PACKAGING REGULATION AND CHOICES OF SUSTAINABLE MATERIALS: A CRITICAL DIALOGUE BETWEEN THE EUROPEAN PPWR AND BRAZILIAN DECREE NO. 12,688/2025, WITH EMPHASIS ON CARDBOARD AND CORRUGATED CARDBOARD

REGULAÇÃO DE EMBALAGENS E ESCOLHAS DE MATERIAIS SUSTENTÁVEIS: UM DIÁLOGO CRÍTICO ENTRE A PPWR EUROPEIA E O DECRETO BRASILEIRO Nº 12.688/2025, COM ÊNFASE EM PAPÉIS DE CARTÃO E PAPELÃO ONDULADO

REGULACIÓN DEL EMBALAJE Y ELECCIÓN DE MATERIALES SOSTENIBLES: UN DIÁLOGO CRÍTICO ENTRE LA PPWR EUROPEA Y EL DECRETO BRASILEÑO N.º 12.688/2025, CON ÉNFASIS EN EL CARTÓN Y EL CARTÓN ONDULADO

https://doi.org/10.56238/sevened2026.008-213

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ABSTRACT

Packaging regulation is at a historical turning point. In the European Union, Regulation (EU) 2025/40 – PPWR requires all packaging on the market to be economically recyclable by 2030, while harmonising design, labelling, prevention and substances of concern. In Brazil, Decree No. 12,688/2025 establishes the Reverse Logistics System for Plastic Packaging, with mandatory recovery targets (32% in 2026, scaling to 2040) and minimum post-consumer recycled (PCR) content thresholds, starting at 22% in 2026 for large companies. This paper provides a critical comparison of these frameworks and discusses technical-commercial implications for material selection, emphasising renewable, FSC chain-of-custody certified paperboard and corrugated board. We argue that cellulosic solutions, when designed for recycling (mono-material, contaminant-free and properly labelled), tend to reduce regulatory risk, compliance costs and reputational impacts while maintaining logistics performance. Decision-making should be guided by design-for-recycling criteria, auditable traceability and evidence (LCA), prioritising cellulosics where technically feasible and, otherwise, polymers compatible with PCR targets and large-scale recycling.

Keywords: PPWR. Decree 12.688/2025. Sustainable Packaging. Paperboard. Corrugated Board. FSC. Reverse Logistics. Recycled Content.

RESUMO

A regulamentação de embalagens vive uma inflexão histórica. Na União Europeia, o Regulamento (UE) 2025/40 – PPWR torna obrigatória a reciclabilidade econômica de todas as embalagens até 2030, além de harmonizar requisitos de desenho, rotulagem, prevenção e substâncias de preocupação. No Brasil, o Decreto nº 12.688/2025 institui o Sistema de Logística Reversa de Embalagens de Plástico, com metas obrigatórias de recuperação (32% em 2026, com evolução até 2040) e percentuais mínimos de conteúdo reciclado pós-consumo (PCR), a partir de 22% em 2026 para grandes empresas. Este artigo compara

criticamente esses marcos e discute implicações técnico-comerciais na escolha de materiais, com ênfase em papéis de cartão e papelão ondulado de fonte renovável e cadeia de custódia certificada (FSC). Argumenta-se que soluções celulósicas, quando projetadas para reciclagem (mono-material, sem contaminantes e rotulagem adequada), tendem a reduzir riscos regulatórios, custos de conformidade e impactos reputacionais, preservando desempenho logístico. Conclui-se que a tomada de decisão deve ser orientada por critérios de projetar-para-reciclar, rastreabilidade auditável e evidências (ACV), privilegiando celulósicos onde tecnicamente viáveis e, nos demais casos, polímeros compatíveis com metas de PCR e reciclagem em escala.

Palavras-chave: PPWR. Decreto 12.688/2025. Embalagens Sustentáveis. Papelcartão. Papelão Ondulado. FSC. Logística Reversa. Conteúdo Reciclado.

RESUMEN

La normativa sobre envases está experimentando un punto de inflexión histórico. En la Unión Europea, el Reglamento (UE) 2025/40 – PPWR exige la reciclabilidad económica de todos los envases para 2030, además de armonizar los requisitos de diseño, etiquetado, prevención y sustancias preocupantes. En Brasil, el Decreto n.º 12.688/2025 establece el Sistema de Logística Inversa para Envases de Plástico, con objetivos de recuperación obligatorios (32 % en 2026, con evolución hasta 2040) y porcentajes mínimos de contenido reciclado posconsumo (PCR), a partir del 22 % en 2026 para las grandes empresas. Este artículo compara críticamente estos hitos y analiza las implicaciones técnicas y comerciales para la selección de materiales, con especial énfasis en el cartón y el cartón ondulado procedentes de fuentes renovables y con certificación de cadena de custodia (FSC). Se argumenta que las soluciones celulósicas, cuando se diseñan para el reciclaje (de un solo material, libres de contaminantes y con el etiquetado adecuado), tienden a reducir los riesgos regulatorios, los costos de cumplimiento y el impacto en la reputación, a la vez que preservan el rendimiento logístico. Se concluye que la toma de decisiones debe guiarse por criterios de diseño para el reciclaje, trazabilidad auditable y evidencia (ACV), priorizando los materiales celulósicos cuando sea técnicamente factible y, en otros casos, polímeros compatibles con el reciclaje de contenido reciclado (PCR) y los objetivos de reciclaje a gran escala.

Palabras clave: PPWR. Decreto 12.688/2025. Embalaje Sostenible. Cartón. Cartón Ondulado. FSC. Logística Inversa. Contenido Reciclado.

1 INTRODUCTION

The transition from the former Directive 94/62/EC to Regulation (EU) 2025/40 (PPWR) establishes a uniform regime for the European market, with the goal of making all packaging recyclable in an economically viable way by 2030 and with general application from August 2026 (EUROPEAN UNION, 2025; EUROPEAN COMMISSION, 2025). In Brazil, Decree No. 12,688/2025 inaugurates a specific framework for plastic packaging, with recovery and recycled content goals in the short term (BRASIL, 2025).

2 COMPARATIVE NORMATIVE FRAMEWORK

2.1 EUROPEAN UNION (PPWR)

The PPWR entered into force on 02/11/2025 and applies generally as of 08/12/2026. Pillars include: recyclability by design by 2030, prevention targets, harmonized labeling, and limits on substances of concern, such as restrictions on PFAS on food packaging (EUROPEAN UNION, 2025; PACKAGINGLAW.COM, 2025).

2.2 BRAZIL (DECREE NO. 12,688/2025)

The decree institutes the Reverse Logistics System for Plastic Packaging, prioritizes cooperatives and defines mandatory recovery and post-consumer recycled content (PCR) targets, starting at 22% in 2026 for large companies, with an expected evolution until 2040 (BRASIL, 2025; MARTINELLI ADVOGADOS, 2025). Also in 2026, SINIR+ opened related technical public consultations (SINIR+, 2026).

2.3 CONVERGENCES

Both regimes require design for recycling, document traceability, and integration with the collection and sorting infrastructure. The EU is moving towards recyclability performance grids and possible eco-modulation of rates, while Brazil imposes annual compliance with targets and proof via management entities (EUROPEAN COMMISSION, 2025; BRAZIL, 2025).

3 CELLULOSIC MATERIALS IN THE COMPLIANCE STRATEGY

3.1 RECYCLABILITY AND CIRCULARITY

Paperboard and corrugated cardboard, when specified as mono-material and without contaminants, are widely compatible with existing recycling streams, favoring compliance with the economic recyclability provided for in the PPWR (EUROPEAN COMMISSION,

2025). Manufacturers report additional benefits in mass optimization, logistical damage reduction, and renewable source communication (STORA ENSO, 2026).

3.2 FSC CHAIN OF CUSTODY

FSC certification (chain of custody) enables auditable traceability of the fiber from forest management to the final product, allowing robust claims on responsible origin and use of brands, which reduces greenwashing risks and meets due diligence expectations (FSC, 2026).

3.3 DESIGN BOUNDARIES AND CAUTIONS

Non-repulpable laminates, inks and incompatible adhesives can compromise the recyclability of the paper. The PPWR provides design criteria for recycling and performance grades that can penalize solutions with low recoverability (ERP GLOBAL, 2025).

4 CRITICAL COMPARISON: WHY CORRUGATED CARDBOARD REDUCES REGULATORY RISKS

- Adherence to 2030 (EU) recyclability: compatibility with existing streams, helping to meet recyclability criteria (EUROPEAN COMMISSION, 2025).
- Traceability from renewable sources: chain of custody (FSC) certifications provide documentary backing for responsible procurement (FSC, 2026).
- Substitution of problematic plastics: when technically feasible, cellulosics avoid PCR targets applicable to plastics in Brazil and simplify evidence (BRASIL, 2025).
- Compliance and reputation costs: materials with high recyclability tend to reduce fees and image risks in EPR and regulatory harmonization regimes (EUROPEAN COMMISSION, 2025).

5 BUSINESS AND ENGINEERING IMPLICATIONS

- Specification governance: positive lists of inputs compatible with paper recycling and internal DfR criteria aligned with PPWR (ERP GLOBAL, 2025).
- Certified supply chain: require FSC CoC from converters, with records of claims and audits (FSC, 2026).
- LCA and data: LCA-supported decisions and primary supplier data on mass, avoided damage, and logistics (STORA ENSO, 2026).
- Integration with LR (Brazil): for lines that maintain polymers, plan PCR and proofs for targets in 2026 and beyond (BRAZIL, 2025).

6 FINAL CONSIDERATIONS

The convergence between PPWR and Brazilian Decree No. 12,688/2025 reinforces the centrality of verifiable circularity as a criterion for competitiveness. In scenarios where function allows, paperboard and corrugated paper designed for recycling and with certified chain of custody tend to offer the most robust combination of regulatory compliance, performance and ESG storytelling; when not, polymeric solutions compatible with PCR and recycling at scale should be prioritized.

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