, 'The Evolution of EU Environmental Governance' (Academy of European Law / European University Institute, Summer School 2008) <https://www.ecologic.eu/243> accessed 15 September 2025.

[143] Yannick Radi, 'International Investment Law and Development: A History of Two Concepts' (Grotius Centre Working Paper 2015/045, Leiden Law School Research Paper, 1 December 2014).

[144] European Commission Communication 'A New Industrial Strategy for Europe' COM(2020) 102 final, updated as COM(2021) 350 final, acknowledges the need to align green transition goals with industrial competitiveness, technological autonomy, and strategic resilience. It calls for regulatory predictability, accelerated permitting and improved finance access. Similarly, the Green Deal Industrial Plan COM(2023) 62 final identifies administrative simplification and funding coordination as pillars for maintaining EU industrial relevance. Regulation (EU) 2024/1781 has not been structurally integrated into this broader strategy, risking unsupported sectors—especially those facing global cost competition—during implementation.

[145] Vassilis Monastiriotis and Tea Gamtkitsulashvili, 'The Territorial Dimension of EU Industrial Policy: Aligning Cohesion and Industrial Strategies' (LEAP LUHNIP Working Paper No 7/2025, 22 April 2025).

7 Socioeconomic and Consumer Implications

A growing body of socio-legal scholarship shows that "consumer empowerment" depends not only on the formal availability of information, but on its intelligibility and on the institutional contexts in which choices are made. In EU consumer law, informational duties have repeatedly produced diminishing returns when disclosures become dense, technical, or fragmented—especially where digital interfaces mediate the transaction[146]. Embedding the DPP within this landscape therefore requires design choices (standardisation, layering, icons, defaults)[147] that translate complex life-cycle data into legible signals of quality, durability and repairability, or else "empowerment" risks becoming merely nominal.

Empirical and institutional evidence also indicates that households' willingness and ability to act on sustainability cues is mediated by income constraints, perceived "green premiums," and digital literacy[148]. Surveys and secondary analyses across the Union[149] identify finance and regulatory uncertainty as persistent obstacles for firms to supply affordable sustainable options, while consumers report confusion about labels and difficulty accessing practical repair services. These dynamics amplify the risk that the Regulation's benefits accrue unevenly unless accompanied by demand-side supports[150] (price instruments, social tariffs) and supply-side enablers[151] (SME-oriented finance, interoperable standards).

The enforcement of Regulation (EU) 2024/1781 introduces significant transformations in the interaction between consumers[152], the market and sustainability policies. Its provisions on product durability, reparability, life-cycle transparency, and the mandatory Digital Product Passport (DPP) reshape consumption patterns, consumer rights, and the affordability of sustainable goods across the Union.

One of the central objectives of the Regulation is to enhance consumer empowerment[153] through better access to structured, verifiable, and environmentally relevant information. This regulatory ambition builds upon and expands the informational rights enshrined in Directive 2011/83/EU, introducing an environmental dimension that alters the legal understanding of product quality[154] and the criteria for responsible

[146] OECD, 'Enhancing Online Disclosure Effectiveness' (2022) <https://www.oecd.org/content/dam/oecd/en/publications/reports/2022/10/enhancing-online-disclosure-effectiveness_e8b230aa/6d7ea79c-en.pdf> accessed 15 September 2025.
[147] Kim Jae-Eun and Lee Min-Kyu, 'When Is Enough, Enough? Investigating Product Reviews and Information Overload from a Consumer Empowerment Perspective' (2019) 100 Journal of Business Research 27.
[148] Hu Xiaojuan and Meng Hu, 'Digital literacy and green consumption behavior: Exploring dual psychological mechanisms' (2022) 22(2) Journal of Consumer Behaviour 272.
[149] European Investment Bank, 'Investment barriers in the European Union 2023' (European Investment Bank, 2023).
[150] LSEG, 'EU Sustainable Finance Regulation – Enhancing and Simplifying to Enable the Transition' (January 2025).
[151] OECD, 'Unlocking the Potential of Demand-Side Climate Mitigation Strategies' (March 2025).
[152] Monastiriotis and Gamtkitsulashvili (n 145).
[153] Stephen Weatherill, *EU Consumer Law and Policy* (2nd edn, Edward Elgar Publishing 2013).
[154] Violet Ross and Lucila de Almeida, 'Refining Reflexive Environmental Law by Nature and Nurture: Autonomy, Accountability, and Adjustability' (2024) 13(2) Transnational Environmental Law 428.

choice[155]. It positions consumers as agents of ecological transition and elevates the act of purchasing to a legally significant behaviour.

Yet the shift towards environmental transparency introduces new complexities. The proliferation of ecolabels[156], the emergence of technically dense digital interfaces, and the requirement to interpret lifecycle data may generate a form of "information fatigue" among consumers. Overexposure to fragmented or overly technical disclosures can undermine engagement, particularly among digitally excluded groups or those with limited digital fluency. In such cases, the right to information[157] becomes difficult to exercise meaningfully, especially where structural inequalities in digital access remain unresolved.

From an equity[158] perspective, the Regulation may intensify socio-economic divides in access to sustainable consumption. Stricter ecodesign obligations tend to increase production costs, which could be reflected in retail prices. In the short term, this may reinforce the perception that sustainable products are luxury items, accessible primarily to higher-income households. Such segmentation threatens to entrench dual consumer markets, structured along lines of economic capacity[159] rather than environmental awareness[160].

These risks[161] are particularly salient in sectors such as domestic appliances, electronics and furniture, where redesigning products to comply with durability and reparability standards involves material investment. Absent compensatory measures—such as reduced VAT, targeted subsidies, or eco-bonuses—households with lower purchasing power may remain locked out of the green transition.

[155] Directive 2011/83/EU on consumer rights guarantees access to pre-contractual information, increasingly including environmental attributes. The CJEU has interpreted Article 6 as requiring clarity and completeness in disclosures, especially when product features influence ethical or ecological decisions. This aligns with Regulation (EU) 1169/2011 on food information and the Aarhus Convention, recognising the right to environmental information as essential to democratic participation and sustainable consumption.

[156] Karthik Murali, Michael K Lim and Nicholas C Petruzzi, 'The Effects of Ecolabels and Environmental Regulation on Green Product Development' (2019) 21 Manufacturing and Service Operations Management 519.

[157] Christopher H Hodges, *The Reform of Class and Representative Actions in European Legal Systems* (Hart Publishing 2008).

[158] Garben and Govaere (n 89).

[159] BEUC, The Illusion of Choice: Barriers to Sustainable Food Consumption (BEUC-X-2023-080, 10 November 2023). <https://www.beuc.eu/sites/default/files/publications/BEUC-X-2023-080_The_illusion_of_choice_report.pdf> accessed 15 September 2025.

[160] The affordability of sustainable consumption is a growing concern in EU legal and policy discourse. While the European Green Deal COM(2019) 640 final and Just Transition Mechanism COM(2020) 22 final recognise risks of deepening socioeconomic divides, Regulation (EU) 2024/1781 remains silent on mitigating measures. The European Consumer Organisation (BEUC) and JRC surveys identify price as the primary barrier to eco-labelled goods uptake, especially among lower income groups. This dynamic threatens social inclusivity and raises distributive justice issues under Article 3 TEU and Article 9 TFEU. The absence of flanking measures such as VAT differentiation (Directive (EU) 2022/542), eco-vouchers or subsidised circular consumption contrasts with practices in Member States like France and the Netherlands, risking market fragmentation and weakening sustainability and cohesion objectives.

[161] European Commission, 'Behavioural Study on Consumers' Engagement in the Circular Economy' (Publications Office of the European Union, December 2018).

Comparative policy practice[162] within the Union suggests a toolkit that can mitigate these distributional frictions: targeted VAT reductions for high-durability or repair-friendly products; tax credits for ecodesign investments passed through to retail prices; and green criteria in public procurement that reward affordability and repair services. Where implemented (France, Sweden, Austria, Belgium) such instruments have lowered effective consumer prices, signalled quality through procurement benchmarks, and catalysed local repair ecosystems. Calibrating these levers to the DPP[163], so that fiscal advantages hinge on verified durability or repair metrics, would align price signals with the Regulation's informational architecture.

Evidence from circular economy case studies[164] point to tangible social co-benefits when reuse, refurbishment and repair are normalised: higher shares of skilled manual employment with low automation potential; shorter supply chains that embed value locally; and measurable reductions in material throughput. Regional analyses[165] further show that such activities are particularly meaningful for peripheral areas reliant on SME networks and tacit know-how. To unlock these gains at scale, repairability obligations should be complemented by vocational training, micro-finance and certification pathways that reduce entry barriers for small operators and social enterprises.

At the same time, the Regulation creates incentives for the development of alternative consumer models[166]. By reinforcing obligations related to spare parts, disassembly and technical documentation, it offers structural support for reuse, refurbishment and repair activities. These practices, previously relegated to the informal or peripheral economy, gain normative recognition and open new avenues for circular business models[167] and decentralised innovation[168].

This evolution carries implications for labour markets. Repair and remanufacturing sectors typically rely on skilled manual work with low automation potential. Their expansion could generate stable employment in local ecosystems, provided that

[162] OECD, 'Tax policy and the environment: empirical evidence and guidelines' (2022).
[163] European Environmental Bureau (EEB), 'Making more durable and reparable products: Building blocks for effective EU repair policies' (May 2025).
[164] European Environment Agency (EEA), 'Europe's circular economy in facts and figures' (December 2024), 20–25.
[165] European Commission, 'An overview of Europe's repair sector: SME clusters and regional employment impacts' (December 2022).
[166] Emma Lees and Jorge E Viñuales (eds), *The Oxford Handbook of Comparative Environmental Law* (OUP 2019).
[167] Ida Mae de Waal, 'The Legal Transition towards a More Circular Electrical and Electronic Equipment Chain—A Case Study of The Netherlands' (2023) 15(2) Sustainability 935.
[168] The EU increasingly recognises repair, refurbishment and reuse sectors' strategic role in circular economy goals. The Circular Economy Action Plan COM(2020) 98 final and Sustainable Products Initiative COM(2022) 140 final highlight the need for spare parts access, technical documentation and dismantling procedures. The European Parliament has supported a "right to repair" (e.g. 2020/2089(INI)) to avoid exclusion of consumers and independent repairers. However, Regulation (EU) 2024/1781 lacks dedicated legal frameworks or enforcement mechanisms for these actors. Absence of harmonised standards for second-hand certification, remanufacturing quality and liability for reused parts creates legal uncertainty. Repair and reuse enterprises—often SMEs or informal—face challenges in compliance, funding and public procurement recognition. The European Economic and Social Committee (EESC) and Committee of the Regions stress the need for institutional safeguards, local employment support and decentralised regulatory guidance. Without these, resource efficiency, job creation and consumer empowerment potential remain underutilised.

supporting measures—vocational training, micro-finance and certification pathways—are introduced to maximise accessibility.

The legitimacy of this regulatory transformation also hinges on public trust[169]. A legal framework that promotes environmental ambition while respecting social constraints enhances the perception that EU governance protects the general interest. In times of political polarisation, such trust constitutes a key asset for institutional resilience.

Ultimately, the effectiveness of Regulation (EU) 2024/1781 depends on more than formal compliance. Long-term success requires distributive fairness, accessibility to sustainable choices and behavioural change across all social strata. Environmental legislation disconnected from social equity[170] risks exacerbating exclusion rather than driving transformation. Bridging this gap is essential to preserving the democratic legitimacy of the green transition.

8 Conclusions and Regulatory Outlook

Regulation (EU) 2024/1781 constitutes a pivotal milestone in the European Union's endeavour to decarbonise and green its internal market through binding product-level sustainability criteria. Its normative ambition—establishing a harmonised framework for ecodesign applicable across product categories—remains undisputed. Yet the Regulation's transformative potential remains constrained by critical shortcomings in its legal architecture, implementation logic and economic inclusiveness.

The analysis conducted throughout this paper has shown that, while conceptually coherent, the Regulation fails to account for the diversity of industrial sectors, firm sizes and national regulatory capacities across the Union. Its uniformity of obligations, particularly regarding digital product passports, reparability standards and supply-chain traceability, creates structural asymmetries that disproportionately burden SMEs and low-margin industries. The absence of differentiated compliance paths, phased implementation or technical-exemption clauses undermines the principle of proportionality and risks excluding key actors from the green transition[171].

Equally concerning is the Regulation's insufficient coordination with existing EU instruments, such as the REACH Regulation, the Corporate Sustainability Reporting

[169] Garben and Govaere (n 89).
[170] Cormac Cullinan, *Wild Law: A Manifesto for Earth Justice* (Green Books 2003).
[171] Article 5 TEU enshrines proportionality as a fundamental EU legislative constraint. The CJEU requires measures to be appropriate and necessary, avoiding excessive burdens on operators. Regulation (EU) 2024/1781's lack of scaled or sector-specific adaptation mechanisms challenges this, especially for diverse firms (Case C-58/08 *Vodafone* [2010] ECLI:EU:C:2010:321). The Vodafone case illustrates how the CJEU interprets Article 5 TEU as a substantive check on the proportionality of EU legislation. By insisting that harmonisation measures be both appropriate and not excessively burdensome, the Court established a benchmark that is directly relevant to Regulation (EU) 2024/1781. Unlike the GDPR, which differentiates obligations by scale and risk, the Regulation applies uniform requirements that may strain SMEs and sector-specific operators. This creates potential tension with the proportionality test articulated in Vodafone. For the purposes of this work, the case underscores the need to assess whether sustainability regulation aligns with constitutional safeguards of balanced and fair implementation.

Directive (CSRD) and the proposed Directive on Corporate Sustainability Due Diligence (CSDDD). The lack of interoperability between information systems, legal definitions and enforcement mechanisms generates confusion, legal uncertainty and unnecessary compliance duplication. Moreover, the Regulation imposes new market-access conditions without the accompanying development of a financial framework to support investment in sustainability upgrades—an omission that contradicts the logic of a just transition.

In light of these deficiencies, several regulatory adjustments are therefore warranted. First, the European Commission should adopt delegated acts under Article 290 TFEU to tailor compliance requirements by sector and firm profile, particularly for SMEs. Second, a system of adaptive governance should be established, including experimental regulatory sandboxes, sector-specific guidance and interoperable technical annexes developed with standardisation bodies. Third, the Regulation should be connected with existing EU funding instruments—such as InvestEU, Horizon Europe or Cohesion Funds—through legally binding cross-references to ensure financial support for compliance[172].

Furthermore, a horizontal framework for regulatory consistency should be established to reconcile overlapping sustainability obligations and reduce systemic fragmentation. Finally, consumer-centred policies—including VAT reductions for sustainable goods and formal recognition of repair sectors—should complement the product-centric orientation of the Regulation.

Ultimately, the success of Regulation (EU) 2024/1781 will not hinge solely on formal transposition, but on its ability to foster inclusive innovation, fair competition and regulatory coherence. The Regulation must be embedded within a broader strategic framework that aligns environmental ambition with legal feasibility, economic resilience and distributive justice[173]. If properly calibrated, it can become a cornerstone of Europe's green competitiveness. If not, it risks reinforcing asymmetries that the Union has long sought to overcome.

[172] InvestEU Regulation (EU) 2021/523 prioritises SME support and green investment, but Regulation (EU) 2024/1781 lacks cross-references to these financial tools, weakening support and potentially hindering SMEs with limited capital or technical access.

[173] The CJEU has emphasised internal coherence in Union law for effective implementation, legal certainty and institutional trust. In *Vodafone and Others* (C-58/08 [2010] ECLI:EU:C:2010:321), the Court held legislative measures must not impose disproportionate burdens compromising internal market function. Similarly, in Commission v Hungary (C-78/18 [2020] ECLI:EU:C:2020:476), the Court reaffirmed proportionality requires balancing regulatory aims with practical capabilities. Combined with Articles 3 TEU and 9 TFEU, these rulings establish environmental legislation must integrate into the broader regulatory landscape. Fragmented or uncoordinated norms risk weakening sustainability, competitiveness and social cohesion. In *Commission v Hungary* (C-78/18), the CJEU struck down restrictions on foreign-funded NGOs, emphasising that proportionality demands alignment between regulatory objectives and the actual capacity of actors to comply. Transposed to Regulation (EU) 2024/1781, the ruling signals that sustainability obligations must not disregard structural disparities among firms and sectors. Articles 3 TEU and 9 TFEU reinforce this, requiring integration of social cohesion and competitiveness into environmental policy. A rigid one-size-fits-all framework risks undermining the very balance that EU primary law protects. The case thus illustrates that proportionality in sustainability law entails both environmental ambition and economic-social feasibility.