CIRCPACK by VEOLIA

EPR system performance in the European Union

europen
SHAPING A SUSTAINABLE FUTURE FOR PACKAGING

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Overview

The Packaging and Packaging Waste Regulation (PPWR) entered into force in 2025, with binding recycling targets and harmonised reporting requirements. Whether Member States meet these obligations largely depends on how their Extended Producer Responsibility (EPR) systems are designed and run. This analysis covers recycling rates, fee structures, eco-modulation design, collection infrastructure and transparency, organised across four analytical Pillars.

Part I sets out the state of packaging waste management in Europe: how much waste is generated, where it ends up, and the regulatory context. Part II is the reference section on all 27 EPR systems, organised by market structure, with comparative data on fee levels, collection streams, deposit return schemes and transparency. Part III sets out the four analytical Pillars: each opens with the key findings and then the supporting evidence. Part IV walks through five country case studies (Belgium, Italy, Spain, Germany, Hungary) that show how system design lands in outcomes.

This study addresses a practical problem. Companies placing packaging on EU markets face 27 divergent national EPR systems that shape compliance costs, recyclability obligations, and market access. The PPWR requires Member States to demonstrate delivery of harmonised calculation methodologies, eco-modulated fees, minimum recycled content, and recyclability criteria. No equivalent country-by-country dataset across the 27 systems existed before this work. This analysis identifies the design choices that distinguish high-performing systems and the structural bottlenecks no current EPR design has fully resolved.

Data

The report draws on three primary data sources. Eurostat packaging waste statistics (2023 reporting period) provide the EU-wide baseline for generation, recycling, and disposal. PRO-published financial and operational reports supply country-level detail on fee structures, eco-modulation design, and collection coverage. A third dataset, produced by CIRPACK prior to this study, uses an adjusted recycling-rate methodology to give the material-specific resolution Eurostat's aggregates lack, with format-level rates across 13 packaging sub-categories, spanning: ferrous and non-ferrous metals; paper; cardboard; complex paper (mixed fraction, including beverage cartons); rigid and flexible plastics; and glass. Its construction and sources are in the technical appendix.

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Executive summary

Disclosure. This study was commissioned by the European Organisation for Packaging and the Environment (EUROPEN), an EU Transparency Register-listed industry association, and was produced by CIRCPACK by Veolia, a unit of Veolia Environnement S.A. Veolia operates collection, sorting and recycling facilities in several of the Member States covered in this analysis; the dataset and the case studies draw in part on Veolia's proprietary operational data. Findings and recommendations are those of CIRCPACK.

EUROPEN commissioned this study from CIRCPACK to identify what separates the EPR schemes already on track from those that are not, and what must change for the 2030 and 2035 PPWR obligations to be met across the EU-27. The analysis draws on Eurostat 2023 data, PRO-published financial and operational reports, national waste registry submissions and a household-scope, format-specific recycling-rate dataset covering 13 packaging sub-categories across all 27 Member States. Five country case studies (BE, IT, ES, DE, HU) illustrate how design choices translate into outcomes. Primary findings follow below.

Fee structure, not fee level, drives recycling performance

The design of the EPR fee structure is the strongest driver of recycling performance identified in the study. Systems with granular eco-modulated fees, where fees are differentiated by material, format and recyclability, outperform those with flat or basic fee structures by 16.5 percentage points in overall packaging recycling. Rigid plastics average 52% in granular systems against 31% in basic systems, a 21 percentage-point gap.

Fee levels alone, by contrast, do not drive waste prevention: volumes track GDP per capita across all material streams. Fee levels still need to be sufficient to fund the collection, sorting and reprocessing infrastructure the PPWR requires, but raising fees without transparently directing revenue towards specific bottlenecks will not close the performance gap. The proper allocation of fee revenue clearly drives higher quality outcomes.

Infrastructural barriers hinder recycling at scale

No single packaging category is on track to meet the PPWR's recycling-at-scale requirements across all 27 Member States. Flexible plastics are the sharpest illustration: they have the lowest recycling rates of any packaging category, negligible sorting and reprocessing capacity in most Member States, and the widest gap between what is collected and what is recycled. But they are not unique. Composite beverage cartons, aluminium in certain Member States, and selected paper streams show the same dynamic. The bottleneck which exists is physical capacity and downstream demand, and no current EPR design, regardless of fee structure granularity, has closed the gap for all categories.

Governance quality matters more than governance model

With the caveat that the state-managed sample is just two Member States (Hungary and Croatia), single-PRO systems average 71.8% overall packaging recycling, multi-PRO systems 62.2%, and state-managed systems 47.4% (Eurostat 2023). Belgium and Italy on one hand (single-PRO, 79.7% and 75.6% respectively) and Germany and Spain on the other (multi-PRO, 69.4% and 70.5% respectively) all sit in the top tier, separated by less than ten percentage points across two very different architectures. The spread within governance models is wider than the spread between them.

High-performing systems share three things: regulators define precisely what PROs must deliver, fee revenue is visible from collection to reprocessing, and reporting is granular enough to diagnose underperformance. Where governance is strong, both single-PRO and competitive structures deliver.

Data granularity is a key driver of EPR performance

Member States classified High on a composite transparency index, covering reporting coverage, methodology disclosure and reporting frequency, recycle 13.4 percentage points more packaging on average than Low Transparency systems (69.6% vs 56.2%, Section 12). The pattern across the wider sample is consistent: countries with more granular, publicly available data tend to achieve higher recycling rates.

Verifiable data enables regulators, producers and operators to see where material is being lost and target fees and infrastructure at the formats that need intervention. Without format-level visibility, eco-modulation defaults to design assumptions and capital concentrates on the formats that already have markets. PPWR Annex XII will require Member States to report per packaging category.

However, the underlying measurement infrastructure (harmonised sorting analysis, standardised material identification, comparable measurement protocols) does not yet exist uniformly across the EU-27, and PPWR does not specify how it is to be built. Reporting obligations alone will not close the data gap unless Member States invest in the laboratory and sorting infrastructure needed to produce comparable category-level figures.

Financial transparency stops at the PRO

Article 8a of the Waste Framework Directive requires PROs to publish their fee schedule, scheme ownership and membership, and the procedure used to select waste-management operators. It does not require disclosure of how aggregate fee revenue is allocated downstream once it leaves the PRO. Nothing comparable applies to the waste-management operators that deliver the service: municipalities, contracted collectors, sorting facilities, reprocessors.

In Belgium, formal contracts between Fost Plus and intermunicipal operators trace fee revenue to specific service standards, and per-format reporting allows recovery outcomes to be measured against payments. In most other Member States, PROs disburse to municipalities or contractors without comparable downstream visibility. This downstream opacity is where most fee revenue is spent, and the report identifies it as the single largest visible gap in the current EPR transparency framework.

The PPWR addresses several of the structural gaps this study identifies. Its harmonised calculation methodology requirement will reduce the methodological divergence that currently inflates some national recycling figures. Its eco-modulation requirements align with what is observed in the highest-performing systems. Its extended reporting obligations move in the direction of the data granularity that the analysis links to better outcomes.

However, the report's key findings indicate that additional harmonised efforts are needed across the EU to level the playing field and bring all Member States closer to the best performing EPR systems. The Member States that perform best combine four design

parameters: granular fee structures, consolidated operational responsibility, format-level data, and transparent methodology disclosure.

These are design choices any Member State can adopt without spending more and can be achieved by any Member State. Future EU legislation, such as the upcoming Circular Economy Act, will be an essential tool to reform EPR governance and drive a harmonised EU approach to waste management.

1. The state of packaging waste management in Europe

The PPWR, in force since February 2025 and applicable from August 2026, replaces three decades of nationally transposed directive rules with a single set of obligations that apply directly in every Member State. From 2030, packaging that does not meet its Design for Recycling (DfR) criteria loses market access; from 2035, packaging must also be recyclable at scale, and the regulation sets headline recycling-rate targets across all packaging streams. In most formats and Member States, collection, sorting and recycling currently fall short. EPR is the system responsible for the performance these targets depend on: the rest of this report examines the design choices that distinguish schemes on track for 2030 and 2035 from those that are not.

The focus here is the recycling obligations the PPWR sets. In particular, the recycled-at-scale obligation from 2035, and the headline rate targets that apply across all packaging streams. The EPR design features that drive whether schemes deliver against these obligations across all 27 Member States are what the rest of this report analyses.

The question this raises is whether the waste management infrastructure that EU Member States have built around EPR is fit for purpose under the PPWR. The EU-27 generated 79.7 million tonnes of packaging waste in 2023, equivalent to 177.8 kg per capita. Overall recycling stood at 64.1%. Recycling rates vary widely across the EU-27: Belgium recycles 79.7% of its packaging while Romania recycles 37.3%. For plastics, the spread is wider and the baseline lower. The EU-27 average for plastic packaging recycling is 42.1% in 2023 (Eurostat), with flexible plastics trailing rigid formats significantly. Many Member States still direct most of their non-recycled packaging waste to incineration or landfill.

EPR systems are the primary mechanism Member States use to organise and finance packaging waste collection, sorting, and recycling. Every EU country operates some form of EPR as a requirement put in place by earlier legislation. Design varies enormously: fee structures, the number and governance of PROs, the granularity of data they report, and the degree to which they incentivise recyclability and recycled content at the packaging design stage.

CIRCPACK assessed the EPR systems of all 27 EU Member States across two dimensions: recycling outcomes (rates, landfill diversion, material-specific recovery) and EPR design (fee structures, market incentives, cost-effectiveness). The analysis is organised under four analytical Pillars. Each isolates a specific mechanism through which EPR systems shape circular economy outcomes: minimising material losses, circular reporting and monitoring, creating circular markets, and transparency. Five country case studies (Belgium, Italy, Spain, Germany, Hungary) illustrate how these mechanisms operate in practice.

The findings do not point to a single model that outperforms all others. They identify a set of design choices that separate high-performing systems from the rest, and persistent gaps in specific material streams, especially flexibles, that no current EPR design has yet resolved.

The 79.7 million tonnes of EU-27 packaging waste generated in 2023 splits unevenly across five material streams, each with a distinct collection, sorting, and end-market profile. Paper and cardboard represent the largest fraction at 32.3 million tonnes (40.5%), followed by plastic at 15.8 million tonnes (19.8%), glass at 15.0 million tonnes (18.8%), wood at 12.6 million tonnes (15.8%), and metals at 3.9 million tonnes (4.9%). Each stream operates within a distinct collection, sorting, and end-market context. Treating them as a single category obscures the structural barriers that hold back waste management performance in individual streams.

Recycling performance varies widely across the EU-27. The spread between Belgium and Romania is more than 40 percentage points and has not closed meaningfully over the past decade. Countries above 70% (Belgium, the Netherlands, Italy, Czechia, Slovenia, Slovakia, Spain) have legacy EPR infrastructure, granular eco-modulation and separate collection systems built up over decades. The countries below 50% (Greece, Malta, Hungary, Romania) lack at least one of these.

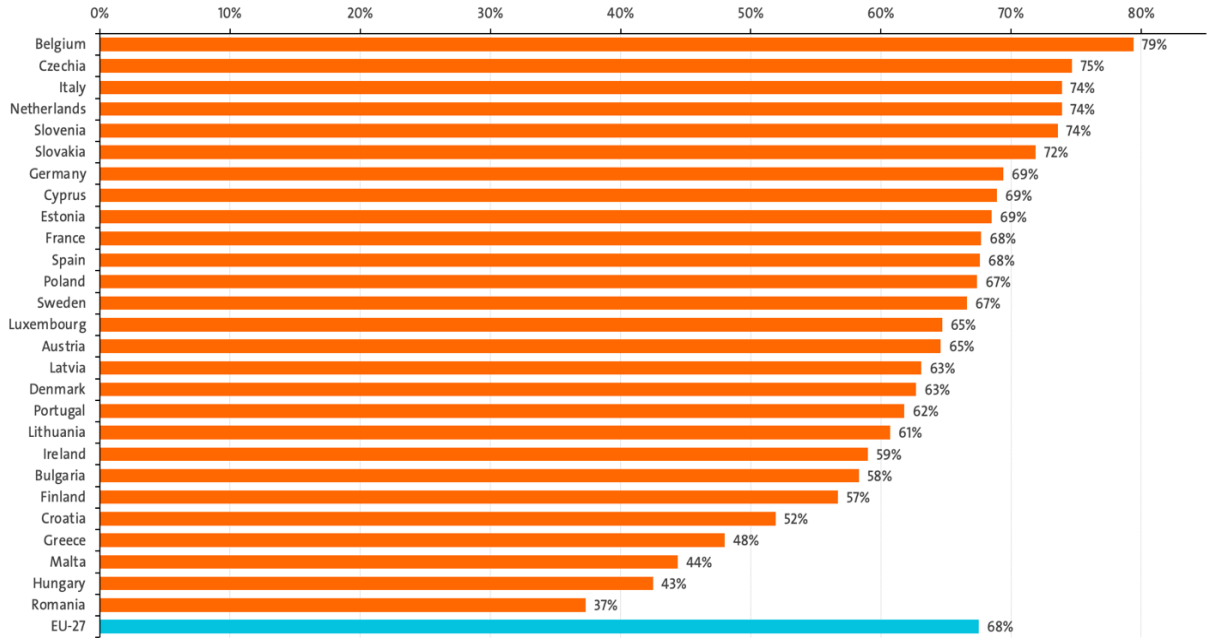


Figure 1. Overall packaging recycling rate by Member State, 2023. *Source: Eurostat, env_waspac (2023 reporting period).*

1.1 Scope and objectives

This study was commissioned by EUROPEN and performed by CIRCPACK. It covers all 27 EU Member States and focuses on household packaging across the major material streams: paper and cardboard, plastics (rigid and flexible), glass, ferrous and non-ferrous metals, and composite packaging including beverage cartons.

Data sources include Eurostat (2023 reporting period where available), PRO-published financial and operational reports, national waste registry submissions, and others. Eurostat updated its recycling-rate figures in May 2026; this study uses the previous release, which was current when the analysis was carried out. In addition, the CIRCPACK format-specific recycling-rate dataset, which triangulates officially reported figures with material flow analysis, was added at the request of EUROPEN. Five Member States receive in-depth case study treatment: Belgium, Italy, Spain, Germany, and Hungary. These were selected to capture a range of system types (single-PRO, competitive multi-PRO, and state-managed), performance levels, and geographic contexts.

1.2 Packaging waste generation and recycling

The EU-27 produced 79.7 million tonnes of packaging waste in 2023, or 177.8 kg per capita. Per capita generation varies by a factor of nearly three across Member States. At the upper end, Ireland reports 223.1 kg per capita (partly reflecting its large food export sector), followed by Italy (219.5 kg), Germany (215.2 kg), Luxembourg (204.5 kg), and Denmark (192.4 kg). At the lower end, Croatia reports 81.4 kg, Slovakia 103.9 kg, and Greece 107.7 kg, though definitional differences and underreporting explain part of that gap.

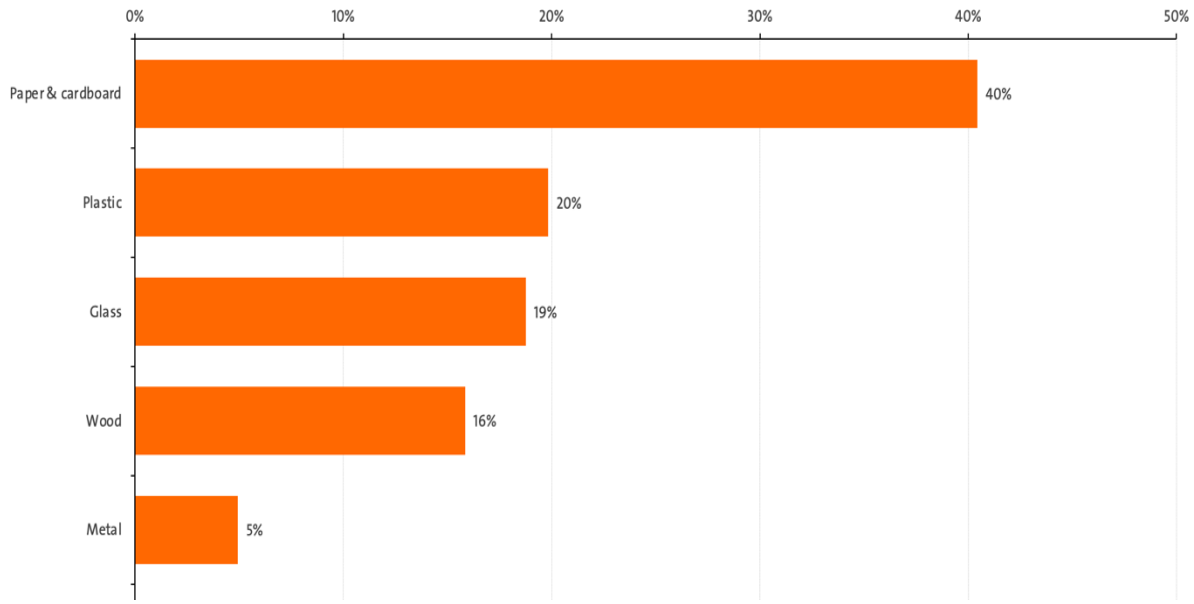


Figure 2. EU-27 packaging waste by material, 2023. *Source: Eurostat, env_waspac (2023 reporting period).*

The material-specific recycling rates developed for this study provide granularity not available from aggregate Eurostat figures. At the EU-27 headline level, material-level rates are as follows: steel at approximately 70%, glass at around 63%, and paper and cardboard at roughly 69%. Within plastics, the rigid–flexible split dominates: rigid plastics average 34.1% across the EU-27 household stream and climb above 50% in the best-performing Western European systems, while flexible plastics sit at 13.1%, constrained by thin separate collection, high sorting losses, and shallow end-markets for recycled output. The gap between rigid and

flexible plastic recycling remains one of the widest material-level disparities in the EU packaging system.

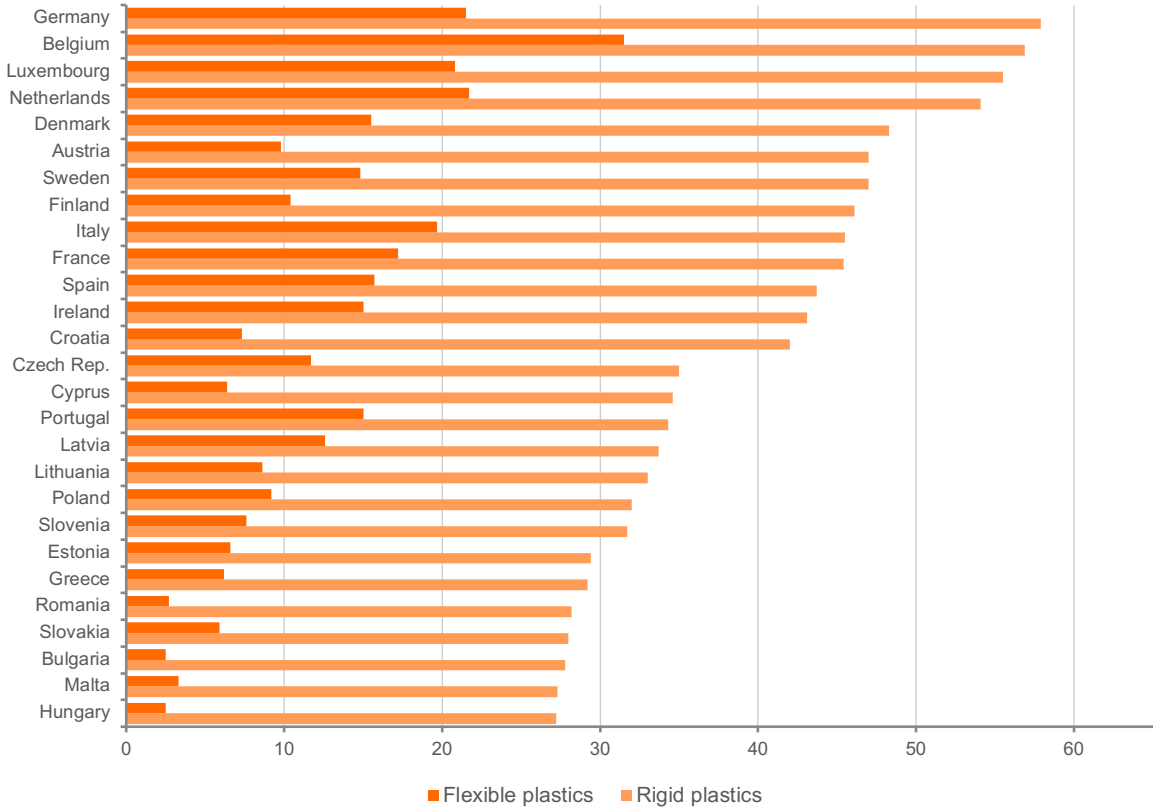


Figure 3. Adjusted rigid and flexible plastic recycling rates by Member State, 2023. *Source: CIRCPACK polymer-specific recycling rate dataset.*

1.3 Incineration and landfill context

Recycling rates alone do not provide a complete picture of system performance. The treatment pathway for non-recycled material, whether incineration or landfill, is an equally important indicator of where each Member State sits in the waste hierarchy.

Incineration trends in the EU split sharply by purpose. The share with energy recovery continues at scale as a residual treatment route. Incineration used only to dispose of waste has collapsed: across the EU-27 it fell from 18 kg per capita in 2015 to around 3 kg per capita in 2024 (Eurostat), with most Member States now reporting effectively zero. The remaining volumes are concentrated in the few Member States with mature waste-to-energy infrastructure.

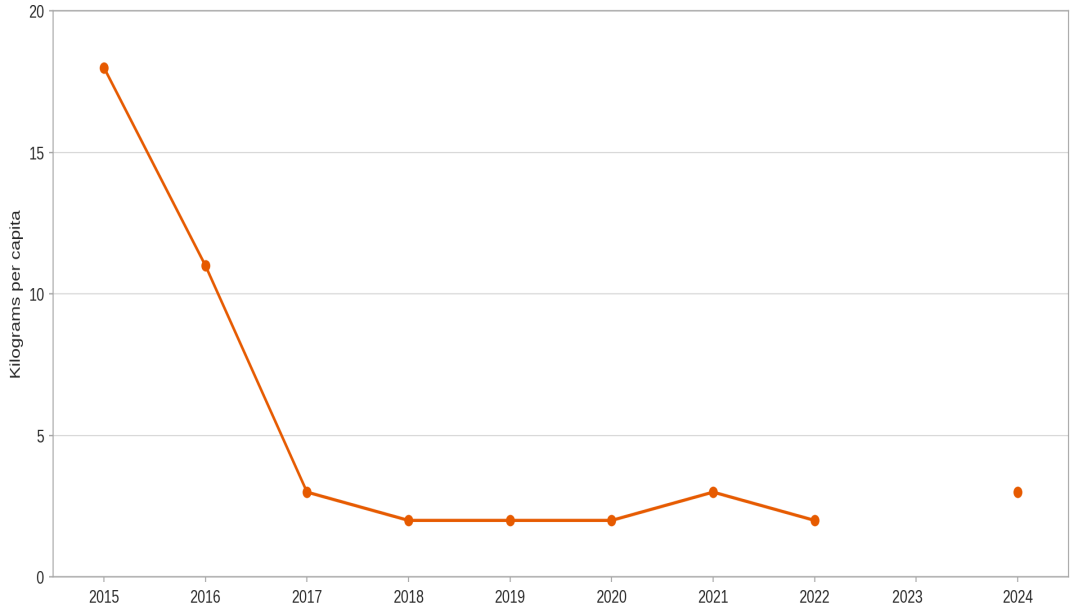


Figure 4. Incineration of municipal waste without energy recovery, EU-27, 2015–2024. *Source: Eurostat, env_wasmun (waste management operation D10), extracted 30 March 2026.*

Landfill reliance has declined steadily at the EU level, but the EU-27 average hides a sharp divide between Member States. On the most recent EEA municipal waste data (2022 reporting), eleven Member States still send more than 30% of their municipal waste to landfill. Greece sits at the top of the distribution at roughly 80%, then Romania at around 70% and Portugal and Spain in the region of 60%. At the other end, Germany, the Netherlands, Belgium, Sweden, Denmark and Austria all sit below 5%. These figures cover municipal waste rather than packaging specifically, but they describe the disposal infrastructure within which packaging waste is managed. The Member States still landfilling much of their municipal stream are, almost without exception, the same Member States whose packaging recycling rates sit furthest below the EU-27 average. A packaging-specific landfill breakdown is in the methodology appendix.

The EU-27 average for landfilled municipal waste fell from 127 kg per capita in 2015 to a provisional 110 kg per capita in 2024 (Eurostat). Within that aggregate, Malta remains the highest per-capita landfill user despite cutting its rate from 676 kg per capita in 2015 to 448 kg in 2024; Cyprus sits in a similar position. Larger Western and Southern economies show slower, incremental progress: Spain moved from 261 to 216 kg per capita, France from 122 to 110 kg, and Italy from 130 kg in 2015 to 87 kg by its most recent Eurostat figure (2022).

These figures define the scale of the investment required. Member States that currently landfill most of their waste will need to build out collection, sorting and recycling capacity in parallel to meet the PPWR recycling targets. EPR fee revenue is a primary funding source, and whether current fee levels and allocation are adequate is assessed in Part II of this report.

Part II

EPR systems across the EU

2. Understanding EPR

EPR makes the companies that place packaging on a market financially, and in some cases operationally, responsible for managing that packaging at end-of-life. It is now required in every Member State for all packaging, with minimum standards set under EU law on transparency, fee modulation, governance and reporting. Some Member States have operated it for decades; others are still building the operational base. EPR is today the primary funding mechanism for packaging collection and recycling across all 27 Member States.

The obligation works through a chain of responsibility. A producer or importer of packaged goods registers with a Producer Responsibility Organisation (PRO). The PRO collects fees from that producer, typically calculated per kilogram of packaging material placed on the market, with rates that may vary by material type, colour, recyclability, or recycled content. These fees generally fund the collection, sorting, and recycling of household packaging waste. In most systems, municipalities carry out the physical collection, while the PRO manages the contracts and finances the operations, though variance exists.

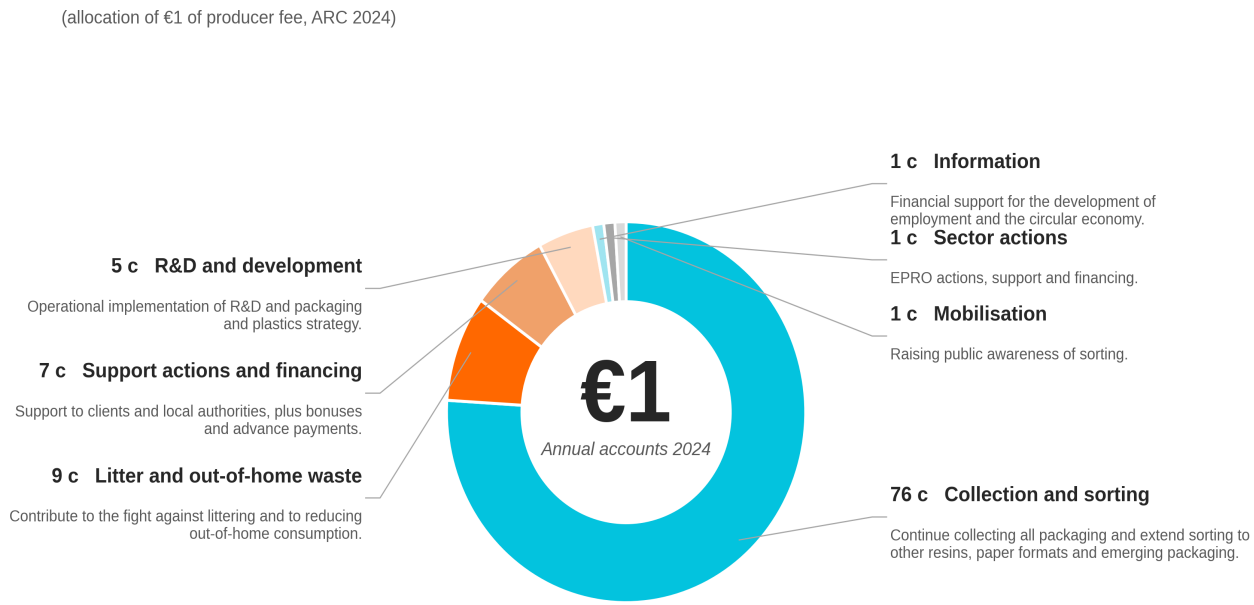


Figure 5. Household packaging and graphic papers fee allocation, France, 2024. *Source: Citeo, ARC 2024 annual accounts.*

How fees are differentiated matters. Eco-modulation refers to the practice of adjusting EPR fees so that packaging which is easier to recycle (and sell as high quality raw material) costs less to place on the market, and packaging which is difficult or impossible to recycle costs

more. If we use plastics as an example, a granular fee breakdown might distinguish between clear PET bottles, opaque HDPE containers, flexible PE film, and multi-material pouches, each at a different rate. A basic schedule might set a single fee for all plastics. The level of granularity correlates with recycling performance: countries with granular eco-modulation average 73.9% packaging recycling, compared to 57.4% for countries with only basic fee differentiation. Granular eco-modulation in multi-PRO markets is set by the regulator or a statutory clearinghouse (Germany's ZSVR, Spain's Ministry for Ecological Transition) rather than agreed between PROs; the correlation reflects regulatory design, not market coordination.

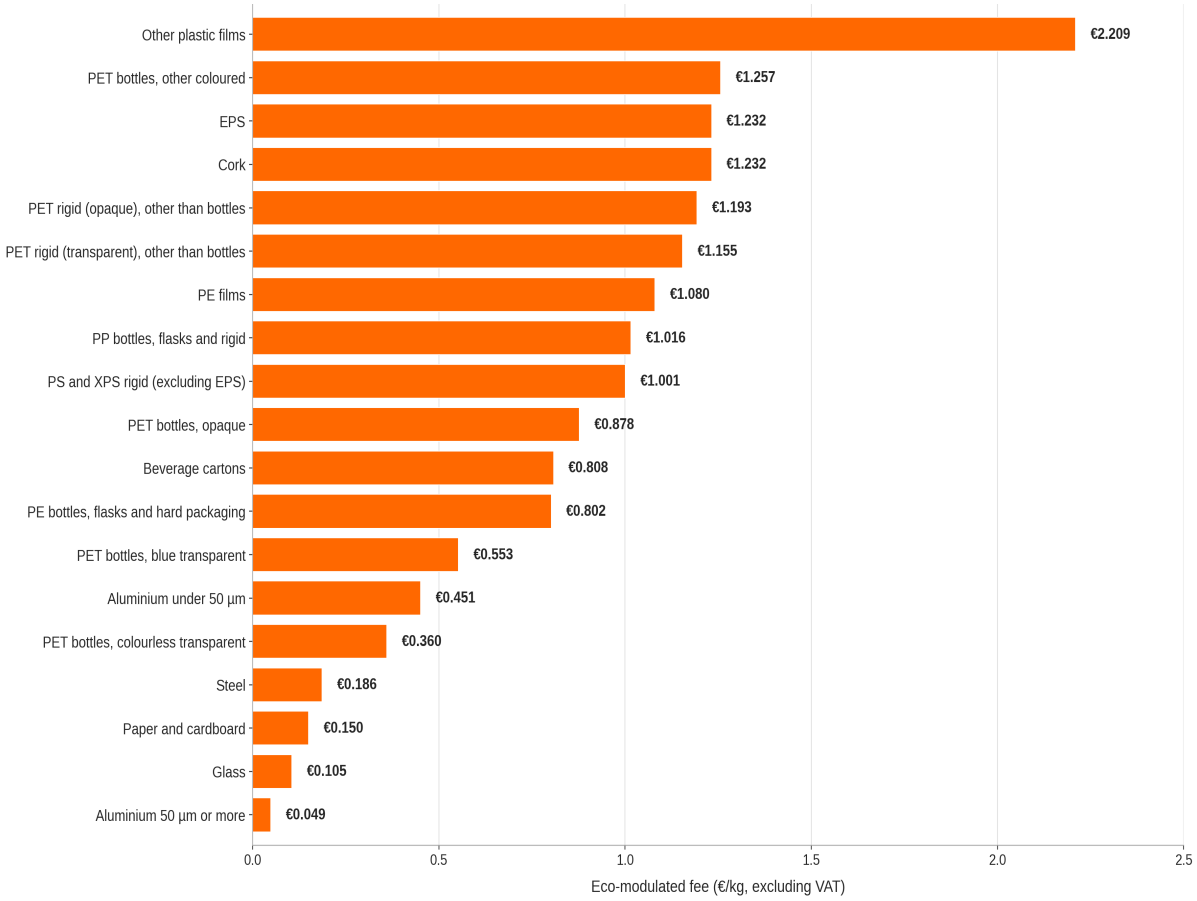


Figure 6. Belgium, Fost Plus eco-modulated fee schedule, 2026. *Source: Fost Plus, 2026 published tariffs (excluding VAT). Excluded from the chart: hazardous household waste, the catch-all "valorised" and "non-valorised" rates (both €4.4190/kg in 2026), and seven new categories effective 12 August 2026 (including beverage capsules, beverage bags, sticky labels for fruit and vegetables).*

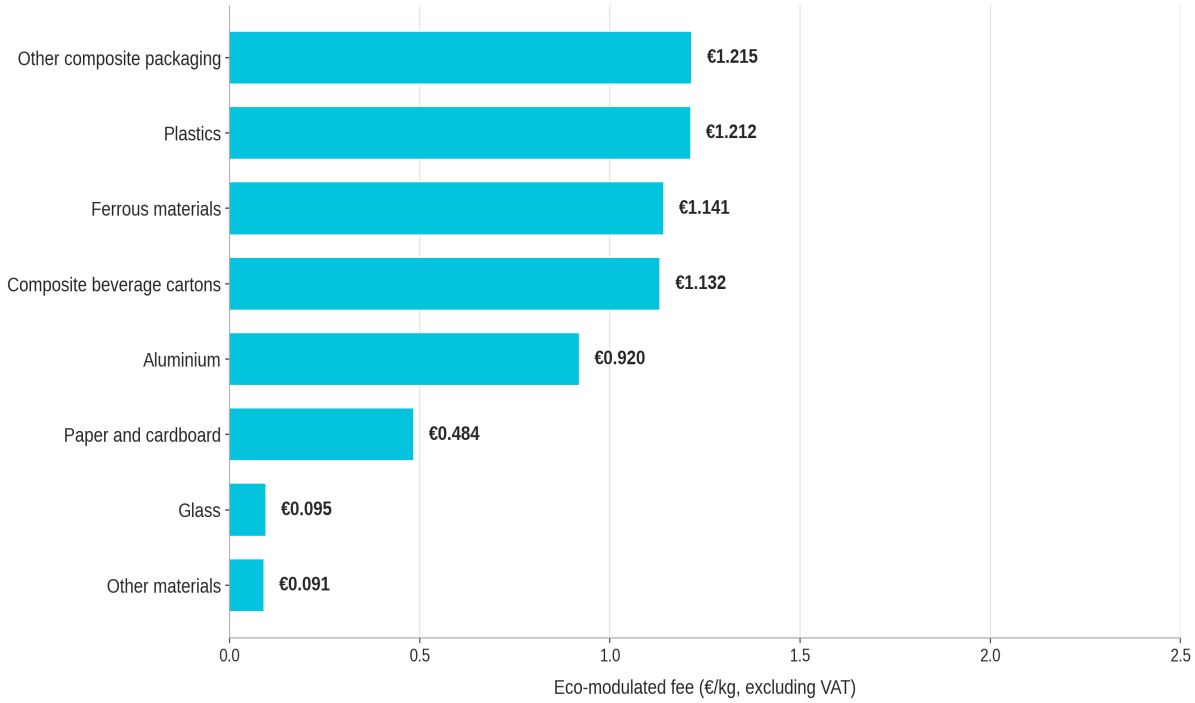


Figure 7. Germany, average eco-modulated fee schedule across eight dual systems, 2026. *Source: 2026 published tariffs of Der Grüne Punkt, Landbell, Lizenzero, Noventiz, PreZero, BellandVision, Recycling-Dual and Reclay (excluding VAT). Eight of the ten licensed dual systems publish their own fee calculators rather than a single tariff; values shown are simple averages across the 8 PROs.*

Member States organise their EPR systems in one of three broad models. In a single-PRO system (Belgium, the Netherlands, Czechia, and others), one organisation handles all household packaging, which concentrates data and simplifies reporting. In a competitive multi-PRO system (Germany, Austria, Spain, and others), several PROs compete for producer contracts, which can drive cost efficiency but complicates coordination and limits transparency. In a state-managed system (Hungary, Croatia), a public body administers the scheme, with fees flowing through a government fund.

Deposit Return Systems (DRS) are a parallel mechanism in which consumers pay a small deposit at the point of purchase and reclaim it by returning the empty container. Seventeen EU Member States currently operate a DRS, and several more are in the process of introducing one. DRS programmes achieve very high collection rates for the specific materials they cover (typically beverage containers), and operate alongside, not instead of, the broader EPR system.

EPR systems' design, funding and enforcement produce measurably different outcomes. The PPWR raises the stakes for each. The sections that follow document where each system stands.

3. EU-27 EPR system profiles

The 27 EU Member States operate EPR systems that fall into three structural categories: single-PRO systems, competitive multi-PRO systems, and state-managed systems. The distinction matters. System structure shapes how fees are set, how data is reported, how municipal collection is coordinated, and ultimately how much packaging gets recycled.

Of the 27, seven operate with a single PRO handling household packaging, 18 have multiple competing PROs, and two rely on a state-administered fund. Single-PRO systems average 71.8% overall packaging recycling, multi-PRO systems 62.2%, and state-managed systems 47.4%. The profiles below summarise each system type and identify which countries fall into each category.

Member State	Market structure (in practice)	Overall packaging recycling rate (2023)
Belgium	Single PRO	79.7%
Netherlands	Single PRO	75.8%
Italy	Single PRO	75.6%
Czechia	Single PRO	74.8%
Cyprus	Single PRO	69.5%
Luxembourg	Single PRO	66.1%
Ireland	Single PRO	61.0%
Slovenia	Multiple PROs	73.6%
Slovakia	Multiple PROs	71.9%
Spain	Multiple PROs	70.5%
Germany	Multiple PROs	69.4%
France	Multiple PROs	69.0%
Estonia	Multiple PROs	68.5%
Sweden	Multiple PROs	68.5%
Poland	Multiple PROs	67.4%
Austria	Multiple PROs	64.9%
Latvia	Multiple PROs	63.1%
Denmark	Multiple PROs	62.7%
Portugal	Multiple PROs	61.8%
Lithuania	Multiple PROs	60.7%
Finland	Multiple PROs	59.4%
Bulgaria	Multiple PROs	58.3%
Greece	Multiple PROs	48.0%
Malta	Multiple PROs	44.4%
Romania	Multiple PROs	37.3%
Croatia	State Monopoly	51.9%
Hungary	State Monopoly	42.8%

Figure 8. EU-27 Member States by EPR market structure and overall packaging recycling rate, 2023.
Source: CIRCPACK analysis based on Eurostat env_waspac (2023 reporting period).

3.1 Single-PRO systems

In a single-PRO system, one organisation holds the mandate for household packaging EPR. This concentrates operational data, eliminates reporting fragmentation, and gives the PRO direct influence over municipal collection contracts and sorting specifications.

Seven EU-27 Member States operate single-PRO systems for household packaging: Belgium (Fost Plus), the Netherlands (Verpact), Italy (CONAI and its material-specific consortia), Czechia (EKO-KOM), Cyprus (Green Dot Cyprus), Luxembourg (Valorlux) and Ireland (Repak). Overall packaging recycling rates in 2023 ranged from 61.0% (Ireland) to 79.7% (Belgium), with a group average of 71.8%, the highest of the three governance models.

Belgium is the clearest example. Fost Plus achieved 79.7% overall recycling in 2023, the highest in the EU. It operates a granular eco-modulation scheme that differentiates fees across 19 plastic sub-categories. Valipac handles commercial and industrial packaging separately, with differentiated fees and targeted monitoring. The system is privately managed, and municipalities carry out collection under nationally standardised sorting rules.

The Netherlands (Verpact) achieved 75.8% overall recycling with a granular fee structure and national collection coverage. Italy (CONAI and its seven material-specific consortia) reached 75.6%, operating through separate consortia for each material stream under a single coordinating body. Czechia (EKO-KOM, 74.8%) and Cyprus (Green Dot Cyprus, 69.5%) sit above the EU-27 average; Luxembourg (Valorlux, 66.1%) and Ireland (Repak, 61.0%) below the single-PRO average but still above the EU-27 multi-PRO average of 62.2%.

What these systems share operationally is unified reporting and a clear single point of accountability.

Member State	Transparency score (0 to 6)
High transparency (n = 8) · score ≥ 5.5	
Belgium	6 / 6
Czechia	6 / 6
Denmark	6 / 6
France	6 / 6
Italy	6 / 6
Finland	5.5 / 6
Luxembourg	5.5 / 6
Netherlands	5.5 / 6
Medium transparency (n = 10) · score 3.5 to < 5.5	
Germany	4.75 / 6
Slovenia	4.75 / 6
Ireland	4.5 / 6
Spain	4.5 / 6
Sweden	4.5 / 6
Croatia	4.25 / 6
Estonia	4 / 6
Slovakia	4 / 6
Austria	3.5 / 6
Lithuania	3.5 / 6
Low transparency (n = 9) · score < 3.5	
Hungary	3.25 / 6
Greece	2.5 / 6
Cyprus	2.25 / 6
Romania	1.75 / 6
Poland	1.5 / 6
Bulgaria	1.25 / 6
Portugal	1.25 / 6
Latvia	1 / 6
Malta	1 / 6

Figure 9. EU-27 transparency performance, 2026. *Source: CIRCPACK EPR transparency assessment (2026 reporting period).*

Our adjusted recycling rates at the material level reveal a structural gap within these systems which is not necessarily related to their administrative structure. Single-PRO countries perform strongly on glass, steel, and fibre-based packaging, often well above the EU-27 average, with

plastic formats lagging, particularly flexible packaging. Belgium's eco-modulation and the Netherlands' granular fee structures explicitly target this differentiation. Yet material-handling constraints at the collection and sorting stages, rather than a gap in system design, appear to be the main reason for this structural gap. Section 9 examines this distinction across all 27 Member States.

Member State	Glass	Steel	Paper and cardboard	Rigid plastic	Flexible plastic
Belgium	92.9%	99.6%	83.9%	50.8%	29.1%
Netherlands	77.5%	88.0%	75.3%	48.2%	19.4%
Italy	74.3%	67.1%	74.4%	40.0%	19.7%
Czechia	71.6%	83.1%	87.3%	30.5%	10.2%
Cyprus	36.0%	86.5%	75.4%	29.0%	6.0%
Luxembourg	67.5%	65.4%	67.9%	48.5%	19.4%
Ireland	74.2%	63.8%	61.8%	37.8%	13.2%
EU-27 average	*62.7%*	*69.9%*	*69.2%*	*34.1%*	*10.7%*

Figure 10. Single-PRO countries: material-level recycling rates, 2023. *Source: CIRCPACK adjusted recycling rates (2023 reporting period).*

Fee levels within single-PRO systems vary widely by material and market. High recycling performance does not require uniformly high fees. Belgium and the Netherlands run above-average fees and reach above-average results, while Italy reaches comparable recycling at substantially lower fee levels.

Member State	PRO	Plastics fee (€/kg)	Glass fee (€/kg)	Notes
Belgium	Fost Plus	**€1.061**	**€0.052**	Granular eco-modulation, 19 sub-categories
Netherlands	Verpact	**€1.320**	**€0.100**	Granular fee structure
Italy	CONAI + 7 material consortia	**€0.210**	**€0.040**	Material-consortium model
Czechia	EKO-KOM	**€0.730**	**€0.076**	Material-based modulation
Cyprus	Green Dot Cyprus	**€0.101**	**€0.027**	Standard material-based fees
Luxembourg	Valorlux	**€0.435**	**€0.020**	Incentive-based modulation
Ireland	Repak	**€0.170**	**€0.023**	Standard material-based fees

Figure 11. Single-PRO countries: plastics and glass EPR fees, 2026. *Source: 2026 published tariff schedules of Fost Plus, Verpact, CONAI, EKO-KOM, Green Dot Cyprus, Valorlux and Repak (excluding VAT).*

3.2 Competitive multi-PRO systems

Eighteen Member States operate with multiple competing PROs. The multi-PRO market structure is designed to drive efficiency: producers can switch between PROs, and PROs compete on cost and service quality. It also introduces coordination challenges and transparency limitations. Each PRO reports independently, fee structures differ between competing organisations in the same country, and municipal collection contracts can come under scrutiny.

Multi-PRO systems show the widest range in fee levels across the EU-27. Plastics fees range from €0.071/kg in Greece to €1.640/kg in Sweden, a 23-fold spread. The variation reinforces a central finding of this report: fee levels on their own do not determine recycling outcomes. What matters more is fee structure, eco-modulation granularity and how revenue is deployed.

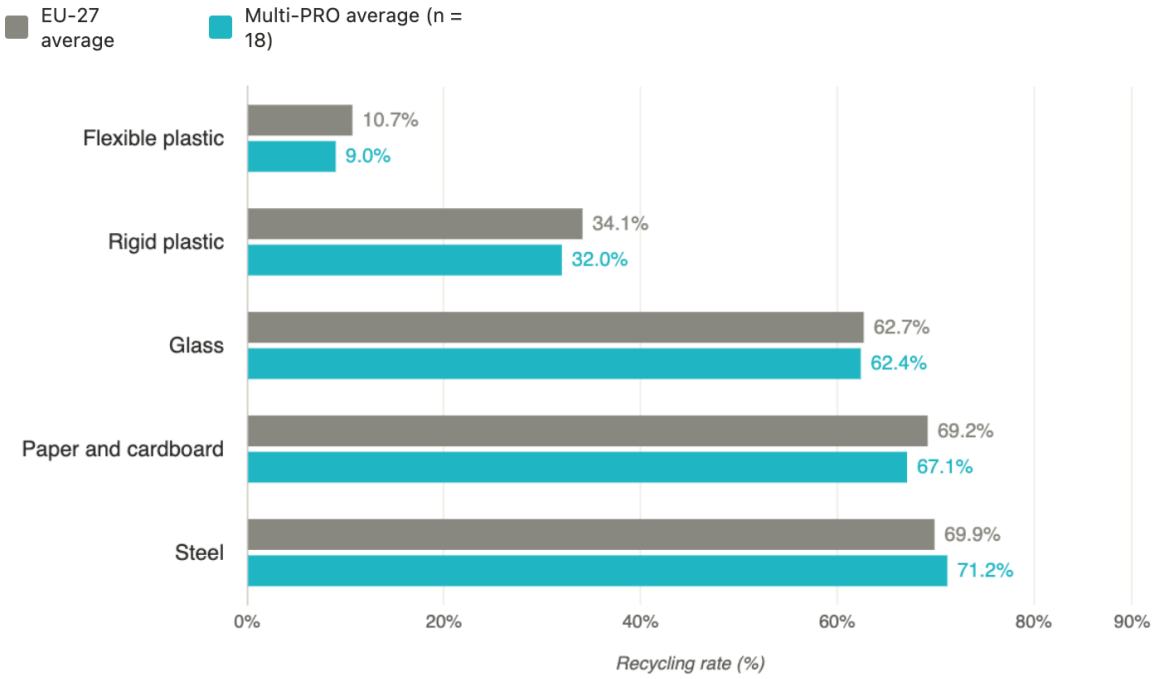


Figure 12. Multi-PRO countries vs EU-27 average: adjusted recycling rates by material, 2023. *Source: CIRCPACK adjusted recycling rates (2023 reporting period).*

At the material level, the multi-PRO average tracks closely with the EU-27 average on three of the five streams (Glass 62.4% vs 62.7%, Steel 71.2% vs 69.9%, Paper and cardboard 67.1% vs 69.2%) and trails by 2.1 percentage points on Rigid plastic and 1.7 percentage points on Flexible plastic. The within-multi-PRO spread, however, is wide: on Flexible plastic the group ranges from 2.5% in Bulgaria and 2.6% in Romania to 18.6% in Germany and 15.1% in France. Operational capacity, not the count of competing PROs, determines material-specific outcomes.

Member State	Overall packaging recycling rate (2023)	Plastics fee (€/kg, 2026)	Glass fee (€/kg, 2026)	Notes
Slovenia	73.6%	€0.329	€0.009	Material-based modulation
Slovakia	71.9%	€0.377	€0.120	Material-based modulation
Spain	70.5%	€0.609	€0.030	Royal Decree 1055/2022; plus national plastic tax €0.45/kg
Germany	69.4%	€1.165	€0.097	Aggregated headline rate; 10 licensed dual systems
France	69.0%	€0.988	€0.020	Granular format-level eco-modulation
Estonia	68.5%	€0.285	€0.080	Material-based modulation
Sweden	68.5%	€1.640	€0.260	Highest plastics fee in the EU-27
Poland	67.4%	€0.630	€0.070	Basic eco-modulation
Austria	64.9%	€1.040	€0.108	Multiple PROs with advanced eco-modulation
Latvia	63.1%	€0.990	€0.112	Material-based modulation
Denmark	62.7%	€0.520	€0.450	Tiered recyclability grades from 2026
Portugal	61.8%	€0.543	€0.078	Material-based modulation
Lithuania	60.7%	€0.518	€0.193	Material-based modulation
Finland	59.4%	€0.215	€0.144	Basic eco-modulation
Bulgaria	58.3%	€0.116	€0.144	Basic eco-modulation
Greece	48.0%	€0.071	€0.019	Basic eco-modulation
Malta	44.4%	€0.205	€0.147	Material-difficulty fees
Romania	37.3%	€0.450	€0.520	Highest glass fee in the EU-27; basic modulation

Figure 13. Multi-PRO countries: plastics and glass EPR fees, 2026. *Source: 2026 published tariff schedules of the national PROs (excluding VAT).*

The fee modulation approaches within multi-PRO markets vary considerably. Germany, the largest multi-PRO market with ten licensed dual systems under the Packaging Act (VerpackG), applies material-level fee differentiation but does not break fees down by packaging format within materials: plastics carry a single externally reported rate regardless of whether the item is a rigid bottle or a flexible film. Germany's fees are among the highest in Europe in absolute terms (€1.21/kg for plastics, €1.125/kg for beverage cartons; both are aggregated headline rates externally reported by the dual systems; the fees individual producers pay vary with contract and are not publicly disclosed, and in several comparable markets the equivalent plastics rate is an estimate rather than a directly reported figure). Sweden is the only multi-PRO market with a higher headline plastics fee at €1.64/kg, although Sweden's overall recycling rate of 68.5% sits just below Germany's 69.4% (Eurostat, 2023 reported rate).

CIRCPACK adjusted figures, which account for sorting and reprocessing losses, place Germany's effective recovery lower for several material streams, particularly flexible plastics where adjusted rates fall below 25% (PE flex 24.4%, PP flex 12.9%). Municipalities have limited operational involvement, as the PROs contract directly with waste operators.

Spain (70.5%, Eurostat) presents a contrasting model with one of the EU's most active PRO markets. Royal Decree 1055/2022 mandates eco-modulation that rewards recyclability and post-consumer recycled (PCR) content, with surcharges for hard-to-recycle formats. Spain's fees are substantially lower than Germany's (€0.61/kg for plastics, €0.03/kg for glass, among the lowest in the EU-27) but are supplemented by a national plastic tax of €0.45/kg on non-recycled plastic in non-reusable packaging. The result is a more layered system where the EPR fee itself is only one component of the financial signal reaching producers.

France (69.0%, Eurostat) brought industrial packaging under EPR and operates separate PROs for household and industrial streams, with granular format-level eco-modulation and plastic fees of €0.99/kg. France's glass fee of €0.02/kg is the second lowest in the EU-27, after Slovenia (€0.009/kg). Austria (64.9%, Eurostat) combines multiple PROs with advanced eco-modulation at €1.04/kg for plastics, but this higher fee level does not translate into a proportionally higher recycling rate. The full fee comparison is set out in Table 2 (Appendix D).

At the lower end of this group, Greece (48.0%, Eurostat), Malta (44.4%, Eurostat) and Romania (37.3%, Eurostat) all operate multi-PRO systems with basic eco-modulation and limited transparency. Romania scored poorly on transparency in our assessment and additionally carries the highest glass fee in the EU-27 at €0.52/kg, yet its overall recycling rate is the lowest. Bulgaria (58.3%, Eurostat) sits just above this lower cohort with similarly basic eco-modulation. The presence of multiple licensed operators alone does not drive performance. Multi-PRO systems that perform well pair the multi-PRO structure with centralised digital registries, mandatory reporting standards, and government oversight.

The remaining multi-PRO systems are Slovenia (73.6%, Eurostat), Slovakia (71.9%, Eurostat), Estonia (68.5%, Eurostat), Sweden (68.5%, Eurostat), Poland (67.4%, Eurostat), Latvia (63.1%, Eurostat), Denmark (62.7%, Eurostat), Portugal (61.8%, Eurostat), Lithuania (60.7%, Eurostat) and Finland (59.4%, Eurostat). Performance within this structural category spans from Slovenia's 73.6% at the top to Romania's 37.3% at the bottom, a 36.3 pp gap among systems that share the same multi-PRO design. The country-level detail is set out in Table 2 (Appendix D) and in the reference tables in Section 7.

3.3 State-managed systems

Two Member States operate state-managed EPR systems: Croatia and Hungary. In these models, producer fees flow into a government-administered fund rather than to a private PRO. The state fund then contracts waste management services and oversees collection and recycling. Operational efficiency, transparency and the quality of contractor oversight largely determine outcomes in these systems.

State-managed systems show a different pattern from the rest of the EU-27: weakness across multiple materials, not plastics alone. Croatia in particular falls below the EU-27 average on every material stream measured. Its underperformance on steel is striking: Croatia records

21.9%, against an EU-27 average of 69.9% and a Western European average of 80.2%. That is a gap of around 58 percentage points behind Western Europe, on a material where most Member States routinely exceed 75%. Austria, by contrast, achieves 97.9% on steel and 79.3% on glass. Hungary's weakness is concentrated in aluminium and plastics rather than steel, where its Eurostat rate of 85.7% is comparatively strong. This breadth of weakness suggests operational constraints in collection, separation and sorting logistics rather than material-specific administrative design gaps. Section 9 frames material-level variance as a proxy for infrastructure investment and operational maturity.

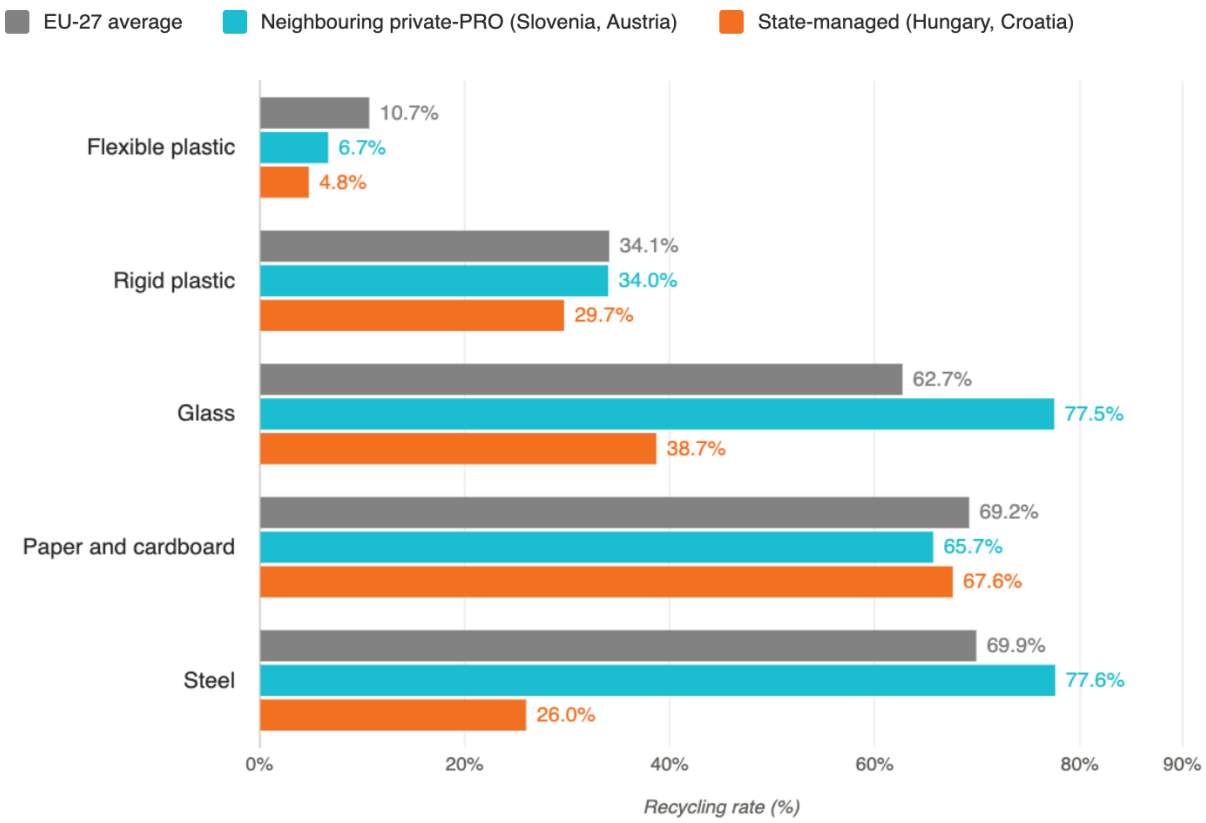


Figure 14. State-managed systems vs neighbouring private-PRO comparators: adjusted recycling rates by material, 2023. *Source: CIRCPACK adjusted recycling rates (2023 reporting period).*

Fee structures are uneven across the two systems. Croatia charges €0.20/kg for plastics and €0.02/kg for glass, both at the lower end of the EU-27 range. Hungary charges €0.55/kg for plastics, sitting just above the EU-27 median, and €0.27/kg for glass, which is the third-highest glass fee in the EU-27 after Romania (€0.52/kg) and Denmark (€0.45/kg). In both countries, fee revenue flows into a centralised state fund rather than being allocated by competing PROs, which limits the producer incentive structure and weakens the link between fee payments and downstream operational outcomes.

Hungary operates through the National Waste Management Coordination Body (MOHU), a state entity that replaced the previous multi-PRO arrangement in 2023. MOHU centralises fee collection, contracts waste operators and sets material-specific targets. Even after that overhaul, Hungary recorded only 42.8% overall packaging recycling in 2023 (Eurostat), the

second-lowest rate in the EU-27 after Romania (37.3%). The Hungarian model is in policy focus because it tests whether full state control of EPR, without a private-sector multi-PRO market, can match the outcomes of competitive systems. The first post-reform reporting period does not yet show that it can.

Croatia (51.9% overall packaging recycling, Eurostat) operates through a fund, with municipalities involved in both collection and sorting; eco-modulation is basic and transparency is constrained. Croatia outperforms Hungary on overall recycling (51.9% vs 42.8%) but lags well behind on steel recovery, suggesting different operational bottlenecks rather than a single structural cause.

The sample is too small (n = 2) to draw structural conclusions about state-managed EPR as a governance model. Both systems sit well below the EU-27 average of 64.1% overall packaging recycling.

Member State	Beverage cartons	Ferrous (steel)	Glass	Non-ferrous (aluminium)	Paper and cardboard	Plastic
Croatia	0.054	0.030	0.020	0.054	0.050	0.199
Hungary	0.430	0.470	0.270	0.470	0.440	0.550
EU-27 average	*0.401*	*0.345*	*0.143*	*0.270*	*0.193*	*0.609*

Figure 15. State-managed countries: household EPR fees by material, 2026. *Source: 2026 published tariff schedules of MOHU (Hungary) and the Croatian Environmental Protection and Energy Efficiency Fund (excluding VAT).*

4. Collection streams by Member State

No single public authority maintains a pan-European dataset tracking bin-acceptance for specific packaging sub-formats; collection methodologies and sorting rules are decentralised across the EU-27 and are shaped by municipal capabilities, regional PRO schemes, and national legislation. The matrix that follows is that dataset: a consolidated, country-by-country picture of which packaging formats are systematically collected, which are not, and where coverage is inconsistent, compiled for this study from the underlying national sources.

Standardised collection (broadly accepted across the EU-27):

Rigid plastic bottles and trays (PET, HDPE) are collected in virtually all Member States, typically through a designated lightweight packaging bin or sack. Fibre-based boxes and trays with over 85% paper content go into paper collection streams in all 27. Aluminium and steel cans and trays are universally accepted and separated magnetically or by eddy current at material recovery facilities. Glass jars and bottles are collected in all Member States, frequently separated by colour at kerbside or drop-off points. Beverage cartons are accepted in most Member States, though processing capacity for their poly-aluminium components varies regionally.

High-variance collection (dependent on regional EPR rules or local infrastructure):

Plastic pots, cups, film, and tubes are collected in countries with advanced EPR schemes (Belgium, France, Germany, the Netherlands) but are frequently directed to residual waste in Member States with basic sorting infrastructure. Fibre pouches and composites with plastic or foil barriers face similar inconsistency, with acceptance depending on the barrier percentage and local sorting capabilities.

Excluded or highly fragmented:

Flexible multi-material pouches are the greatest collection and sorting challenge. They are difficult to separate in standard lightweight packaging streams and are excluded from separate collection in the majority of Member States. Even in countries where they are formally accepted (Belgium, for example), collection methodology varies by municipality, which confuses consumers and complicates reporting.

The detailed country-by-country collection tables appear in Appendix C. The two working examples that follow, Belgium and Greece, show how the matrix reads in practice at the two ends of the collection-system spectrum.

Working example: Belgium collection streams

Belgium operates a mature, formal collection network with 100% population coverage across urban and rural areas. Collection rules are standardised nationally. No single-use DRS exists; a harmonised DRS operates for reusable glass bottles. The table below shows the acceptance status by packaging format.

Material stream	Packaging format	Accepted?	Coverage
Plastics	Rigid tray (PET)	✓	National
	Pot and cup (PS)	✓	National
	Film (PE/PP)	✓	National
	Tube (PE/PP)	✓	National
	Flexible pouch (PE/PP)	✓	National
Fibre and paper	Box (>85% fibre)	✓	National
	Tray (>85% fibre)	✓	National
	Pouch (>85% fibre)	✓	National
Metals	Aluminium beverage cans	✓	National
	Steel tin cans	✓	National
Glass	Jars	✓	National
Beverage cartons	Beverage cartons (large and small)	✓	National

Figure 16. Belgium: packaging formats accepted in the household collection stream. *Source: Fost Plus, household packaging sorting rules (2026). All plastic formats are collected in the PMD bag. Plastic-aluminium laminates are excluded.*

Aluminium foil and aluminium trays are also excluded from the PMD bag and routed to drop-off at container parks. The paper stream requires a minimum 85% fibre content; items must be dry and clean, and dairy-soiled cardboard is prohibited. Beverage cartons are collected separately in the PMD bag. Belgium's 85% fibre threshold sits in the upper tier of EU-27 practice. Only Germany applies a stricter rule (95%), while the majority of Member States (19 of 27) operate at the EU default of 50%. The full schedule of national licensing thresholds is set out in **Table C.1, Appendix C**.

Working example: Greece collection streams

Greece organises household packaging collection through HERRCO (Hellenic Recovery Recycling Corporation), the country's main PRO, with municipalities running the bins. Collection is broadly single stream, with mixed dry recyclables sharing a blue bin and glass collected separately. Greece's overall packaging recycling rate is 48.0% (Eurostat). The table below shows acceptance by packaging format, against Belgium's multi-stream PMD reference.

Material stream	Packaging format	Accepted?	Coverage
Plastics	Rigid tray (PET)	✓	Urban and suburban
	Pot and cup (PS)	–	Urban only
	Film (PE/PP)	✓	Urban and suburban
	Tube (PE/PP)	✓	Urban and suburban
	Flexible pouch (PE/PP)	✓	Urban and suburban
Fibre and paper	Box (cardboard)	✓	Urban and suburban
	Tray (fibre)	–	Urban only
	Pouch (fibre)	✗	Not collected
Metals	Aluminium beverage cans	✓	Urban and suburban
	Steel tin cans	✓	Urban and suburban
Glass	Jars and bottles (separate drop-off)	✓	Urban; rural gaps
Beverage cartons	Beverage cartons	✓	Urban; coverage uneven

Figure 17. Greece: packaging formats accepted in the household collection stream. *Source: HERRCO collection guidelines (2026). Greece operates a single-stream mixed dry recyclables collection (blue bin) with glass collected separately. Rural coverage is uneven; some materials are urban-only in practice.*

5. Fee structures and eco-modulation

EPR fee structures vary widely across the EU-27 in both level and granularity. Italy operates one of the most granular models by design: CONAI coordinates seven material-specific consortia, each setting its own format-level fee bands, with Corepla (plastics) differentiating fees across nine sub-categories by recyclability tier. Belgium runs an equally granular Fost Plus tariff covering 19 plastic sub-categories and the broadest set of eco-modulation criteria observed in the EU-27 (recyclability, recycled content, weight and design). France applies granular format-level eco-modulation that includes hazardous-substance penalties. The Netherlands operates a Verpact tariff with material-level format differentiation. At the other end, Bulgaria, Croatia, Cyprus, Estonia, Greece, Latvia, Lithuania, Malta, Romania and Slovakia apply basic fee schedules with minimal material differentiation.

Eco-modulation granularity is the strongest single driver of recycling performance in the dataset. Countries classified as having granular eco-modulation, Belgium, France, Germany, Italy and the Netherlands, average 73.9% overall packaging recycling (Eurostat, 2023 reporting period). Countries with advanced schemes (Austria, Czechia, Denmark, Finland, Ireland, Luxembourg, Poland, Portugal, Slovenia, Spain and Sweden) average 64.5%. Countries with only basic differentiation average 57.4%. The step from basic to granular corresponds to a 16.5 percentage-point improvement in recycling outcomes.

Germany is a partial exception within the granular tier. Its national framework, the Packaging Act (VerpackG), supports granular eco-modulation in principle, but the ten licensed dual systems publish only aggregated material-level tariffs (eight categories: glass, aluminium, ferrous, paper and cardboard, plastics, composite beverage cartons, other composite, other). The granular differentiation that exists inside producer contracts is therefore not visible in the published fee schedule, which limits the design-stage price signal compared to Italy's, Belgium's or France's systems. Section 3.2 sets out the German tariff structure in detail.

Fee levels per kilogram differ by an order of magnitude across countries and materials. Across the EU-27 in 2026, glass EPR fees range from €0.009/kg in Slovenia to €0.520/kg in Romania (58× spread), ferrous metal fees from €0.005/kg in Italy to €1.950/kg in Sweden (390× spread), and beverage carton fees from €0.054/kg in Croatia to €1.125/kg in Germany (21× spread). The full per-material schedule is set out in Table 2 (Appendix D).

PE flexible pouch

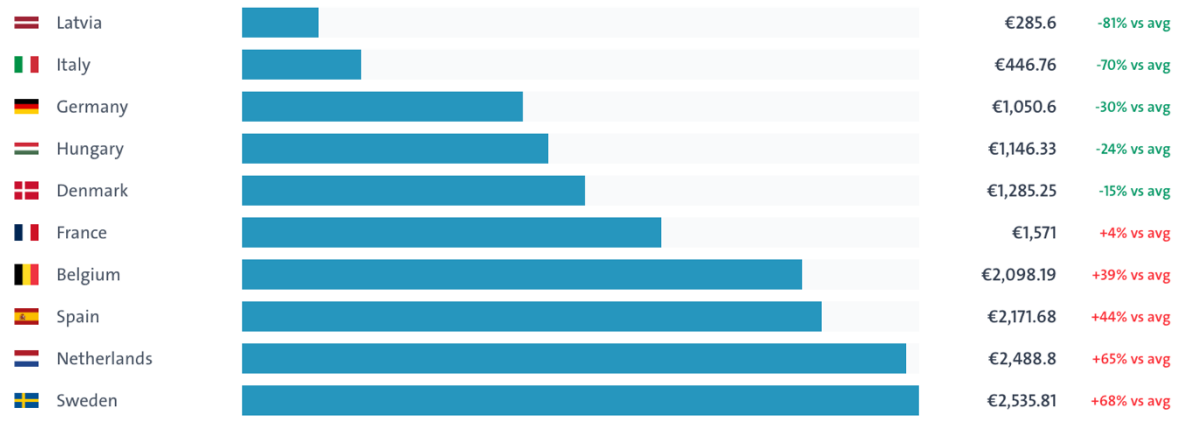


Figure 18. Country-by-country EPR fees: PE flexible pouch. *Source: CIRCPACK Recycling Intelligence Platform (2026 update).*

Aluminium can (non-beverage)

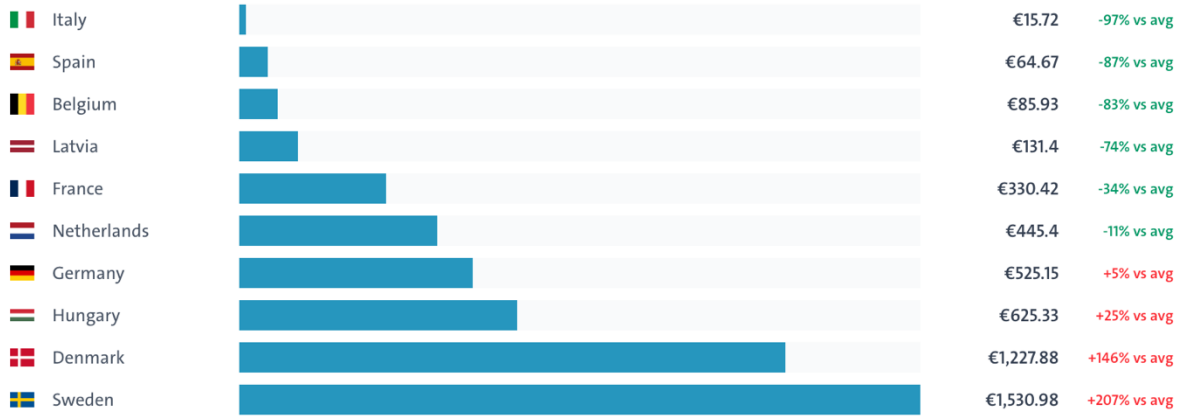


Figure 19. Country-by-country EPR fees: aluminium can (non-beverage). *Source: CIRCPACK Recycling Intelligence Platform (2026 update).*

Clear PET jar

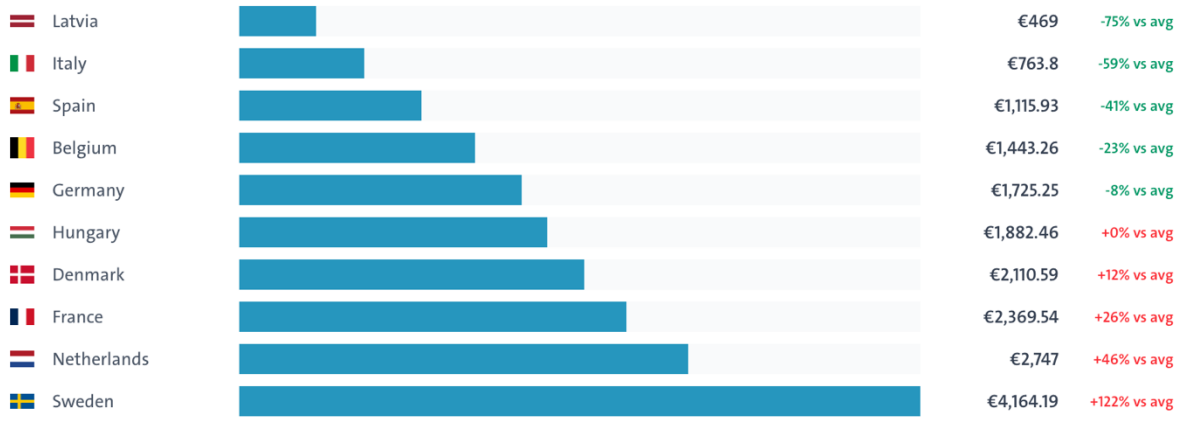


Figure 20. Country-by-country EPR fees: clear PET jar. *Source: CIRCPACK Recycling Intelligence Platform (2026 update).*

Light blue PET bottle (Beverage): full breakdown of fees

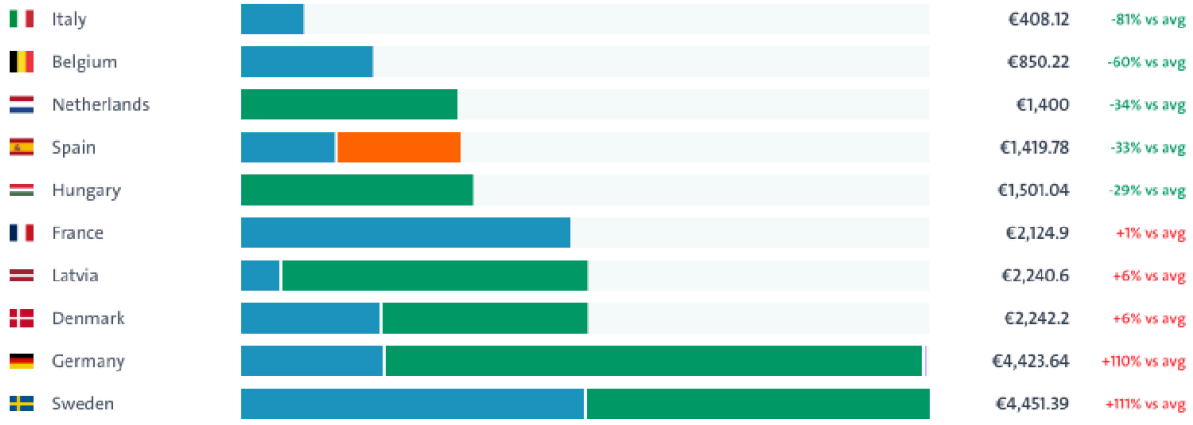


Figure 21. Country-by-country EPR fees: light blue PET bottle (beverage), full breakdown. *Source: CIRCPACK Recycling Intelligence Platform (2026 update).*

Beverage carton: full breakdown of fees

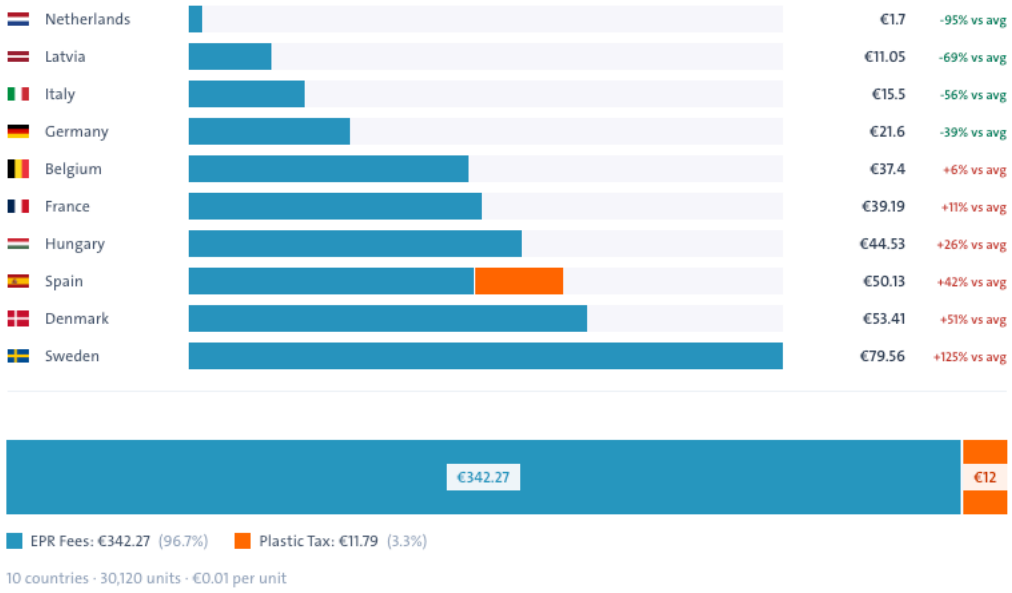


Figure 22. Country-by-country EPR fees: beverage carton, full breakdown. *Source: CIRCPACK Recycling Intelligence Platform (2026 update).*

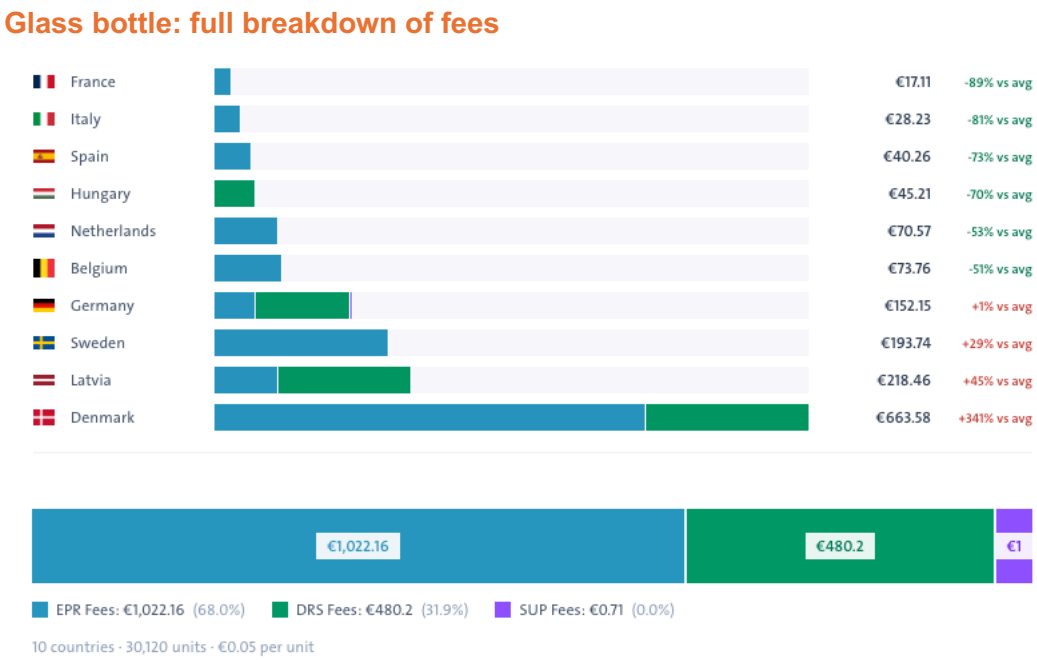


Figure 23. Country-by-country EPR fees: glass bottle, full breakdown. *Source: CIRCPACK Recycling Intelligence Platform (2026 update).*

The majority of Member States do not currently apply eco-modulation bonuses or penalties specifically for PCR content in plastic packaging. As the PPWR mandates minimum recycled content percentages from 2030, the number of countries incorporating PCR-based fee modulation is expected to increase.

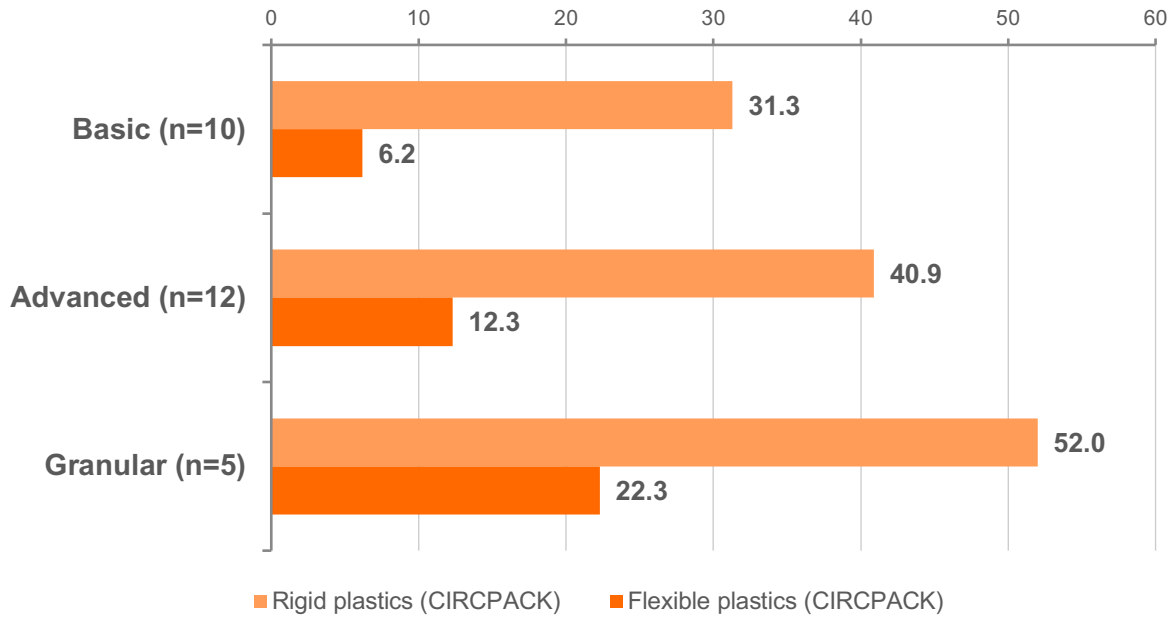


Figure 24. Overall packaging recycling rate by eco-modulation tier, rigid and flexible plastics, 2023. *Source: CIRCPACK eco-modulation classification and Eurostat env_waspac (2023).*

6. Deposit return systems

Seventeen EU Member States currently operate a deposit return system (with Luxembourg running a limited-scope programme) for beverage containers, covering some combination of PET bottles, metal cans, glass bottles, and in some cases other formats. The PPWR now requires all Member States to establish a DRS for single-use plastic and metal beverage containers by 2029, unless they can demonstrate a 90% separate collection rate through existing systems. The following countries are already moving ahead of that deadline.

Operational DRS:

Austria, Croatia, Denmark, Estonia, Finland, Germany, Hungary, Ireland, Latvia, Lithuania, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, and Sweden (Luxembourg operates a limited-scope programme) all have functioning deposit return programmes. The materials covered and deposit levels vary: Germany's system covers single-use PET and cans; Denmark covers PET, cans, and glass; the Nordic systems (Finland, Sweden, Estonia, Latvia, Lithuania) have operated DRS for decades and report collection rates above 85% for covered materials.

Under development:

Belgium, Bulgaria, Cyprus, Czechia, France, Greece, Italy, Slovenia, and Spain are at various stages of DRS legislation or pilot programmes, driven in part by the PPWR's 2029 deadline.

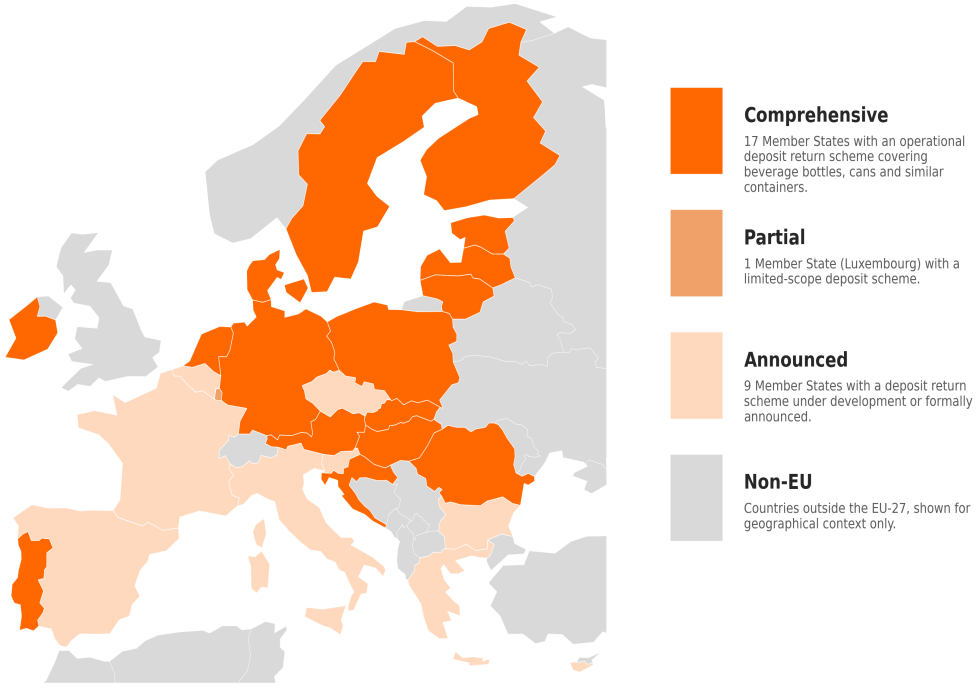


Figure 25. Deposit return scheme coverage in the EU-27, May 2026. *Source: National PRO and government publications.*

DRS and EPR systems work effectively together. DRS diverts specific high-value beverage containers from the general EPR collection stream, which improves collection rates for those materials but reduces the fee base available to the PRO for managing the remaining packaging. The interaction between DRS and EPR fee structures is examined in Section 11.

7. Transparency benchmarking

Data quality is the biggest barrier to comparing EPR performance across the EU-27. The WFD requires PROs to publish certain information, but what they publish varies widely. Belgium, Italy, France and Czechia publish per-PRO, per-format figures, so PPWR recycling-at-scale targets can be checked against real numbers. Other Member States cannot be checked the same way: Germany reports detail internally but does not publish it at PRO level; Spain runs a multi-PRO market with no central registry; Hungary and Croatia run state-managed systems that report less. What follows maps where each Member State stands, and where the gap is widest.

Layer 1: Fee and performance disclosure

We assessed each Member State across three indicators, each scored equally on a 0 to 2 scale (total 0 to 6): coverage of reported information (how many of the required data elements a PRO publishes), recycling rate methodology disclosure (whether the methods and assumptions behind reported recycling rates are publicly documented), and reporting frequency (whether data is updated annually). Member States with a composite score of 5.5 or above are classified High, those between 3.5 and below 5.5 Medium, and those below 3.5 Low. The full scoring rubric is set out in the methodology annex.

The results fall into three tiers, summarised below.

(equal-weight composite score of coverage, methodology disclosure and reporting frequency)

Thresholds: High ≥ 5.5; Medium 3.5 to < 5.5; Low < 3.5.

Classification	Count	Member States
High	8	Belgium, Czechia, Denmark, Finland, France, Italy, Luxembourg, Netherlands
Medium	10	Austria, Croatia, Estonia, Germany, Ireland, Lithuania, Slovakia, Slovenia, Spain, Sweden
Low	9	Bulgaria, Cyprus, Greece, Hungary, Latvia, Malta, Poland, Portugal, Romania

Figure 26. EU-27 transparency classification, 2026. *Source: CIRCPACK EPR transparency assessment (2026 reporting period).*

Member States classified High recycle 13.4 percentage points more packaging on average than those classified Low (69.6% vs 56.2%, Eurostat 2023 reporting period). Transparency and recycling performance are not identical axes, but they correlate strongly: every Member State in the High tier exceeds the EU-27 average recycling rate of 64.1% except for two near-misses (Denmark 62.7% and Finland 59.4%), and every Member State in the Low tier except Cyprus and Poland sits below it. The relationship is not deterministic. Cyprus (Low transparency, 69.5%) and Poland (Low, 67.4%) both publish little but recycle above the EU-27 average; Denmark and Finland (both High transparency) publish fully but recycle below it. The country profiles in Section 13 trace the pattern across the EU-27.

Layer 2: Financial flow transparency

Where do producer contributions go once they leave the producer, and on what terms? This layer covers the traceability of PRO revenues to the operators, municipalities, and service providers that deliver collection, sorting and recycling, together with the public availability of the contractual and pricing terms that govern those flows.

Producer fee schedules are largely public. The WFD requires PROs to publish what producers pay per kilogram of packaging, and every Member State in the High and Medium transparency tiers does so. What is not public, in any Member State outside a small group of exceptions, is what happens to that money after the PRO disburses it downstream. PROs contract waste-management operators (municipalities, private collectors, sorting facilities, reprocessors) to deliver collection, sorting and recycling services, but the contractual and pricing terms that govern those downstream payments are not subject to a parallel disclosure obligation. EU legislation does not require PROs to publish how aggregate fee revenue is allocated across operators, nor does it require operators to disclose what they receive per tonne of material collected, sorted or reprocessed.

The blind spot is therefore not at the PRO interface but downstream of it. A reader of a PRO's annual report can find the fee schedule that producers pay; they cannot find out how much of that revenue reaches municipal collection, how much reaches sorting and reprocessing, how much is spent on administrative overhead or awareness campaigns, or whether different operators receive different per-tonne payments for the same service in the same Member State. In Belgium, formal contracts between Fost Plus and the intermunicipal operators trace fee revenue to specific service standards, and per-format reporting allows recovery outcomes to be measured against payments. That level of downstream traceability is rare: in most Member States the contractual terms governing operator payments are commercial in confidence and go unpublished. The largest single transparency gap in the current EPR framework is the visibility of how PRO revenue flows downstream once it leaves the PRO, not the visibility of producer-side fees that PROs already publish.

The Layer 1 gap between High and Low transparency systems (13.4 percentage points in recycling outcomes, 69.6% vs 56.2%, Eurostat 2023 reporting period) is examined in more detail in Section 12.

Layer 3: Consumer awareness and producer-funded campaigns

Consumer information and education are a core component of an effective waste management system, and producer fees are explicitly meant to fund them. Yet PROs are not required to disclose what share of their fee revenue is allocated to awareness campaigns, how

much reaches each campaign, or how that spending translates into measurable outreach (campaign reach, sorting-behaviour changes, evaluation outcomes). The WFD treats consumer awareness as a producer responsibility without specifying how PROs should report on it.

As with the downstream operator payments discussed in Layer 2, this is a category of producer-funded activity for which the inputs and the public-facing outputs are both visible (fees are paid in, awareness campaigns appear on television, on signage and online), but the cost-effectiveness, the contractual terms with delivery partners, and the share of total fee revenue devoted to awareness are not.

8. How to read this report: our methodology

Part III of this report sets out four analytical Pillars, each looking at a specific dimension of EPR system performance. Reading the findings well requires knowing how they were built: what the data covers, how it was assembled, and what the numbers mean.

Four analytical Pillars

Each finding tests a hypothesis about what drives a particular outcome. Pillar 1 (Minimising material losses) identifies which system characteristics predict high recycling rates. Pillar 2 (Circular reporting and monitoring) examines the link between data quality and performance. Pillar 3 (Creating circular markets) investigates what creates demand for secondary raw materials. Pillar 4 (Transparency) tests whether transparent systems outperform opaque ones.

How the analysis works

For each finding, we mapped the relevant EPR system variables across all 27 countries and calculated correlation coefficients to identify which variables are most strongly associated with the outcome. The dataset was compiled from Eurostat (2023 reporting period), PRO-published reports, national waste registries, and the CIRCPACK format-specific recycling-rate dataset covering 13 household material sub-categories across all 27 Member States, with plastics consolidated into two headline categories (rigid plastics and flexible plastics). The dataset is strictly household in scope and excludes commercial and industrial packaging flows. These rates are tonnage-weighted using EU packaging market composition shares (Plastics Europe, 2023) and cover household packaging. Eurostat's all-plastics recycling rate of approximately 42%, which includes commercial and industrial streams, provides a reference point; the difference between household-only and all-packaging rates is addressed in the finding analysis.

The analysis uses descriptive statistics throughout: group averages, percentage point (pp) gaps between system types, and country comparisons. Where patterns hold consistently across the sample, we state the observed difference directly. The full statistical methodology, including the analytical framework and variable construction, is documented in Appendix A.

Limitations

The sample size is 27. This is large enough to identify strong patterns but too small for multivariate regression or to control for confounding variables with precision. Reporting standards differ across Member States, and not all variables are available for every country. Temporal misalignment exists in some cases where data from different sources refers to

slightly different reporting years. These limitations are documented in the methodology appendix accompanying this report.

Each finding follows the same structure: key findings first, followed by the supporting evidence and analysis.

Part III

The four analytical Pillars

9. Minimising material losses

Recycling rates in this Pillar are Eurostat 2023 unless flagged otherwise.

This Pillar examines how EPR system design affects physical recycling performance. We assessed four variables across all 27 EU Member States: eco-modulated fees for recyclability, technical DfR support, the comprehensiveness of material coverage, and local authority involvement. Of these, eco-modulated fees emerge as the strongest driver: countries with granular, format-specific fee tiers achieve overall packaging recycling rates 16.5 percentage points higher than those with basic weight-based fees. Technical DfR support follows, with a 12.6 percentage point uplift in overall packaging recycling between systems offering no structured support and those providing full programmes, though DfR support shows no effect on plastic-specific recycling rates. Coverage structure and local authority involvement play supporting roles that amplify the effectiveness of the primary levers.

System effectiveness is not universal, but depends heavily on contextual factors such as GDP per capita, cultural awareness of recycling, and geographical conditions. The analysis below takes each variable in turn, presents case studies, and draws conclusions relevant to policy design under the PPWR.

9.1 Key findings

Core drivers of success

Four EPR system-design variables emerged as relevant drivers, ranked by the magnitude of their effect on overall packaging recycling rates (Eurostat, 2023). Eco-modulated fees for recyclability are the strongest lever (16.5 pp gap between basic and granular systems, subject to local collection and sorting performance; see Section 9.2). Technical DfR support is the second strongest (12.6 pp uplift on overall packaging, no effect on plastic-specific rates; Section 9.3). Comprehensive coverage of household and industrial packaging streams gives a moderate uplift (8.5 pp; Section 9.4). Local authority involvement is an operational qualifier rather than a volume driver, with effects that are hard to isolate at the aggregate level (Section 9.5). The four sub-sections that follow take each variable in turn.

The same pattern holds at material level. In the case of plastics, our format-specific data across the 27 Member States show that rigid plastics achieve an EU-27 household average of 34.1%, while flexible plastics reach only 13.1%. The gap between these two categories is a factor of 2.6. When commercial and industrial packaging is included, the rigid figure trends

towards the upper 40s, closer to Eurostat's reported all-plastics recycling rate of approximately 42% (which blends rigid and flexible, household and commercial/industrial streams). The disparity confirms that the system design features assessed in this finding do not act uniformly across packaging formats: they drive gains for rigid packaging, where established collection and sorting infrastructure exists, while leaving flexible formats largely untouched.

The push towards mono-materials, advanced recycling capacity and design-for-recycling guidelines is, however, shifting the flexibles market slowly. A persistent obstacle is that the various national and industry recyclability frameworks do not always agree on what counts as recyclable. The PPWR aims to settle the question with harmonised recyclability guidelines from 2030 and an assessment of what is recycled at scale from 2035. Industry will need to transform packaging to meet these rules, and formats that cannot be transformed will leave the EU market. The harder question is whether EPR systems can absorb the transformed formats at the scale the PPWR requires. That depends on three things working in parallel: collection routes that capture the new formats, sorting capacity that can separate them, and eco-modulation that prices recyclability rather than mass.

9.2 Eco-modulated fees for recyclability

The evidence

Eco-modulation maturity correlates with overall recycling performance across the EU-27. Countries applying basic weight-based modulation achieve an average recycling rate of 57.4%. Those with advanced bonus-malus systems reach 64.5%. Countries operating granular net-cost models with format-specific fee tiers average 73.9%. The 16.5 percentage-point gap between basic and granular systems is robust across the sample, but the eco-modulation tariff is one of two factors at work. In the granular-fee Member States (Belgium, France, Italy, the Netherlands; Germany, the fifth granular-tier Member State, is the partial exception described in Section 5) the tariff differentiates fees by format AND the collection and sorting infrastructure can separate those formats in practice. Recycling outcomes reflect both the price signal at the design stage and the operational capacity at the collection and sorting stage. Basic-fee Member States typically run with both a flatter price signal and a thinner sorting infrastructure, and the dataset cannot fully separate the two effects from one another.

The format-specific rates show where the combined effect concentrates. Rigid plastics average 52% in countries with granular fee structures, compared to 31% in basic-fee systems, a 21 percentage-point difference. Flexible plastics rise from 6.2% under basic systems to 22.3% under granular ones, a difference smaller in absolute terms (16 percentage points) but proportionally much greater (3.6× higher). The flexible-plastic outcome illustrates how the two levers interact. A granular tariff that charges €1/kg or more for flexible film creates a strong design incentive, and that incentive translates into recycling outcomes only where a Member State also operates a sorting line capable of separating film from rigids and a reprocessor that takes the resulting bale. Belgium's 34% PE-flex recycling rate reflects both: a granular tariff that prices flexible film at premium rates, and the multi-year investment in film collection and sorting that the tariff revenue helps fund. Bulgaria's 2.5% reflects the opposite conditions: a flat tariff with no separate film collection or sorting route.

The policy implication is that both levers need to operate together to meet PPWR recycling-at-scale targets by 2030. Granular eco-modulation without sorting capacity produces a design

signal that cannot fully translate into recycling outcomes. Sorting capacity without granular eco-modulation leaves the design incentive unused. The Member States closest to the 2030 targets have made both moves; those furthest away have made neither.

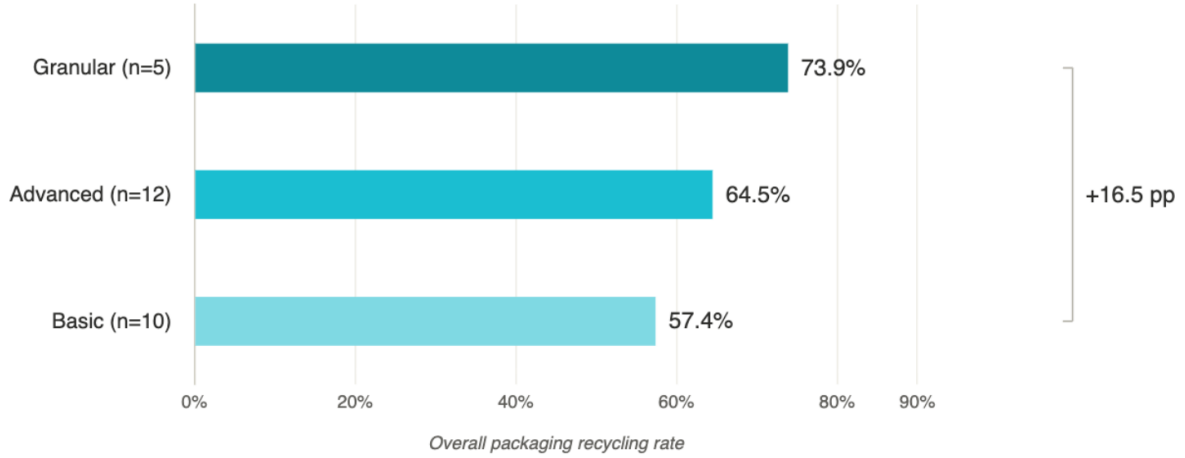


Figure 27. Overall packaging recycling rate by eco-modulation tier, 2023. *Source: CIRCPACK eco-modulation classification and Eurostat env_waspac (2023).*

Country case studies

Belgium and Italy demonstrate that when EPR fees reflect the relative cost of collecting, sorting and reprocessing specific packaging formats, recycling outcomes improve materially. Belgium's Fost Plus operates 19 plastic sub-categories, each with a different fee per kilogram, and Italy's CONAI system applies fees through seven material consortia, with Corepla (plastics) further differentiating fees across multiple sub-bands by polymer and recyclability tier. Both countries exceed 75% overall packaging recycling (Eurostat, 2023 reporting period).

Germany's VerpackG ended a period of recycling stagnation by introducing financial penalties for complex multi-layer packaging through its central clearing register (ZSVR), although the ten licensed dual systems publish only aggregated material-level tariffs in practice (see Section 3.2). Spain's Law 7/2022 paired eco-modulated fees with a national plastic tax of €0.45/kg on non-recycled plastic in non-reusable packaging, creating a double financial signal that accelerated producer packaging audits.

Hungary, by contrast, illustrates the limits of eco-modulation when applied without parallel infrastructure investment. Despite the centralised fee structure introduced under the MOHU concession in 2023, Hungary's recycling rate remains at 42.8% (Eurostat), the second lowest in the EU-27 after Romania. The proximate constraints are operational and less regulatory: collection infrastructure has historically concentrated on traditional materials (glass, paper, cardboard), separate film collection and format-specific sorting capacity for flexibles are limited, and the post-2023 reform reporting period is the first under the new state-managed model. The fee signal alone, however well designed, cannot deliver recycling outcomes while the operational layer that converts that signal into recovered material is still being built.

Implications

Eco-modulated fees raise recycling rates when they reach sufficient granularity. Hungary illustrates the dependency: even centralised fee structures fail to deliver results without granular eco-modulation, full legal scope and local collection infrastructure. We return to this interaction in Section 9.4 on comprehensive coverage and explored further in the case studies in Part IV. The lever's full effect requires increased operational performance for collection and sorting: granular fee signals on their own do not move tonnages without the physical infrastructure to act on them.

One distinction matters in practice. Allocation does most of the work here, as the absolute fee level only matters at the edges. In well-performing systems, the allocation of fee revenue to operators, collection points, and sorting infrastructure is transparent and visible to the producers paying into the system. In underperforming systems, allocation is opaque, contested, or disconnected from the operational requirements the system faces. This is fundamentally a governance question. What drives performance is how fee revenue is allocated, more than how high the fees are set.

9.3 Technical support for design for recycling

What we found

The 27 EU Member States divide into three tiers based on the DfR support provided by their PROs. Tier 1 (nine Member States) offers no structured DfR programme, typically only static written guidance. Tier 2 (nine Member States) provides partial DfR support, such as written guidelines combined with limited consulting access. Tier 3 (nine Member States) operates full DfR programmes that include interactive digital assessment tools, dedicated consulting teams and integration with the eco-modulation tariff.

Overall packaging recycling rates rise consistently across the three tiers: tier 1 averages 57.9%, tier 2 averages 62.3%, and tier 3 averages 70.5%, a 12.6 percentage-point gap between the lowest and highest tier. The mechanism is the same as the one observed for eco-modulation in Section 9.2: design support translates into recycling outcomes through the operational infrastructure that captures the redesigned packaging, and Member States that have invested in structured DfR support typically also operate alongside more developed collection and sorting capacity.

Country case studies

Belgium and Spain (both tier 3) operate PROs that support organizations placing packaging on the market. Fost Plus offers free engineering advice and a digital packaging assessment tool; Ecoembes runs one of the largest design-consultancy teams of any EU PRO. This proactive approach reduces non-recyclable packaging at the design stage and contributes to Belgium's 79.7% and Spain's 70.5% overall recycling rates (Eurostat, 2023 reporting period).

In France and the Netherlands (both tier 3), the PRO's design tool sets the fee directly: producers run their packaging through Citeo's TREE or KIDV's Recycle Check (used by Verpact), and the score the tool returns is the eco-modulated rate they pay. Germany, Italy and Austria (all tier 3) operate similar tools, but the fee depends on separate recyclability rules; in Germany those rules are the legally binding ZSVR Minimum Standard, which producers must meet to qualify for the lower fees.

Hungary (tier 2) provides written guidelines without interactive design tools or dedicated consulting capacity. This partial support generates limited corporate design-change activity and, combined with the underdeveloped collection and sorting infrastructure described in Section 3.3, helps explain Hungary's 42.8% overall recycling rate (Eurostat). The reading consistent with the rest of the report is not that DfR support alone determines outcomes, but that DfR support and operational infrastructure together do.

The material-stream data bear out the same pattern. Countries in tier 3 achieve rigid plastic recycling rates averaging 43.0%, compared to 32.3% in tier 2 and 27.0% in tier 1 (CIRCPACK adjusted figures). The effect on flexible plastics is narrower in absolute terms but proportionally similar: tier 3 averages 16.8%, tier 2 averages 9.3%, and tier 1 averages 6.0%. The gradient is consistent with the joint-causation argument developed in Section 9.2: design support and operational capacity reinforce each other, and Member States with strong scores on both tend to recycle materially more flexible packaging than those weak on either.

Implications

Technical DfR support shifts an EPR system from fee collector to industry partner, but voluntary support alone is not enough to drive effective recycling. Voluntary DfR has driven a modest response on rigid plastics in countries with full programmes, minimal improvement on flexibles, with complex paper formats facing the same issues. To improve recycling, voluntary DfR advice must be paired with the financial incentives of granular eco-modulation (Section 9.2) and investment in physical sorting infrastructure (Section 11.4).

PPWR Article 6 tightens the regulatory backstop. From 1 January 2030, packaging may only be placed on the EU market if it falls within recyclability performance grades A, B or C. A separate recycled-at-scale test applies from 1 January 2035, governed by implementing acts. From 1 January 2038, only grades A or B packaging will qualify. Formats that cannot meet the 2030 bar will need to be redesigned or withdrawn. This sequence converts voluntary DfR guidance into mandatory market-access criteria, and the tier 3 Member States already operating mature DfR programmes (Section 9.3) will be best placed to help producers navigate the transition.

9.4 Comprehensive coverage

The cross-country pattern

The 27 EU Member States divide into three tiers based on how household and industrial packaging streams are structurally separated within their EPR systems. Tier 1 (four Member States) operates with no differentiation between the two streams: fees, targets and reporting apply uniformly. Tier 2 (eight Member States) operates the two streams under the same PROs, with partial differentiation in fees but without targeted monitoring or reporting. Tier 3 (fifteen Member States) operates with either separate PROs for each stream or a single coordinating body with fully differentiated fees and targeted monitoring and reporting.

Overall recycling outcomes across the three tiers do not follow a clean progression. Tier 3 averages 64.5%, tier 2 averages 59.7%, and tier 1 averages 67.9%. The tier 1 figure is driven by a small sample of four countries that includes Slovenia (73.6%) and Poland (67.4%), both of which combine no formal household-industrial differentiation with above-average recycling performance, so the tier 1 sample is too small to draw structural conclusions. The clearer

signal is the 4.8 percentage-point gap between tier 3 (64.5%) and tier 2 (59.7%), which suggests that when EPR systems do separate household from industrial streams, they perform better than systems that operate the two streams under the same governance without targeted oversight. The interpretation consistent with Section 9.2 and 9.3 is that structural separation correlates with the broader operational maturity that drives recycling outcomes, rather than acting as the proximate cause on its own.

The analysis covers the structural separation between household and commercial/industrial packaging streams. It does not cover municipal coverage, SKU coverage, or geographic coverage.

Country case studies

Belgium (tier 3) operates Fost Plus for household packaging and Valipac for industrial packaging, two separate PROs that prevent consumer fees from subsidising heavier commercial waste. Spain (tier 3) reached tier 3 recently through Royal Decree 1055/2022, which integrated industrial packaging under EPR with separate PRO coordination. Germany and Italy (both tier 3) manage both streams under a single coordinating framework (the Dual System and CONAI respectively) but enforce targeted reporting and differentiated fees based on the packaging's point of entry into the waste system. All four countries exceed 69% overall recycling.

Hungary (tier 2) operates the household and commercial streams under the same MOHU concession with differentiated fees but without targeted monitoring or reporting that would allow the two streams to be separately measured. Hungary's overall recycling rate is 42.8% (Eurostat). As in Sections 9.2 and 9.3, the gap comes mainly from operational weaknesses (limited collection and sorting capacity) not from how the system is structured: thinner collection and sorting infrastructure for non-traditional materials, combined with the first post-reform reporting period under the new state-managed model.

Implications

Comprehensive coverage is not the sole determinant of recycling performance, but it fulfils a structural role. By keeping fees, targets and reporting aligned to the appropriate producer base, it creates a stable foundation for more targeted mechanisms (granular eco-modulation, DfR programmes, adapted KPIs) to function effectively. The interaction between coverage and fee design is a recurring theme, returned to in the case studies in Part IV.

The material-level data is consistent with this. Single-PRO systems, which maintain unified scope over household packaging, show rigid plastic recycling rates averaging 40.7% across the seven Member States in that group, compared with 32.0% across the 18 Member States that operate multi-PRO environments. The 8.7 percentage-point gap reflects the same joint-causation pattern: governance choices that simplify financial flows tend to travel together with the operational investments that convert those flows into recycling outcomes.

9.5 Local authority involvement

How the variables compare

The 27 EU Member States divide into three tiers based on the operational involvement of municipalities in household packaging waste management. Tier 1 (fourteen Member States)

operates with municipalities involved in collection only. Tier 2 (eight Member States) operates with municipalities involved in both collection and sorting. Tier 3 (five Member States) operates with limited or no municipal involvement, the PRO contracting waste operators directly.

Overall packaging recycling rates do not progress cleanly with the degree of municipal involvement (Eurostat, 2023 reporting period). Tier 1 averages 62.5%, tier 2 averages 63.1%, and tier 3 averages 67.3%. The composition of the data explains the counter-intuitive ordering. Overall packaging statistics are heavily influenced by industrial waste and DRS volumes, both of which operate independently of local government. The impact of municipal involvement is concentrated in household waste streams, specifically in participation rates and sorting purity, and is masked by the aggregate figures. As in Sections 9.2 to 9.4, the more useful reading is that the municipal model is one operational lever among several (fee structure, DfR support, household-industrial separation), and outcomes reflect the combination of levers rather than any single factor.

Country case studies

Belgium and Spain (both tier 1) show that municipal involvement works well when roles are clearly defined and standardised. Spain's municipalities serve as direct collection operators under contracts with Ecoembes. Belgium's Fost Plus contracts municipalities as professional collection operators under nationally standardised sorting rules. In both cases, the clarity of financial agreements and the availability of technical support from the PRO supports high household participation, and both countries exceed 70% overall recycling (Belgium 79.7%, Spain 70.5%, Eurostat 2023).

Italy (tier 2) operates a model in which municipalities are responsible for both collection and sorting, coexisting with the CONAI consortium framework that aggregates national reporting and fee modulation. Regional service-delivery variation is the trade-off, but the model produces a 75.6% overall recycling rate. Germany (tier 3) operates at the other end of the spectrum: the dual systems manage household packaging collection independently of municipal authorities, contracting waste operators directly. The model supports higher-efficiency commercial sorting and contributes to Germany's 69.4% rate. The two models (Italy fully municipal, Germany fully PRO-led) demonstrate that strong recycling outcomes can be reached at either end of the municipal-involvement spectrum when other operational layers are in place.

Hungary (tier 1) operates with municipal involvement in collection under the centralised MOHU concession that took effect in 2023. The 42.8% overall recycling rate reflects the operational constraints described in Sections 9.2 to 9.4 (limited collection and sorting infrastructure for non-traditional materials, first post-reform reporting period under the state-managed model) rather than the municipal model alone.

Implications

Local authorities should be viewed as a secondary operational factor, not a main driver of recycling volumes. The evidence is that strong recycling outcomes occur under a range of municipal configurations, from full responsibility for collection and sorting (Italy) to limited involvement (Germany), when the model is paired with clear stakeholder responsibilities, standardised collection infrastructure and a functioning eco-modulation tariff. Household-level

losses fall when collection is consistent and easy for citizens to use, which also keeps sorting purity high.

10. Circular reporting and monitoring

This finding examines how data quality and monitoring affect recycling performance. We assessed three variables: data granularity, the presence of adapted key performance indicators (KPIs), and the degree of government support and operational involvement. The first two are strong predictors: data granularity and adapted KPIs are the strongest predictors of overall packaging recycling rates. Government operational involvement, by contrast, shows no positive effect, and in several cases a negative one.

The pattern is consistent: better data and more precise metrics produce better outcomes, but direct state involvement in system operations does not automatically improve performance. The subsections below present the evidence for each variable, including the interaction between data quality and KPI effectiveness.

10.1 Key findings

Core drivers of success

Adapted KPIs and data granularity are the most influential variables. Systems with detailed metrics for material recovery, eco-modulation, and transparency (score 4 on our index) generally achieve the highest recycling rates. Countries that track the right indicators at the right level of precision outperform those that do not. Data granularity is the foundation of those KPIs: without it, adapted indicators cannot be monitored or enforced.

PRO market structure has a moderate effect on reporting quality. Single-PRO systems report at a finer level of detail than competitive multi-PRO markets, where data fragmentation creates monitoring silos. This is a structural rather than inherent advantage: multi-PRO markets that invest in centralised clearinghouses (such as Germany's LUCID system) can achieve comparable data quality.

Government support and operational involvement show a low or negative effect. Private system management averages 64.9% overall packaging recycling, compared to 47.4% for state funds. Systems where municipalities have strictly limited operational involvement achieve the highest average recycling rates (67.3%), outperforming systems with more direct municipal control. Public sector involvement shows no meaningful relationship with data granularity, confirming that governments do not inherently build better monitoring systems than private PROs.

10.2 Data granularity

The picture across the EU-27

We found a strong positive relationship between data granularity and overall packaging recycling rates across the EU-27. Countries with high-detail reporting frameworks, those tracking material flows at the format level, consistently achieve higher recovery rates. Single-PRO systems (such as Belgium and Czechia) report at a finer level of detail than markets with

multiple competing PROs (such as Germany and Estonia), where data fragmentation across competing operators creates monitoring gaps. Granular data allows targeted interventions, and the absence of granular data prevents systems from identifying where material losses occur.

Country case studies

Belgium and Italy mandate detailed data granularity, whether through a single PRO (Belgium) or material-specific consortia (Italy). This transparency allows targeted interventions at the material and format level. Their EU-leading recycling performance reflects this infrastructure investment. Spain reports household packaging data to a high standard, but the reporting mostly reflects Ecoembes's activities, since Ecoembes handles most of the tonnage. Germany suffers from data silos inherent in its multi-PRO Dual System, making it harder to track material leakages across competing operators. Hungary's legacy of fragmented data and its ongoing systemic transition correlate with lower performance, illustrating that systems cannot improve what they do not accurately measure.

Implications

Systems with detailed data outperform others because their reporting infrastructure allows material-specific financial signals and identifies system leakages in near-real-time. Fragmented or transitioning systems cannot optimise effectively regardless of the quality of other policy instruments. As the PPWR pushes for machine-readable datasets and harmonised reporting standards, investment in digital reporting infrastructure should be a prerequisite, not an add-on.

By disaggregating plastics into rigid and flexible streams, we found a gap (34.1% versus 13.1% at the EU-27 level) that aggregate Eurostat reporting does not capture. Countries scoring highest on data granularity are those where our adjusted rates track closest to the Eurostat figures, which shows that granular reporting produces more accurate headline numbers.

10.3 Adapted KPIs

What the figures show

We found a positive relationship between adapted KPI integration and overall packaging recycling rates. Countries scoring 4 on our KPI index, those tracking material recovery, eco-modulation, and transparency, generally sit at the top of the EU-27 recycling distribution. High KPI scores indicate institutional capacity and reporting maturity. KPIs are not, on their own, an instrument: cross-referenced against data granularity, the analysis shows that strict KPIs plateau where the underlying reporting cannot support them.

Country case studies

Belgium (79.7%), Italy (75.6%), and Spain (70.5%) all score 4 on our KPI index and show that advanced statutory metrics drive EU-leading results when supported by strong governance. Whether operating through a single PRO (Belgium) or material consortia (Italy, Spain), their ambitious targets shape market behaviour. Germany also scores 4, and its VerpackG mandates strict KPIs. However, Germany's fragmented multi-PRO system creates data silos that prevent tracking across competitors. This is the "Germany exception": strict KPIs on paper

do not guarantee maximum performance if the underlying data architecture is fragmented. Hungary scores 2, which shows that the system is still developing its governance metrics during a major structural overhaul. This directly correlates with its lower performance.

Implications

Adapted KPIs are a reliable performance guide. The pattern holds across the full sample: systems with integrated, ambitious metrics consistently outperform those without them. But the German case shows the limit: mandating targets without the transparent, machine-readable reporting infrastructure to track them is ineffective. Policymakers should treat adapted KPIs and data granularity as two parts of the same mechanism. This interaction is important to the PPWR's goal to create comparable performance tracking across all Member States.

10.4 Government support and monitoring

The numbers

We analysed the relationship between system governance models and recycling performance and found that state involvement does not drive better outcomes. Private system management averages 64.9% overall packaging recycling, compared to 47.4% for state fund models. Systems where municipalities have strictly limited operational involvement achieve the highest rates (67.3%), outperforming those with direct municipal control over collection (62.5%) and combined collection and sorting (63.1%). Public sector involvement shows no meaningful relationship with data granularity scores, confirming that governments do not build better or more transparent monitoring systems than private PROs. The state-fund sample is n=2 (Hungary and Croatia), which is too small to support structural conclusions about public-sector operational models.

Country case studies

Belgium and Spain operate private system management models where municipalities are limited to collection duties. Their leading recycling rates show that direct state operational control is unnecessary when the institutional framework (data granularity, KPIs, and legislative mandates) is strong. Austria and Germany function with strictly limited municipal involvement under private PRO management and achieve solid results, though Germany's multi-PRO structure creates separate transparency challenges. Croatia and Hungary are the only pure state fund models in the dataset. Despite high government integration, both sit at the bottom of the performance table, confirming that state control without mature infrastructure, independent monitoring, and granular data does not produce results.

Implications

State involvement is no substitute for a well-run system. Heavy state or municipal involvement in operations correlates with lower average recycling rates and worsens reporting transparency. High performance is achieved when governments focus on enforcement, institutional capacity, and maintaining clear rules for private PROs instead of expanding their own operational footprint. This distinction between regulation and operation matters for the PPWR's provisions on Member State oversight responsibilities.

11. Creating circular markets

Recycling rates in this Pillar are Eurostat 2023 unless flagged otherwise.

This finding examines whether EPR system structures support secondary raw material markets. We assessed three variables: eco-modulation for PCR content, PRO market structure, and infrastructure quality. PRO market structure produces the largest single effect in the dataset, with a 24.4 percentage-point spread across governance models. The full breakdown is presented in Section 11.3. Infrastructure quality, defined as the physical capacity for sorting and processing together with the geographic reach of collection networks, sets the ceiling on what any financial instrument can achieve. Outcomes are also shaped by contextual factors, including international trade in secondary materials and the presence of deposit return schemes. Both affect the quality and volume of material available to circular markets. The subsections below present the evidence for each variable.

11.1 Key findings

Core drivers of success

PCR fee modulation drives uptake where supply chains already exist. Markets that have implemented PCR-based fee modulation, set by regulators or statutory bodies, show the strongest uptake of recycled content in PET and PE streams. The financial signal matches the existing industrial supply chains for secondary raw materials in those streams.

PRO market structure has a high impact. Single-PRO systems average 71.8% overall packaging recycling, multi-PRO systems 62.2%, and state-managed systems 47.4%. The resulting 24.4 percentage-point spread is the largest structural gap in the dataset. The state-managed category contains only two Member States, Croatia and Hungary, and is developed further in Section 11.3.

Infrastructure quality is a moderate but binding constraint. Financial incentives stimulate demand for secondary materials, but the physical maturity of national recycling infrastructure, its geographic accessibility, and its material-specific processing capacity determine the supply ceiling. Beverage glass leads with an average collection rate of 76.7%, followed by metal (73.5%) and PET (67.0%). Flexible plastics are the structural bottleneck. CIRCPACK rates each country's end-to-end value chain for a given material on a four-level scale: "Mature" (a fully developed value chain across collection, sorting, and reprocessing), "Advanced developing", "Early developing", and "Limited". For PE flexible packaging, only three Member States (Belgium, Germany, and Sweden) reach the "Mature" tier. The format-specific recycling rates compiled for this study quantify the gap: flexible plastics average 13.1% across the EU-27 for household packaging, against 34.1% for rigid plastics. This is the largest material-level performance gap in our data.

Aluminium behaves differently from flexibles. Where flexibles show a predictable spread, with higher performers consistently doing better and lower performers consistently doing worse, aluminium varies widely even among high-performing schemes. Part of this variation reflects how Eurostat reports aluminium, since the boundary between packaging aluminium and other aluminium flows is not drawn consistently across Member States. The underlying gap is

nevertheless real. Croatia in particular sits well below the peer group, which shows that even high-value materials underperform where infrastructure has not been built out.

11.2 Eco-modulation for PCR content

Findings

We assessed the relationship between eco-modulation for recycled content and recycled-content uptake across the EU-27. The strongest relationship between modulation and actual market uptake is concentrated in PET and PE streams, where the financial signal of the EPR fee aligns with established industrial supply chains for secondary raw materials. Outside plastics, ferrous and non-ferrous metals operate in mature secondary-material markets; the recycled-content signal there runs through established secondary-market economics rather than EPR fee modulation.

Country case studies

Spain, France and the Netherlands operate explicit PCR-based eco-modulation in their household packaging tariffs, with bonus-malus structures that price recycled content into the fee schedule. Belgium runs the equivalent on the commercial stream through Valipac's €100/t bonus for plastic packaging containing at least 30% recycled content, doubled to €200/t in 2025; the household stream (Fost Plus) modulates on recyclability rather than recycled content, where uptake comes from long-running industry agreements and existing infrastructure instead. Germany and Italy apply recycled-content modulation to plastics on top of long-standing recyclability modulation. Portugal modulates only on recyclability.

Implications

Eco-modulation for PCR content moves demand, but it does not move it alone. Whether the financial signal lands in physical recovery depends on the maturity of collection, sorting and reprocessing capacity. Policymakers should pair eco-modulated rewards under the PPWR with direct investment in reprocessing infrastructure. The interaction between fee design and physical capacity is examined in Section 11.4.

11.3 PRO market structure

What the comparison shows

We classified PRO market structures across the EU-27 and found consistent differences in recycling performance. Single-PRO systems achieve the highest overall packaging recycling rates, averaging 71.8%. Multi-PRO competitive systems average 62.2%. State-managed systems underperform consistently at 47.4% (Eurostat). The gap between single-PRO and state-managed systems is 24.4 pp, one of the largest structural effects in our data. The mechanism is direct: a single PRO eliminates reporting fragmentation, creates a unified data flow, and provides a single point of financial control over the national collection and sorting network.

The material-level picture, drawn from the CIRCPACK format-specific dataset, is consistent. Single-PRO systems achieve average rigid plastic recycling rates of 40.7% and PE flexible rates of 19.5%. Multi-PRO markets sit at 32.0% and 11.6%. State-managed systems fall further behind at 29.6% and 5.0%. The PE flexible gap widens from 7.9 pp (single vs multi-

PRO) to 14.5 pp (single vs state). The same governance gradient holds for metals, though more compressed: aluminium and ferrous-metal recovery rates step down from single-PRO to multi-PRO to state-managed systems by smaller margins than for plastics. The plastics gap is sharper because plastic recovery layers DfR compliance on top of collection and sorting, while metals carry the collection-and-sorting signal more cleanly.

Country case studies

Belgium operated under a single-PRO structure (Fost Plus) for household packaging until the current period, and Spain operated under a material-specific single-PRO structure (Ecoembes for light packaging, paper and cardboard; Ecovidrio for glass) until the 2022 reform. Although Spain's pre-reform system was not a single-PRO scheme in the strict sense, each major material stream was managed by a single PRO with no competing operator inside its scope, which produced the same operational outcomes a true single-PRO arrangement delivers: unified reporting per material, a single point of financial control, and consolidated logistics networks. Spain's transition under Royal Decree 1055/2022 to a competitive multi-PRO market, with full-scope EPR extending into commercial and industrial packaging, is a natural experiment in whether that efficiency holds once each material stream has multiple competing operators. Italy operates as a single-PRO system under CONAI, which coordinates seven material-specific consortia under one governance structure. The internal complexity is real, but CONAI functions as a single national scheme and reaches near-benchmark recycling figures. Germany, by contrast, runs a competitive multi-PRO market with strong rates, supported by intensive centralised regulatory oversight (ZSVR) that offsets the fragmentation of a ten-PRO market. Both Italy and Germany show that systems with internal architectural complexity can approach the same performance as a clean single-PRO scheme, but only with substantial secondary investment in coordination and enforcement. Hungary, operating under a state concession, sits at the bottom of the dataset. Centralisation alone has not produced recovery: without competitive pressure on operators or independent performance monitoring, recycling outcomes stay well below the EU-27 average.

Implications

Single-PRO systems carry an inbuilt advantage in data consolidation and coordinated fee-setting, which translates into higher average recycling rates in the 2023 sample. That advantage is not intrinsic to the consolidated single-PRO form. Germany's LUCID clearinghouse demonstrates that competitive multi-PRO markets can achieve comparable data quality where an independent consolidation mechanism is mandated and funded. For policymakers implementing the PPWR, the implication is that whichever structure a Member State chooses, it must be paired with a credible independent oversight body, harmonised reporting standards, and sufficient enforcement capacity. Direct state operational control of collection and sorting shows consistently weaker results in our sample (n=2) and is not supported by the evidence as a preferred model.

11.4 Infrastructure quality

Country-by-country picture

We examined how mature physical recycling infrastructure is across the EU-27 and found that infrastructure readiness aligns with collection performance in a clear order. Glass is highest,

with an average collection rate of 76.7%, followed by metal (73.5%) and PET (67.0%). Member States with effective infrastructure for one material tend to perform well across all streams. The weakest link is PE flexible packaging infrastructure, where only three Member States hold a "Mature" rating. Most Member States are still at "Early developing" or "Limited" for flexible plastics. The format-specific recycling rates show how large the gap is: PE flexible packaging averages 13.1% across the EU-27 for household packaging, against 34.1% for rigid plastics. Even in top-performing systems such as Germany (PE flexible 24.4%, rigid 51.0%) and Belgium (PE flexible 33.9%, rigid 50.8%), the flexible-to-rigid ratio stays well below parity. Infrastructure maturity for flexible plastics is what holds plastic recycling back overall. The parallel track is the design-for-recycling transformation of flexible packaging discussed in Section 9. Recovery rates will rise only as fast as the collection and sorting capacity behind them is built out.

Geographic reach is a second critical variable. Systems that ensure widely available separate collection in rural areas systematically outperform limited networks: 82.6% for glass and 76.6% for metal in widely available systems, against 70.0% and 68.8% respectively in constrained networks. The rural collection divide is one of the largest performance gaps in our data.

Country case studies

Germany and Belgium hold mature infrastructure across multiple material streams and guarantee widely available rural collection. Germany captures 95.0% of PET and Belgium achieves 100.0% beverage glass collection. Their performance shows that mature sorting and processing systems minimise material leakage across the entire value chain. Italy and Spain maintain large installed recycling capacities. Italy captures 90.0% of beverage metal, and Spain ensures widely available rural accessibility. Both confirm that high-volume markets require substantial, stable physical infrastructure to process domestic generation without reliance on landfill. Hungary operates with "Early developing" or "Limited" status in key material streams. The consequences of infrastructure underinvestment are visible in its rates. Without mature physical systems and widespread rural accessibility, financial and regulatory incentives are constrained by logistical reality. The infrastructure advantage is visible across the CIRCPACK format-specific data, and widens as the format gets harder to recycle. On rigid plastics, Belgium and Germany both exceed 50%, roughly 10 pp above the next tier of multi-PRO markets. On PE flexibles, Belgium reaches 33.9% and Germany 24.4%, against a multi-PRO PE flexible average of 11.6%. Hungary illustrates the same logic on non-ferrous metals: aluminium recovery sits at 18.4% in 2023, compared with 70.3% in Italy, 68.0% in Germany and 51.2% in Spain. Even materials where market pull should compensate for infrastructure gaps fail to reach normal recovery levels when the underlying collection and sorting system is weak.

Implications

Infrastructure quality sets the ceiling on how much secondary raw material a system can supply. The data are clear: high collection and recycling rates are not achievable without mature sorting and reprocessing capacity, paired with rural-area coverage. Policymakers should close the rural collection gap and target investment at the weakest material streams. Physical infrastructure is what every other circular policy rests on. This finding speaks to PPWR Article 43 on separate collection and to the infrastructure-investment timelines that go with it.

12. Transparency

This finding examines the link between institutional transparency and recycling outcomes. We assessed two variables: balanced monitoring (the combination of coverage of reported information, methodology disclosure, and reporting frequency) and the effect of PRO market structure on transparency outcomes. Member States that perform substantially on all three transparency dimensions achieve an average overall packaging recycling rate of 69.6%, against 56.2% for Member States with material gaps across all three dimensions. The 13.4 percentage-point gap is the headline transparency effect; the full breakdown sits in 12.2.

This section builds on the transparency benchmarking in Section 7, which classified all 27 Member States as High, Medium or Low under a composite index. Each of the three indicators (Coverage, Methodology, Frequency) is scored on the same 0-to-2 scale, so the composite ranges from 0 to 6. The classification thresholds are 5.5 for High and 3.5 for Medium. The full methodology and country-level scores are documented in the transparency annex. What follows asks why each Member State lands where it does and what the policy implications are.

12.1 Key findings

Core drivers of success

Substantial performance on all three transparency indicators is the most influential factor in this Pillar. Member States that combine detailed data coverage with documented calculation methodology and regular annual reporting achieve an average recycling rate of 69.6%, against 56.2% in Low Transparency systems. The 13.4 pp gap is the largest single transparency effect in our data and is consistent with two complementary mechanisms: higher physical recovery in transparent systems, and less measurement slack in the reporting itself. The data cannot separate the two.

PRO market structure has a moderate effect on transparency outcomes, and single-PRO systems make balanced governance easier to achieve. Of the seven Member States operating a single PRO, five (Belgium, Czechia, Italy, Luxembourg and the Netherlands) reach a "High Transparency" classification. Italy publishes per-PRO, per-material performance figures through CONAI and the seven material-specific consortia, which places it in the High Transparency cohort alongside Belgium, Czechia, Denmark, Finland, France, Luxembourg and the Netherlands. Per-municipality fee allocation in Italy is less granular than in Belgium, but the chapter-level transparency classification stays High. Ireland sits at Medium under the new framework: methodology disclosure scores 1.0 (partial) and Coverage 1.5, which together place the composite below the 5.5 threshold despite the simplifying effect of a single PRO. Cyprus, also a single-PRO market, falls to Low because reporting frequency scores zero.

Among the eighteen Member States with competitive multi-PRO markets, only Denmark, France and Finland reach the High Transparency threshold. The remaining fifteen sit in the Medium or Low tiers, and reporting fragmentation across competing operators is the most consistent driver of the gap.

State-managed systems split between Medium (Croatia, composite 4.25) and Low (Hungary, composite 3.25). Their combined recycling average is 47.4%, the weakest in the dataset (n=2).

Reporting that can't be independently verified is worth little. High data coverage and frequent reporting on their own do not move physical recycling performance if they are not paired with documented methodology that an independent party can reproduce. Administrative reporting without methodological transparency risks inflating headline figures while obscuring actual physical recovery.

12.2 Balanced monitoring and methodology disclosure

What the dataset shows

High Transparency systems average 69.6%, Low Transparency systems 56.2%, a 13.4 pp gap. The mechanism operates through methodology disclosure. When the calculation point and the methodology behind the published figure are publicly documented, the reported rate can be independently verified against the underlying material flows. When they are not, the reported figure reflects a regulatory classification decision whose basis cannot be externally checked.

Two consequences follow from missing format-level visibility. Eco-modulated fees default to design assumptions and broad proxies, weakening the signal that producer charges are meant to send to end-of-life outcomes. Investment follows the same logic: without disaggregated data on where material is being lost, capital concentrates on the formats that already have established offtake markets. The country cases below trace both effects through Belgium, Germany, Italy, Spain and Hungary.

Country case studies

Belgium scores the maximum on all three indicators (Coverage 2.0, Methodology 2.0, Frequency 2.0; composite 6.0). Its balanced oversight aligns with the highest recycling rate in the EU-27, 79.7%.

Italy publishes per-PRO and per-material performance figures through CONAI and the seven material-specific consortia. Italy scores the maximum on all three indicators (composite 6.0) and reaches a 75.6% recycling rate. The narrower gap against Belgium concentrates on financial-flow disclosure and per-municipality fee allocation rather than on headline reporting.

Germany has full methodology disclosure and full reporting frequency (both 2.0), but Coverage is 0.75. Household packaging EPR in Germany is operated by ten licensed dual systems, of which eight publish their own fee calculator, and there is no consolidated national tariff. A producer cannot obtain a single document setting out the German EPR fee schedule, which suppresses the Coverage indicator. The framework places Germany at Medium Transparency as a result. The country still records a strong 69.4% recycling rate, which shows that high methodology and frequency scores can offset fragmented coverage in the short term but do not deliver the consolidated reporting basis the PPWR aims to require.

Spain remains at Medium Transparency. A transitioning competitive market without a central registry constrains methodology verification across multiple operators (Spain scores Methodology 1.0), and the public record does not document systemic material losses in a way that closes the loop between reported and physical recovery.

Hungary falls to Low Transparency (composite 3.25). The reporting frequency score is zero because the most recent published figures are more than two years out of date, and Coverage

is 1.25 due to a partial disclosure footprint during the MOHU transition. Methodology disclosure scores 2.0 in isolation, but the absence of regular publication breaks the chain of accountability. The 42.8% recycling rate shows that even strong methodology documentation does not move material recovery in the absence of recent and complete data.

Implications

Accountability shows up in the data. Member States that combine detailed coverage with documented methodology and annual reporting consistently outperform Member States that do not.

PPWR begins to move in this direction. Article 56 requires Member States to submit harmonised data accompanied by a quality-check report, and Article 47 requires independent verification of PRO authorisation. The case for mandatory public methodology disclosure and standing third-party audit goes beyond what PPWR currently requires. The WFD's reporting standards could be strengthened by requiring Member States to publish both what they achieve and how they calculated it, which would close the gap between reported and actual recovery.

The "follow the money" side of transparency, namely where EPR fees are spent and on what, is another area on which current EU legislation does not yet require detailed public disclosure. A preliminary assessment shows wide variation across Member States; a full picture across all 27 systems remains a critical data gap.

12.3 Market structure and transparency

The pattern across market structures

PRO market structure and transparency outcomes show distinct patterns. Multi-PRO markets require an additional layer of centralised data architecture to achieve the reporting consolidation that single-PRO systems generate structurally. Where that architecture is partially built, as in Germany's competing dual systems with no consolidated tariff, the index records Medium Transparency rather than High.

Of the seven Member States operating a single PRO, five (Belgium, Czechia, Italy, Luxembourg and the Netherlands) reach High Transparency. The streamlined reporting channels between a single producer entity and the government minimise data fragmentation, and the single-PRO group posts the bloc's highest average recycling rate at 71.8% (Section 11.3). Ireland and Cyprus are the two single-PRO Member States outside the High band. Ireland's composite is 4.5 (Medium) because methodology disclosure is partial. Cyprus drops to 2.25 (Low) because reporting frequency is absent. Both cases show that single-PRO structure does not automatically deliver transparency: the underlying disclosure practices matter.

In competitive multi-PRO markets, only Denmark, France and Finland reach the High Transparency threshold (three of eighteen). The burden of aggregating disparate producer data across competing operators frequently overwhelms government oversight where no central data clearinghouse is mandated.

State-managed systems split between Medium (Croatia) and Low (Hungary).

The relationship between EPR system structure and operational efficiency is not one-directional, and we are careful not to suggest otherwise. Competitive systems can, under sufficient regulatory supervision, deliver operational efficiency: cost discipline, innovation in fee modulation, and responsiveness to producer needs are all documented outcomes in competitive arrangements where the regulator has both the mandate and the capacity to hold the competing PROs to common standards. Germany and Austria show this in parts of their histories. The converse is equally well documented and is the more important finding for this study. Belgium, operating a single-PRO arrangement for household packaging through Fost Plus, is among the highest performers in the dataset across recycling rate, transparency and cost coverage. This shows a centralised system can be efficient when it's well governed.

The conclusion we draw is not that one structure is superior to the other, but that structure is a weaker determinant of performance than governance, specifically the quality and depth of regulatory oversight applied to whichever structure a Member State has chosen. For the purposes of this report, we treat the single-PRO and competitive distinction as a descriptive variable rather than an explanatory one, hence the reference to eco-modulated fees as the strongest driver of effective recycling.

Country case studies

Belgium's single-PRO system removes reporting fragmentation. The result is High Transparency (composite 6.0) and the EU-27's highest verified recycling rate (79.7%).

Italy operates a single-PRO consortium model under CONAI, with seven material-specific consortia each publishing per-format performance data. This places Italy in the High Transparency band (composite 6.0) alongside Belgium, Czechia, Denmark, Finland, France, Luxembourg and the Netherlands. The narrower gap against Belgium concentrates on per-municipality fee allocation rather than on headline reporting.

Germany illustrates the limits of methodology-only transparency. The centralised packaging register (LUCID) supports verifiable methodology and annual reporting, but Coverage scores 0.75 because, of the country's ten licensed dual systems, only eight publish separate fee structures and there is no single national tariff. Germany sits in Medium Transparency as a result. The case demonstrates that strong central regulatory infrastructure on methodology and frequency cannot fully offset the coverage gap that multi-PRO fragmentation creates.

Spain shows how structural complexity can constrain transparency. The shift to a broader competitive market without a unified registry holds the system at Medium Transparency, because cost allocation and methodology verification across multiple operators are harder without centralised data oversight.

Hungary's transition to a state concession simplifies administrative data collection in principle, but the reporting frequency score is zero because published figures lag by more than two years. The system sits at Low Transparency (composite 3.25), despite full methodology disclosure on paper.

Implications

Market structure determines the baseline difficulty of balanced monitoring. Single-PRO systems have a transparency advantage in their simpler data flows, and that advantage correlates with stronger recycling outcomes. Multi-PRO market structures put government-

producer accountability under strain through data fragmentation. Member States operating fragmented PRO markets need to mandate and fund centralised, independent data clearinghouses to reach the balanced monitoring that single-PRO systems achieve more naturally. The point reinforces the analysis in Section 11.3 on PRO market structure and supports the PPWR's harmonised reporting requirements.

Part IV

Country case studies

13. Comparative case studies across five countries

The five Member States examined were selected to represent different system types, performance levels, and recent reform paths, and are presented here in descending order of overall packaging recycling performance (Eurostat 2023). Belgium operates a dual EPR framework (Fost Plus for household, Valipac for commercial and industrial) and is the EU-27's highest-performing system. Italy operates a single-PRO consortium model: CONAI is the umbrella organisation coordinating seven material-specific consortia, and the fee system is the most granular in Europe. Spain is mid-transition from a long-standing material-specific single-PRO arrangement (Ecoembes for light packaging, paper and cardboard; Ecovidrio for glass) to a competitive multi-PRO market under Royal Decree 1055/2022. Germany runs a mature competitive multi-PRO market and also records the highest packaging-waste generation in the bloc. Hungary, the lowest performer among the five, replaced its previous PRO arrangement in 2023 with a 35-year state concession to MOHU.

Each case study follows the finding structure used in Part III: minimising material losses, circular reporting and monitoring, creating circular markets, and transparency. The country analyses can therefore be cross-referenced directly against the thematic findings. The full detail, including collection-stream tables and recycling-rate breakdowns by material, sits in Appendix C. The main text carries a condensed version focused on the analytical narrative.

13.1 Belgium

System overview

Belgium operates a dual EPR framework. Fost Plus manages household packaging; Valipac handles commercial and industrial streams. The overall packaging recycling rate is 79.7% (Eurostat 2023), the highest in the EU-27. GDP per capita is €53,930. The system has operated since the early 1990s, giving it over three decades of institutional maturity.

Minimising material losses

Belgium achieves the EU-27's highest material recovery, driven by granular fees that directly reward recyclability. The fee structure is the primary driver: producers pay less when packaging fits the existing sorting infrastructure and more for complex formats. The current fee schedule is being aligned with the PPWR's recyclability grade structure for the 2030 deadline. The system also benefits from clear packaging definitions that close off free-riding,

design-for-recycling support, and tight day-to-day coordination with municipalities. The 2019 to 2023 "New Blue Bag" rollout extended PMD collection (plastic packaging, metal packaging and drink cartons) to nationwide 16-fraction sorting, which cut material losses at the sorting stage. Context matters. Belgium is small, highly urbanised, and households sort by habit, which makes the operational model demanding to replicate at scale in larger or less urbanised Member States. Outside plastics, Belgium's metals stream is structurally strong: the Fost Plus collection rate for beverage metals is 94%, ferrous metals recycling reaches 99.6%, and rigid aluminium recovery sits in the upper EU-27 quartile at 91.2%. Beverage cartons and complex paper move through the same PMD route and are recovered at high rates, because the operational capacity at the collection and sorting stages is in place.

Circular reporting and monitoring

Belgium mandates detailed data granularity, with format-specific tracking reinforced by 2023 legislative updates to reporting rules. The strictly defined dual-PRO structure, without market competition, eliminates data fragmentation: Fost Plus and Valipac produce consistent, harmonised reporting at the national level. The Interregional Packaging Commission (IRPC) manages accreditation and compliance monitoring across the three regions. The system's time in place is its primary enabler. Over thirty years of institutional maturity, established data pipelines, and a culture of high transparency produce one of the most detailed monitoring frameworks in Europe.

Creating circular markets

Belgium uses a bifurcated approach to PCR-content incentives. The household sector managed by Fost Plus relies primarily on upcoming PPWR mandates rather than direct financial bonuses. The commercial sector is more active: Valipac's "myRecycledContent" bonus financially rewards producers for integrating recycled plastic into their supply chains, doubled from €100/t to €200/t in 2025. Infrastructure quality is high, with state-of-the-art sorting and processing facilities. Belgium's reprocessing capacity exceeds what domestic collection alone produces, which makes it a net importer of plastic scrap from neighbouring Member States, primarily the Netherlands. This intra-EU flow reflects how the single market is designed to function for secondary raw materials: the PPWR does not set self-sufficiency targets at Member-State level, so material naturally moves to where reprocessing capacity exists at scale. The corollary is that remaining barriers to waste shipment within the EU should be lowered, so that reprocessing capacity and feedstock can be matched across borders without friction.

Recycling performance against EU targets

Overall packaging 79.7% (Eurostat 2023). At the material level, under the CIRCPACK household-scope methodology used through this report, Belgium reaches paper 83.9%, glass 92.9% (with beverage glass collection at 100%), ferrous metals 99.6%, rigid aluminium 91.2%, plastic 59.5%, and flexible plastic 33.9%. Belgium has already exceeded the PPWR 2030 targets for plastic (55%), glass (75%), ferrous metals (80%) and aluminium (60%), and sits within reach of the paper and cardboard 2030 target of 85%. Belgium leads the EU-27 on flexible plastic recycling at 33.9%, against the EU-27 average of 13.1% under the same methodology. This is a particularly strong result given that separate collection of household flexibles only began with the New Blue Bag rollout four years before the reporting period.

13.2 Italy

System overview

Italy operates the CONAI single-PRO consortium model. CONAI is a non-profit umbrella organisation that coordinates seven material-specific consortia covering paper, glass, steel, aluminium, plastic, wood, and bioplastics. The EPR system has been in place since 1997, giving it 29 years of operational maturity. The overall packaging recycling rate is 75.6% (Eurostat), above the EU 2030 target of 70% but driven by uneven performance across material streams. Italy has a population of 58.9 million, a population density of 198 inhabitants per km², and an urbanisation rate of 71%. GDP per capita is €38,310. The fee structure is modulated and rated as granular under our framework, with separate eco-modulation tracks for recyclability (paper/cardboard and plastic) and recycled content (plastic).

Minimising material losses

CONAI's multi-level fee system is the main driver of Italy's material recovery. Hard-to-recycle complex materials pay more, and packaging that fits existing sorting streams pays less. DfR guidance is provided through the Progetto Ecodesign initiative, and CONAI's strict packaging definitions limit free riding. Municipalities are the operational gatekeepers, since they drive citizen participation and separate-collection quality at source. The North-South divide remains a structural factor, but recent data show it is closing. Separate-collection growth rates in the South and Centre run at +5.1% and +6.2% respectively. Tighter coordination between sorting plants, consortia and producers has lifted national recycling rates by roughly 7 percentage points over the past decade. The plastic recycling chain reached 49% in 2023, close to the EU's 50% target for 2025. Italy's metals performance is among the strongest in the EU-27, with steel recovery at 89.0% and aluminium recovery in the upper quartile. CONAI's material-specific consortia (RICREA for ferrous, CiAl for aluminium) run dedicated collection economics. Beverage cartons recovered through the Comieco paper consortium illustrate the complex-paper case: recovery here depends on operational capacity at sorting level.

Circular reporting and monitoring

Italy's reporting infrastructure provides granular tracking across all major packaging streams, and eco-modulated fees are tied closely to real-world performance. Recycling rates for paper (92.6%) and glass (77.4%) have already surpassed the EU's 2030 targets. In 2022, CONAI channelled over €600 million to municipalities and waste operators to cover sorting, collection, and reporting costs. The overall packaging recycling rate reached 75.6% in 2023. Despite significant operational costs, Italy's system is regarded as one of the most transparent and high performing among the large EU Member States.

Creating circular markets

Italy's eco-modulation framework links producer fees to recyclability and recycled-content share on a polluter-pays basis. Packaging that is easily recyclable, or that incorporates recycled content, pays significantly reduced fees, while harder-to-recycle formats pay more. Italy is in the advanced stages of aligning its framework with the PPWR, which will reinforce eco-modulation standards and introduce mandatory recycled-content targets for 2030. A significant price gap persists between virgin and recycled plastic, which continues to limit the demand-pull effect of eco-modulation.

Recycling performance against EU targets

Paper 92.6%, glass 77.4%, metals 89.0% (steel) and 70.3% (aluminium), plastic 49.0%, and wood 51.8% (Eurostat 2023). The overall packaging recycling rate is 75.6%, above the EU 2030 target of 70%. Italy has already exceeded the 2030 targets for paper, glass, steel, aluminium, and wood. Plastic is the only stream still short of target. Italy's paper performance is among the strongest in the EU-27, supported by Comieco's consortium model and a mature collection network for fibre-based packaging.

13.3 Spain

System overview

Spain is transitioning from a 25-year material-specific single-PRO arrangement to a competitive market. The overall packaging recycling rate is 70.5% (Eurostat 2023). Population is 48.6 million, 83% urban. GDP per capita is €34,210. The system was dominated by Ecoembes (light packaging, paper, cardboard) and Ecovidrio (glass) until Royal Decree 1055/2022 ended that arrangement, mandated eco-modulated fees, and extended EPR to commercial and industrial packaging. A national deposit-return scheme covering single-use plastic bottles and metal cans is scheduled to launch in late 2026. Eight PROs are currently authorised in total: three for household packaging and five for industrial and commercial packaging. Spain introduced the first plastic packaging tax in the EU (€0.45/kg on non-recycled plastic) in January 2023.

Minimising material losses

Royal Decree 1055/2022 requires Spain's new competitive PROs to apply eco-modulated fees with bonus-malus structures. Complex materials such as multilayer plastics and non-recyclable packaging attract significant maluses, which makes designs that end up in incineration or landfill expensive. The Product Producer Registry requires verified EPR registration for any commercial activity and has been effective at closing off free riding, particularly in e-commerce. Municipalities still control yellow-bin (light packaging) and blue-bin (paper and cardboard) collection, so initial sorting quality depends on what they do. Until the planned DRS launches, the current framework leans on getting more out of existing municipal collection streams. Metals move through a separate route: ferrous and aluminium streams pass through industrial scrap markets, where recycled-content economics work largely outside EPR fee modulation. Beverage cartons and complex paper sit inside the yellow-bin route; recovery rates here depend on operational capacity at sorting level.

Circular reporting and monitoring

The legal framework has shifted from Ecoembes self-reporting to a state-governed digital system. The Product Producer Registry provides a transparent baseline for recovery data. The system is navigating significant structural adjustment following the end of the single-PRO era: eight authorised PROs now operate in the market, requiring substantial administrative oversight to ensure data integrity. Historical allegations of data inflation under the previous arrangement were a primary catalyst for the 2022 legislative overhaul. The current regime focuses on independent, third-party verification to ensure that reported recycling volumes reflect actual secondary material uptake. Under our transparency framework Spain scores

Medium; the Methodology score is constrained by the fact that a transitioning multi-PRO market without a fully built central registry limits methodology verification across operators.

Creating circular markets

Royal Decree 1055/2022 mandates eco-modulation of EPR fees to reward recyclability and PCR content, with surcharges for disruptive packaging features. Individual PROs currently have some flexibility in applying bonuses and penalties as the market transitions towards a fully binding national standard by 2027. The €0.45/kg plastic tax directly incentivises recycled content: any certified recycled plastic portion is exempt from the levy. Spain stands out in the EU-27 for its higher plastic PCR content at 22.1%. The PPWR mandatory recycled-content targets, coupled with mandatory eco-modulation, are expected to drive PCR uptake further.

Recycling performance against EU targets

Paper 81.2%, glass 71.4%, metals 97.1% (steel) and 51.2% (aluminium), and plastic 47.9% (Eurostat 2023). The overall packaging recycling rate is 70.5%, just above the EU 2030 target of 70%. Spain has exceeded the 2030 target for steel, and clears every 2025 target except plastic, which sits at 47.9% against the 50% 2025 threshold. Paper, glass, aluminium, and plastic remain below their 2030 thresholds, but the trend is positive: paper has climbed from 72.9% in 2019 to 81.2% in 2023, and the overall rate has recovered from a 2020 to 2022 dip back above 70%. The transition from material-specific single-PRO arrangements to competitive PROs and full-scope EPR under Royal Decree 1055/2022 is expected to push these figures further, although the adjustment period creates short-term uncertainty in the reported data.

13.4 Germany

System overview

Germany operates a competitive multi-PRO system with ten licensed operators. The overall packaging recycling rate is 69.4% (Eurostat 2023). The country generates the highest absolute volume of packaging waste in the EU and sits in the top three Member States on a per-capita basis. GDP per capita is €53,520. The system originated in 1991 with the Dual System Deutschland (DSD) monopoly, transitioned to a competitive market after 2003, and was overhauled by the 2019 Packaging Act (VerpackG). The ZSVR (Central Agency Packaging Register) now sets recyclability standards and manages compliance through the LUCID database.

Minimising material losses

The shift from flat Green Dot fees to eco-modulated fees under VerpackG is the main driver of Germany's material recovery. The ZSVR publishes an annual Minimum Standard that sets how recyclability is measured, which pushes producers to design for the sorting infrastructure that exists. The LUCID register has worked to bring unregistered producers into compliance, particularly in e-commerce. Reported packaging volumes rose over the past two decades, peaking in 2021 and easing somewhat since; the long rise is generally read as better data capture under the register rather than a real increase in material losses. Local authorities still run paper and cardboard infrastructure, while PROs handle lightweight packaging and glass collection separately. This hybrid setup, paired with strong household-sorting habits, keeps

contamination low at the collection point. On metals, Germany's aluminium recovery at 68.0% is towards the top of the EU-27 distribution and ferrous recovery is at 86.7%. The eco-modulation signal lands cleanly on metals because secondary-material markets price them directly. For beverage cartons, the residual recovery gap is about operational capacity at collection and sorting level, not design non-compliance.

Circular reporting and monitoring

The LUCID database requires volume reporting from all PROs, providing a centralised data backbone for Germany's fragmented multi-PRO market. The ZSVR manages compliance and publishes annual recyclability standards. Monitoring is granular, tracking distinct material streams including plastics, glass, ferrous and non-ferrous metals, beverage cartons, paper, and cardboard. The system's weakness is the data silo effect inherent in multi-PRO market architecture: tracking material leakages across ten competing operators is inherently more difficult than in a single-PRO system. Under our transparency framework Germany scores Medium; the Coverage score is constrained by the fact that there is no consolidated national tariff, so a producer cannot obtain a single document setting out the German EPR fee schedule. Composite packaging materials continue to show lower recovery rates, and research by the German Environment Agency identifies incorrect household sorting (residual waste in recycling bins) as a persistent obstacle. These are monitoring and operational challenges, not policy failures.

Creating circular markets

Under Section 21 of VerpackG, PROs are legally required to structure fees that reward recyclable design or recycled content. Competitive PRO markets like Germany's reach the same eco-modulation outcome as single-PRO systems, but through different mechanisms, and the classification (competitive multi-PRO) is the relevant variable in this analysis. Germany's established infrastructure and mature secondary-material markets position the system well for the next phase of EU-wide harmonisation, although the practical challenge is internal: aligning ten licensed dual systems on a common interpretation of recyclability grades and recycled-content tariffs will require tighter federal coordination through the ZSVR.

Recycling performance against EU targets

Paper 86.6%, glass 80.6%, metals 86.7% (steel) and 68.0% (aluminium), plastic 52.2%, and wood 30.2% (Eurostat 2023). The overall packaging recycling rate is 69.4%, just below the EU 2030 target of 70%, and well above the 2025 target of 65% that Germany has cleared comfortably. At the material level, paper, glass, steel, aluminium, and wood have passed their 2030 thresholds (wood by a narrow margin). Plastic remains the only material short of its 2030 target, at 52.2% against 55%, although it has climbed steadily from 43.3% in 2019.

13.5 Hungary

System overview

Hungary operates a state-managed concession model. In July 2023, the government awarded a 35-year concession to MOHU (MOL Group) to manage nationwide waste collection and treatment, replacing the previous fragmented PRO system. The overall packaging recycling rate is 42.8% (Eurostat 2023), with plastic at 23.0% and glass at 22.8%. Population is 9.6

million, GDP per capita €23,000, below the EU average. A nationwide DRS covering single-use plastic bottles, metal cans and glass bottles was mandated from January 2024.

Hungary is the Member State in our dataset where the short-run outlook is the hardest to call with precision. The system remains in early implementation, with key operational and reporting parameters still being defined. The concession-based structure introduced in 2023, with MOHU as the single concessionaire, centralises operational responsibility in a way that can deliver the step-change in collection, sorting and reporting that Hungary needs, provided execution follows design. If implementation falters, it risks reproducing the structural weaknesses observed in other Member States where fee revenue and operational delivery are imperfectly connected. The evidence on which of those trajectories is unfolding is not yet settled, so this report does not attempt to quantify an outlook. Two things seem likely. First, recycling rates are expected to rise: the baseline is low and 2026 investment commitments are public. Second, how much they rise depends on whether MOHU pairs infrastructure build-out with the transparency and governance EU rules require, and whether producers can see how their fees are spent.

Minimising material losses

Hungary's historical PRO system used basic weight-based fees and did not eco-modulate at the granularity needed to drive material recovery. The persistently low 23% plastic recycling rate is what that looks like in practice: no systematic DfR support, no financial penalties for complex packaging. Under the MOHU concession, fees have been centralised but not yet moved to format-specific modulation that rewards recyclability. Government Decree 80/2023 strengthened market oversight by requiring dual registration with both MOHU and the state authority, aimed at producers placing packaging on the market without registering. The concession model puts operational control at the centre and pushes municipalities out of their traditional roles. Whether central capital allocation will lift citizen participation and sorting quality, particularly in rural areas where contamination is high, is the open question for the system. On metals, Hungary's aluminium recovery sits well below the EU-27 peer average and ferrous recovery is also constrained; the same operational-capacity gap at collection and sorting level that limits plastic recovery applies here too. Beverage cartons and complex paper face the same pattern: recovery here depends on the infrastructure build-out under MOHU.

The reported 18% drop in packaging waste in 2023 should be read with care. Short-term system effectiveness is hard to assess here because macroeconomic shocks and reporting disruptions obscure the underlying trajectory.

Circular reporting and monitoring

Hungary's reporting framework is undergoing a structural overhaul. The system now mandates strict dual registration through the national OKIRkapu platform and the MOHU concessionaire, seeking to establish a regulated baseline of placed-on-market data. The immediate priority is eliminating historical underreporting and establishing transparency regarding waste flows. Under our transparency framework Hungary scores Low (Coverage 1.25, Methodology 2.0, Frequency 0; composite 3.25): methodology disclosure is strong in isolation, but reporting frequency is zero because the most recent published figures are more than two years out of date, and Coverage is constrained by partial disclosure during the MOHU transition. The 2023 recycling rate stands at 42.8%, with paper and cardboard performing relatively better at 70.3%

while plastic (23.0%) and glass (22.8%) represent critical failure points. Achieving rapid alignment with EU targets requires aggressive capital expenditure. Producers are now subject to steep, non-modulated EPR fees paid directly to MOHU, with funds deployed to modernise infrastructure: the nationwide DRS rollout in January 2024, new municipal collection fleets, and sorting facilities. Short-term statistical fluctuations in recycling rates are expected as reporting methodologies align with EU standards.

Creating circular markets

The system currently operates on a strict cost-recovery basis rather than an incentivised design logic. EPR fees are calculated by the national energy and public utility regulatory authority and set by ministerial decree based on operational costs. Producers do not receive financial discounts for incorporating PCR content or designing recyclable packaging, a missing signal for upstream circular design. Recent legislative updates have introduced severe penalties for data inaccuracies and reporting failures to eliminate free riding. At the start of 2025, the historical Environmental Product Charge was abolished for waste streams now covered by EPR, simplifying the previous double-taxation framework and establishing the EPR fee as the singular fiscal instrument. Aligning with the PPWR's eco-modulation requirements and mandatory recycled-content targets will require a fundamental redesign of the fee structure.

Recycling performance against EU targets

Paper 70.3%, glass 22.8%, metals 85.7% (steel) and 18.4% (aluminium), and plastic 23.0% (Eurostat 2023). The overall packaging recycling rate is 42.8%, well below the EU 2030 target of 70% and the 2025 target of 65%. Steel is the only material to clear its 2030 threshold. The gap between current performance and EU targets is the largest of the five case study countries.

Part V

Conclusion

14. Conclusions and policy implications

This report set out to identify what separates high-performing EPR systems from the rest, and to provide perspective on the market-readiness of the European Union under the PPWR. The four analytical Pillars in this study, combined with household-scope, format-specific recycling rates covering 13 packaging sub-categories across all 27 EU Member States, point to a consistent set of findings.

Across very different scheme typologies, the schemes that already perform well do so for a consistent set of reasons: greater transparency, attention to operational realities, and well-structured fees. Belgium (single-PRO), Italy (single-PRO with material-specific consortia underneath) and Germany (multi-PRO) all sit in the high-performance cohort despite very different scheme architectures.

Fee structure, not fee level, drives recycling performance

The data do not support a direct link between fee levels (amounts) and recycling performance: Belgium and Italy reach comparable rates (79.7% and 75.6%) at very different fee levels, and packaging waste volumes track GDP per capita rather than fee design. What links fees to outcomes is design: granular eco-modulation that differentiates by material, format and recyclability outperforms flat or basic structures by 16.5 percentage points on overall packaging recycling (Section 9). The governance model interacts: single-PRO 71.8%, multi-PRO 62.2%, state-managed 47.4% (group averages of overall packaging recycling, Eurostat 2023; Section 11). Fee structure is what separates high-performing systems from the rest. Fee levels still need to be sufficient to fund the collection, sorting and reprocessing infrastructure the PPWR requires. However, the proper allocation of fee revenue is the clear driver of high quality recycling outcomes.

Infrastructural barriers hinder recycling at scale

Not one packaging category is currently on course to meet the PPWR's recycling-at-scale requirements in every Member State. The clearest case is flexible plastics, which combine the lowest recycling rates of any category with little or no sorting and reprocessing capacity in most Member States and the largest gap between what is collected and what is actually recycled. The problem is broader than plastics, though: composite beverage cartons, aluminium in some Member States, and certain paper streams follow the same pattern. Physical infrastructure remains the largest limitation, and no fee design seen in this study, however granular, has yet closed the gap across all categories.

Quality of governance matters more than governance model

The architecture (single-PRO, multi-PRO, or state-managed) matters less than the quality of governance installed around it: how precisely regulators define what PROs must deliver, how transparently fee revenue is tracked from collection to reprocessing, how ambitious the

statutory KPIs are, and whether reporting granularity is sufficient to diagnose performance over time. Belgium and Italy (single-PRO, 79.7% and 75.6%) and Germany and Spain (competitive multi-PRO, 69.4% and 70.5%) sit in the same top tier despite very different scheme architectures. The spread within governance models is wider than the spread between them: among single-PRO Member States, performance ranges from Ireland at 61.0% to Belgium at 79.7%; among multi-PRO Member States, from Romania at 37.3% and Greece at 48.0% to Slovenia at 73.6% and Slovakia at 71.9%. Germany shows how a competitive market can match the data quality of a single-PRO system when an independent clearinghouse is mandated and funded (LUCID, under ZSVR oversight), although the additional regulatory overhead required to substitute for the consolidated reporting that single-PRO systems generate structurally remains substantial.

Data availability and granularity are key performance drivers

On the composite transparency index used in Section 12, which weighs reporting coverage, methodology disclosure and reporting frequency, the High-transparency Member States recycle on average 13.4 percentage points more packaging than the Low-transparency group (69.6% against 56.2%). The same relationship holds across the wider sample: where data is more granular and openly published, recycling rates tend to be higher. Verifiable data is what allows regulators, producers and operators to see where material is being lost and to target fees and infrastructure at the formats that need intervention. When that visibility is missing, eco-modulation cannot be calibrated against measured outcomes; fee differentials fall back on design assumptions, and capital flows to the formats that already have offtake markets. PPWR Annex XII Table 3 will require per-category reporting, but the underlying data infrastructure varies widely across the EU-27 today. Until it converges, the differentials this report documents will remain difficult to track in official statistics.

Financial transparency stops at the PRO

Disclosure obligations stop at the PRO. Under Article 8a of the Waste Framework Directive, PROs must publish their fee schedule, their ownership and membership, and how they select waste-management operators, but they are not required to show how aggregate fee revenue is allocated once it leaves the PRO. The operators that actually deliver the service (municipalities, contracted collectors, sorting plants and reprocessors) face no equivalent requirement. Belgium is the exception: format-level reporting and published service standards make its fee revenue traceable through to recovery outcomes, whereas in most other Member States PROs pay municipalities or contractors with little downstream visibility. Since this is where most fee revenue is ultimately spent, the report identifies it as the single largest visible gap in the EPR transparency framework today.

Filling the remaining structural gaps for effective waste management

Several of these structural gaps are already being addressed by the PPWR. Its harmonised calculation methodology, aligned with Directive 2018/852 and CID 2019/665, should narrow the methodological divergence that currently inflates some national recycling figures. The eco-modulation requirements mirror the approach taken in the best-performing systems, and the extended reporting obligations push towards the kind of data granularity this analysis links to stronger outcomes. Even so, the findings point to a need for further harmonised effort across the EU to level the playing field and pull every Member State closer to the leading schemes.

The best performers share four design choices: granular fee structures, consolidated operational responsibility, format-level data, and transparent methodology disclosure, and any Member State can adopt them. Forthcoming legislation, in particular the upcoming Circular Economy Act, will be an essential lever for reforming EPR governance and driving a more harmonised EU approach to waste management.

Appendix

Appendix A. Analytical framework

A.1 Purpose and scope of the framework

This appendix documents the analytical framework underlying the study's assessment of EPR systems across the EU-27. It has three aims: to make explicit the mechanisms through which EPR design influences circular economy outcomes; to show how the five case studies illustrate these mechanisms in practice; and to clarify what the framework does and does not measure.

The PPWR entered into force in 2025. It puts strict transparency and performance requirements into EU law. Whether Member States meet them depends, in large part, on how their EPR systems are designed and governed. This report assesses each Member State against four analytical Pillars, with each Pillar isolating a specific mechanism through which EPR systems shape outcomes. The Pillars (minimising material losses, circular reporting and monitoring, creating circular markets, and transparency) are not additive; they interact. No system performs strongly across all four without deliberate architectural choices. The framework that follows shows what those trade-offs look like and where Member States sit within them.

The analysis draws on Eurostat packaging waste statistics (2023 reporting period), PRO-published financial and operational reports, national waste registry submissions, and format-specific recycling rates developed by CIRCPACK across 13 packaging sub-categories. Part III of the report applies this framework to all 27 Member States. The five country case studies in Part IV illustrate how the Pillars operate in practice and where the interactions between design choices create performance differences.

A.2 The four analytical Pillars

A.2.1 Minimising material losses

What the Pillar isolates

This Pillar examines how EPR system design affects physical recycling performance. It isolates four specific mechanisms: the design of fee structures (whether and how they reward recyclability), technical DfR support, the comprehensiveness of coverage (whether household and industrial streams are separated), and the role of local authority involvement in collection and sorting. The Pillar does not measure waste prevention or reuse. It measures only the degree to which material that has been placed on the market is recovered and processed back into use.

Why it matters under PPWR

Two PPWR provisions sit behind this Pillar. Article 52 sets binding recycling targets for packaging waste: 65% overall by 2025, 70% by 2030, with material-specific thresholds for paper and cardboard, ferrous metals, aluminium, glass, plastic, and wood. Article 6 makes EPR fee modulation by recyclability performance compulsory once the underlying delegated

and implementing acts enter into force, with Article 7(7) adding a voluntary lever for PCR content. Section 9 sets out the EU-27 experience with eco-modulation as one of the levers Member States can use.

What the analysis measures

The Pillar uses three primary data sources. Recycling rates are drawn from Eurostat (2023 reporting period) as the baseline aggregate metric. Format-specific recycling rates, compiled by CIRCPACK using a methodology that triangulates reported figures with material flow analysis, provide the granularity needed to test whether eco-modulation effects vary by material. Finding 1 statements (Section 9 of the body) are supported by descriptive statistics comparing system types: the 16.5 percentage-point gap between basic and granular eco-modulation systems is the average difference observed across the sample. The 12.6 percentage-point uplift for systems with full DfR support is similarly a group average, not a statistical inference. No correlation coefficients or hypothesis tests appear in the findings; conclusions are drawn from observable patterns in the data.

A.2.2 Circular reporting and monitoring

What the Pillar isolates

This Pillar examines how data quality and monitoring infrastructure affect recycling performance. It isolates three mechanisms: the granularity of reported data (material-level, format-level, or aggregate only); the presence of adapted key performance indicators (KPIs) covering material recovery, eco-modulation and transparency; and the degree of government operational involvement in collection and sorting. The Pillar does not measure how accurate reported figures are against actual physical recovery; it measures the institutional capacity and the incentive structure for monitoring.

Why it matters under WFD Article 8a and PPWR Article 56

The PPWR's harmonised calculation methodology (Appendix B) is designed to narrow the methodological divergence that has historically inflated reported recycling rates. How well that methodology lands depends on the reporting infrastructure Member States build to implement it. The findings in Section 10 show that countries with high-detail reporting frameworks reach stronger recovery outcomes; data granularity is the digital backbone, and without it adapted KPIs cannot be monitored effectively. The Pillar maps onto WFD Article 8a, which sets minimum reporting and monitoring requirements for EPR schemes, and onto PPWR Article 56, which mandates harmonised data submission to the Commission via the Annex XII reporting tables.

What the analysis measures

The Pillar operationalises the three mechanisms isolated above using six variables in the EU-27 dataset, all coded on a common scale for every Member State.

The granularity mechanism is measured by a data granularity score from 1 to 4, capturing the level of material and format detail each PRO publishes. The adapted KPI mechanism is captured by the Circular KPI integration level (1 to 4), which scores whether statutory targets reach beyond headline tonnage to format- or polymer-specific objectives. Reporting hygiene

is broken into three sub-variables (coverage of reported information, methodology disclosure, and reporting frequency) and combined into a composite Transparency rating of High, Medium or Low. The government operational involvement mechanism is captured by a categorical variable that records whether municipalities are responsible for collection only, collection and sorting, or sorting and reprocessing as well. Governance type (single-PRO, competitive multi-PRO, state fund, state concession) is held alongside these as a classification variable so that the monitoring effect can be distinguished from the structural effect.

The outcome variable is the overall packaging recycling rate from Eurostat (2023 reporting period). The relationships identified, including the one between data granularity and overall recycling rates, are reported as observed correlations across the EU-27 sample. With an n of 27, inferential statistical testing is not the right tool, and the granularity finding is independently grounded in PPWR Article 56 and Annex IX, which mandate the same level of reporting detail that this Pillar's data architecture variable captures. The point is reinforcement, not contradiction: the analytical pattern and the regulatory direction of travel are pointing the same way.

The CIRCPACK format-specific dataset is used in this Pillar as evidence of what granular reporting makes visible. By building recycling rates across 13 packaging sub-categories at household scope, the project quantified the rigid versus flexible gap that aggregated EU reporting hides. The plastic figures cited in the body of the report (rigid plastics EU-27 average 34.1%, flexible plastics 13.1%) are unweighted country means across all 27 Member States, medium scenario, household scope. The rigid figure is the mfean of five sub-streams (Clear PET bottles, Coloured PET bottles, Rigid PET other, Rigid PE, Rigid PP). The flexible figure combines Flexible PE, PP, and MPO formats. These are generalisations.

A.2.3 Creating circular markets

What the Pillar isolates

This Pillar examines whether EPR system structures support secondary raw material markets. It isolates three mechanisms: eco-modulation for PCR content (whether fees reward packaging made from recycled material), PRO market structure (single-PRO vs. competitive multi-PRO vs. state-managed), and infrastructure quality (the physical maturity and geographic reach of sorting, reprocessing, and collection networks). The Pillar measures market structure and infrastructure readiness but does not measure end-market demand for recycled material or international trade flows, which sit outside the scope of EPR system design per se.

Why it matters under PPWR Article 7(7)

Under PPWR Article 7(7), producer fees may be modulated based on the share of PCR content; this is voluntary. Mandatory recyclability based fee modulation operates under PPWR Article 6, which makes fee modulation by recyclability performance compulsory once the underlying delegated and implementing acts enter into force. The findings in Section 11 show that PRO market structure has the largest single effect observed in the study: single-PRO systems average 71.8% recycling, competitive multi-PRO systems 62.2%, and state-managed systems 47.4%, a 24.4 percentage-point spread. The infrastructure quality findings show that

no financial instrument substitutes for the absence of physical capacity. Flexible plastics remain the largest unresolved material-level challenge, because sorting, washing and reprocessing capacity does not exist at scale in most Member States. Composite paper formats, including beverage cartons, sit alongside them as a second structural gap for the same reason: recovery depends on dedicated sorting and reprocessing chains that only a minority of Member States have built out.

What the analysis measures

The Pillar uses Eurostat overall recycling rates stratified by PRO market classification, format-specific recycling rates (rigid vs. flexible plastic averages), and infrastructure maturity ratings (mature, developing, early developing, limited) for each material stream by country. PCR-based fee modulation is coded as a binary variable. The single largest finding (the 24.4 pp gap between single-PRO and state-managed systems) is presented as a group average from Eurostat 2023 data. The gap between rigid (34.1%) and flexible (13.1%) plastics is computed from the CIRCPACK dataset. These are descriptive comparisons; no statistical models are applied.

A.2.4 Transparency

What the Pillar isolates

This Pillar examines the link between institutional transparency and recycling outcomes. It isolates two mechanisms: balanced monitoring (the combination of detailed data coverage, public methodology disclosure, and independent government auditing) and the effect of PRO market structure on the achievability of transparency. Transparency here measures the degree to which calculation methodologies can be externally verified and to which the reported recycling rate maps to actual physical recovery.

Why it matters under WFD Article 8a and PPWR Articles 56–57

Article 8a of the WFD sets the EPR-transparency baseline: public disclosure of fees, membership and operator selection, plus independent oversight. PPWR Articles 56 and 57 operationalise this for packaging through harmonised reporting to the Commission and publicly accessible national packaging databases. The findings in Section 12 show that the gap between high- and low-transparency systems corresponds to a 13.4 percentage-point difference in recycling rate (69.6% vs 56.2%). Transparent systems do not simply perform better. They support verifiable reporting that avoids the data inflation seen in systems where calculation points and methodologies are opaque. The finding supports the case for mandatory methodology disclosure and independent auditing under WFD Article 8a(3) and (5), now operationalised for packaging by the harmonised reporting and public-database obligations in PPWR Articles 56 and 57. Multi-PRO market structures carry an inherent transparency burden: data fragmentation across competing operators weakens government oversight and reporting credibility.

What the analysis measures

The Pillar uses a transparency classification scheme (High, Medium, Low) based on coverage scores, methodology-disclosure completeness, reporting frequency and market structure. It correlates that classification with overall recycling rates (Eurostat, 2023) and tests it against case-study examples. The 13.4 percentage-point gap is the difference in average recycling rate between the High and Low tiers. The multi-PRO transparency burden is illustrated through Germany and Spain. Italy and Hungary face their own transparency constraints: Italy through its complex consortium structure, Hungary through the recent transition to a state-managed model.

A.3 Findings mapped to Pillars

The five key findings identified in the analysis interact with the four Pillars in the following pattern:

Table 1. Findings mapped to Pillars.

Finding	Title	Pillar(s)	Section in body	Key variables
Finding 1	Eco-modulated fees, design for recycling, and comprehensive coverage drive material recovery	Primary: Minimising material losses Secondary: Circular reporting and monitoring	Paragraph 9	Eco-modulation maturity level, DfR support presence, household/industrial separation, format-specific recycling rates (rigid vs flexible)
Finding 2	Data granularity and KPIs as performance drivers	Primary: Circular reporting and monitoring Secondary: Minimising material losses	Paragraph 12	Data granularity level (material, format or aggregate), KPI index score (1 to 4), governance model (private PRO, state fund, state monopoly)
Finding 3a	PRO market structure and infrastructure maturity shape circular markets	Primary: Creating circular markets	Paragraph 13	Single-PRO vs multi-PRO vs state monopoly classification, PCR-based fee modulation presence, infrastructure maturity rating
Finding 3b	Methodology disclosure and reporting clarity drive transparency outcomes	Primary: Transparency	Paragraph 14	Transparency classification (High, Medium, Low), methodology disclosure presence, reporting clarity assessment

Synthesis: How findings interact

Eco-modulation for recyclability raises recycling rates without curbing volumes; volumes track GDP per capita rather than fee design.

Findings 2 and 3 together establish that governance quality and data architecture are preconditions for all the other Pillars. Data granularity allows targeted eco-modulation to function (Finding 1); transparency prevents the inflation of reported recycling rates (Finding 3b); PRO market structure determines the baseline feasibility of achieving both.

The five case studies in Part IV illustrate these interactions in situ. Belgium's high performance (79.7%) is enabled by a single-PRO structure, granular data, and adapted KPIs aligned across collection, sorting and reporting. Italy reaches comparable results (75.6%) through a single-PRO consortium model under CONAI, with seven material-specific consortia each publishing per-format performance data; the operational architecture differs from Belgium's but the underlying conditions are the same, namely consolidated reporting, granular fee modulation and high statutory KPI ambition. Spain (70.5%) shows the multi-PRO transition path: a 25-year material-specific single-PRO arrangement under Ecoembes (light packaging, paper and cardboard) and Ecovidrio (glass) was broken up by Royal Decree 1055/2022, with explicit eco-modulation by recyclability and PCR content carried over into the new competitive market. The early data show performance holding, but the transition is recent and remains a live test of whether granular governance can survive fragmentation. Germany (69.4%) achieves comparable results to the single-PRO leaders with a multi-PRO structure, but only through heavy investment in regulatory oversight via ZSVR and LUCID data consolidation, which substitutes mandated centralisation for the reporting unification that single-PRO systems generate structurally. Hungary's low performance (42.8%) reflects the interaction of a state-concession structure with weak data infrastructure and underdeveloped monitoring KPIs; the financial centralisation introduced under the MOHU concession has not yet been paired with the format-level reporting or material-specific fee signals that the other four cases share.

A.4 Boundaries of the framework

The framework is deliberately bounded in four ways.

1. The analysis covers household packaging only. Industrial and commercial packaging (such as pallets, shipping boxes, and inter-warehouse containers) is subject to separate collection and end-market dynamics that operate on a different scale and with different economics than household waste. Including industrial and commercial streams would conflate two distinct policy problems. The PPWR itself covers all packaging, but the membership and structure of PROs often differ between household and industrial streams, and the financial viability of collection systems depends on whether household and industrial revenue streams are separated or pooled. The study's focus on household packaging is explicit in the findings (see Section 9.4 on comprehensive coverage) and is the appropriate scope for benchmarking Member States' readiness under the PPWR household packaging targets.

2. The analysis does not compare EPR system performance between the EU-27 and non-EU countries. System performance is shaped by contextual factors including GDP per capita, cultural awareness of recycling, geographic density of collection networks, and the maturity of end-markets for recycled material. A comparison to non-EU systems would require disentangling these contextual factors from policy design, introducing substantial interpretive uncertainty. The study instead focuses on the variation within the EU-27, where the policy and regulatory context is more homogeneous and where Member States face a common PPWR deadline.

3. The framework does not model consumer behaviour. Collection and sorting outcomes depend partly on household participation rates and the purity of material placed in separate collection streams. These in turn depend on consumer awareness, collection system design, and social norms around recycling. The study assesses the institutional conditions and

financial signals that shape participation (local authority involvement, data quality) but does not conduct household-level surveys or behavioural analysis. This is a deliberate boundary. EPR system design does not directly control consumer behaviour; it creates the infrastructure and incentive conditions within which behaviour occurs.

4. The framework does not conduct cost-benefit analysis at the household or system level. Some Member States absorb EPR fee revenue into general waste-management budgets, which makes household-level cost attribution impossible. Cost-effectiveness varies sharply by material stream: glass collection is capital-intensive but mature, while flexible plastic collection is nascent and carries substantial unit costs. The study documents the relationship between fee levels and recycling outcomes; it does not model the total cost of compliance with PPWR targets. That sits outside the scope of an EPR-system assessment and is covered by separate Member States' cost projections.

We set these boundaries to keep the analysis focused on what EPR systems can and cannot do under the PPWR. The findings describe which design choices correspond to which outcomes, rather than prescribing optimal policy in the EU-27 data available as of 2023.

Reuse and waste prevention findings are not part of this study's analytical body. The cross-country data on those outcomes is too sparse to support comparable performance assessments at the EU-27 level, and PPWR Article 29 has already chosen the binding instrument for reuse on specified packaging applications.

A.5 Source attribution

- **Recycling rate data.** Eurostat, Packaging and Packaging Waste (2023 reporting period), drawn from Member State waste registry submissions.
- **Format-specific recycling rates.** CIRCPACK adjusted recycling-rate dataset, triangulating Eurostat figures with material flow analysis across 13 packaging sub-categories (rigid PET, rigid HDPE, rigid PP, flexible PE, flexible PP, aluminium, steel, paper & cardboard, complex paper, glass, etc.) for all 27 Member States, household scope. The dataset predates the PPWR harmonised calculation methodology and reflects collection, sorting and reprocessing capacity as of 2023. Data is available for 77 countries. Methodology in Appendix B.
- **Fee structure and eco-modulation data.** CIRCPACK Recycling Intelligence Platform (2026 update), compiled from PRO-published tariff schedules and financial reports across all 27 Member States, cross-checked against national waste legislation and PRO concession agreements. For multi-PRO markets, fees are averaged across schemes; where complete data was unavailable, the dominant-PRO figure is used as representative.
- **KPI and data granularity classifications.** CIRCPACK qualitative assessment, based on published reporting frameworks, Member State waste registry structure and PRO data submission formats (2026 update).
- **Transparency classifications.** CIRCPACK benchmarking analysis (Section 7), scored on three criteria: availability of material- or format-specific recycling data in the public domain; public disclosure of calculation methodology and verification procedures; reporting frequency and timeliness. The market-structure effect on data consolidation (single-PRO versus multi-PRO) is assessed alongside these criteria as context.

- **DfR support assessments.** CIRCPACK qualitative documentation of structured design-for-recycling programmes offered by PROs to obligated producers, covering design guidelines, engineering consultations, digital simulation tools and certification schemes (2026 update).
- **Infrastructure maturity ratings.** CIRCPACK assessment of collection, sorting and reprocessing capacity by material stream and Member State, drawn from national registry data, facility surveys and operator interviews (2026 update). Classified as mature (national-scale, geographically accessible, competitive pricing); developing (regional availability, limited competition, higher unit costs); early developing (pilot-phase facilities, limited geography); or limited (no dedicated infrastructure).
- **Regulatory references.** PPWR references throughout this report draw on Regulation (EU) 2025/40 on packaging and packaging waste. Waste Framework Directive references draw on Directive 2008/98/EC, as amended.

Appendix B: Recycling rate methodology

The recycling rates used to supplement this report are adjusted rates produced by CIRCPACK, not exclusively raw Eurostat or PRO reported figures.

Table B.1: Material-level recycling rates by Member State, 2023

EU-27 material-level recycling rates by Member State, 2023

(percent recycled, by material)

Member State	Glass	Steel	Rigid alu	Flexible alu	Paper	Complex paper	Rigid plastic	Flexible plastic
Austria	79%	98%	78%	16%	80%	28%	41%	9%
Belgium	93%	100%*	91%	23%	84%	45%	51%	29%
Bulgaria	46%	40%	43%	9%	70%	24%	24%	5%
Croatia	43%	22%	19%	6%	71%	32%	36%	7%
Cyprus	36%	86%	83%	14%	75%	28%	30%	6%
Czechia	72%	83%	28%	6%	87%	36%	31%	10%
Denmark	74%	74%	66%	12%	67%	30%	33%	10%
Estonia	71%	85%	82%	15%	80%	33%	25%	6%
Finland	75%	75%	78%	16%	90%	46%	39%	10%
France	73%	82%	51%	16%	69%	29%	39%	15%
Germany	80%	92%	94%	20%	85%	45%	51%	19%
Greece	23%	76%	36%	5%	65%	23%	26%	6%
Hungary	34%	37%	42%	8%	64%	22%	24%	5%
Ireland	74%	64%	39%	13%	62%	30%	38%	13%
Italy	74%	67%	62%	15%	74%	36%	40%	20%**
Latvia	62%	59%	45%	11%	74%	33%	30%	11%
Lithuania	58%	65%	55%	13%	70%	31%	28%	8%
Luxembourg	68%	65%	64%	16%	68%	39%	48%	20%
Malta	53%	50%	10%	4%	37%	18%	23%	3%
Netherlands	78%	88%	65%	18%	75%	37%	48%	19%
Poland	62%	82%	50%	16%	71%	31%	28%	9%
Portugal	45%	68%	50%	11%	59%	22%	30%	13%
Romania	36%	60%	16%	6%	61%	25%	24%	3%
Slovakia	67%	78%	25%	6%	46%	18%	25%	6%
Slovenia	76%	57%	33%	9%	52%	21%	28%	7%
Spain	64%	72%	61%	15%	70%	39%	37%	15%
Sweden	79%	78%	63%	16%	62%	29%	41%	14%

Source: CIRCPACK adjusted recycling rates (2023 reporting period). Rigid and flexible aluminium and plastics shown separately; complex paper covers fibre-based composite formats.

* Reported rate capped at 100%. ** Includes chemical recycling capacity.

State of the data

The EU has defined a harmonised calculation point for packaging recycling: Directive 2018/852 and Commission Implementing Decision 2019/665, applicable from reference year 2020, require Member States to measure recycling at the input to effective recycling processes rather than at the output of sorting facilities.

The legislation does not, however, require Member States to report at the level of individual packaging formats. Eurostat notes that reported rates remain only partly comparable across Member States, as most countries still do not distinguish between packaging sub-formats within a material category, let alone industrial vs household formats.

We standardised these rates by accounting for sorting losses, reprocessing yields, and supplementary collection systems (deposit return schemes, separate collection programmes) to produce rates that are comparable across all 27 Member States and across material streams. This is supplemented by data accessible to CIRCPACK. For the purposes of expanding available context, Norway, Switzerland, and the United Kingdom are also included in some charts, though they were not considered in the main study's findings.

Not all data is available for all countries. This dataset uses a strategy of filling in the blanks by using representative data from similar countries, countering these added assumptions by increasing the uncertainty margin for that country. Similarity between countries is defined using a structured methodology. We use three primary levels of data quality indicators for countries, each with their own associated margin. We also consider the likelihood of the packaging to leak into the environment, though this is less relevant for European countries when considering the global nature of this dataset.

Data inputs

The rates draw on three categories of input. First, publicly available national recycling statistics from PROs, Eurostat, and regulatory bodies. Second, proprietary operational data from Veolia's European recycling operations, covering a significant number of sorting and reprocessing sites, providing direct visibility into material flows, loss rates, and output quality at each stage. This is relevant in order to accurately assess material losses throughout the recycling value chain. Third, data from Veolia's internal market intelligence functions, covering secondary material market pricing, format-specific benchmarks, and infrastructure capacity by country.

The dataset predates this study. It is an independently developed dataset maintained by CIRCPACK, currently covering 77 countries and format-specific material flows across 13 packaging sub-categories, including individual polymer-specific reporting for rigids and flexibles. For this report, we applied the EU-27+3 subset using medium-scenario estimates and a simplified overview of rigid and flexible packaging.

Scope

The full technical methodology, including country-level calibration procedures, data quality classifications, error margin calculations, and scenario parameters, is documented separately and is available upon request. Recycling rates are presented at the level of the major material groups (glass, steel, aluminium, paper and cardboard), with plastics shown as two headline categories, rigid and flexible. We use this level of granularity to match the resolution at which

EPR system variables can reliably be compared across Member States; the full 13-stream breakdown exists in our underlying dataset but is out of scope for this report.

Material categories and definitions

These definitions are non-exhaustive. Please contact CIRCPACK for more details.

Glass

Household bottles and jars regardless of colour.

Metal - steel (ferrous)

Household packaging primarily includes tin-coated steel cans for food, beverage and aerosol products.

Metal - aluminium (rigid)

Household packaging such as beverage cans and some trays that retain their shape.

Metal - aluminium (flexible)

Household packaging such as trays that do not retain their shape.

Paper & cardboard

Generalized grouping of household fibre-based packaging which is considered highly recyclable. This includes consumer corrugated packaging and many fibre-based consumer packaging formats.

Complex paper

Generalised grouping of household fibre-based packaging which contains heavily (or two sided) coated or multi-layer paper, such as beverage cartons and paper combined with additional materials which are considered harder to recycle.

Rigid plastics

Contains household Transparent clear PET bottles, transparent coloured PET bottles, rigid PET containers other than bottles, rigid PE packaging, and rigid PP packaging.

Flexible plastics

Contains household flexible PE-based packaging, flexible PP-based packaging, and mixed polyolefin formats.

Appendix C: Collection streams by Member State (detailed tables)

As referenced in the main report, the table below sets out the minimum paper-fibre content thresholds applied by each Member State when licensing packaging as paper or cardboard under national EPR rules. Most countries operate at the EU default of 50%, while Germany applies the strictest threshold (95%) and Belgium and Luxembourg set the bar at 85%.

Table C.1: National licensing thresholds for paper fibre content (EU-27)

(minimum paper-fibre share required to license packaging as paper or cardboard under national EPR rules)

Licensing threshold	Member States	Countries
Minimum >95%	1	Germany
Minimum >85%	2	Belgium, Luxembourg
Minimum >80%	2	Austria, Ireland
Minimum >70%	2	Croatia, Czech Republic
Minimum >60%	1	Italy
Minimum >50% (EU default)	19	Bulgaria, Cyprus, Denmark, Estonia, Finland, France, Greece, Hungary, Latvia, Lithuania, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden

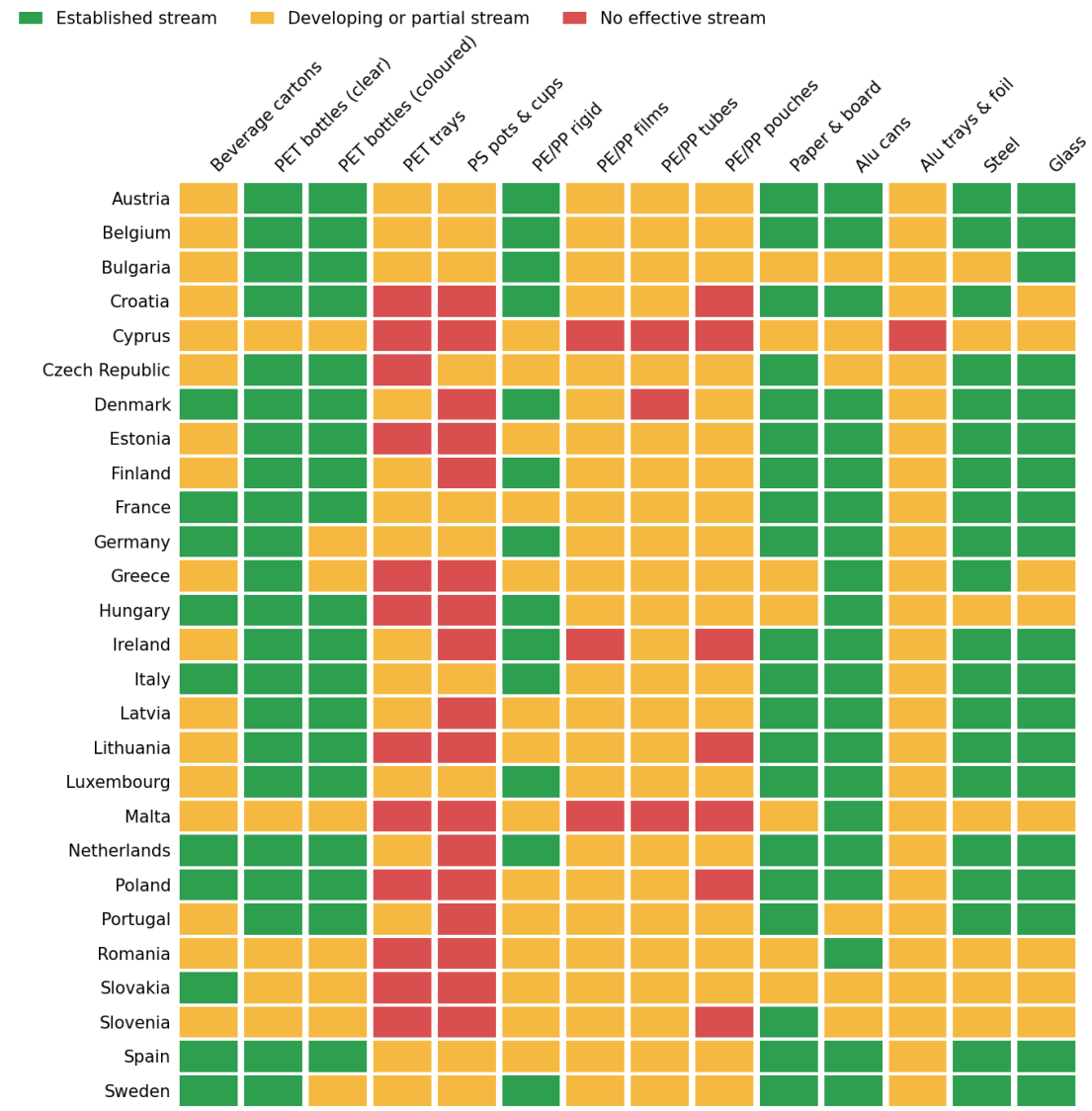
Source: CIRCPACK Recycling Intelligence Platform (2026 update).

The matrix below summarises household-stream acceptance by packaging format for each EU-27 Member State.

Table C.2: Household-stream acceptance by packaging format (EU-27)

Two limitations should be borne in mind when reading the matrix. First, the underlying information was gathered primarily from PROs and their published sorting rules; reporting practices differ across Member States, and the picture remains incomplete for some formats and countries, so the statuses shown reflect the best available evidence rather than audited coverage. Second, the existence of a collection stream does not translate directly into recycling outcomes: a format may be formally accepted for collection yet achieve low recycling rates owing to sorting losses, limited reprocessing capacity, or shallow end-markets, which is why these statuses do not always align with the recycling data presented elsewhere in this report. Formal bin-acceptance by format is tabulated in Table C.2, Appendix C; the matrix here assesses whether each stream operates effectively in practice. An overview of recycling rates by Member State is provided in Section 1.2 (Figures 1–3), and of landfill and incineration context in Section 1.3.

(status of household collection by packaging format; paper & board assessed at each country's own minimum fibre threshold)



Source: national PRO and government publications, 2026.

Appendix D: EPR system profiles by Member State

The following table summarises the EPR system structure, key PROs, fee modulation approach, and municipality role for each EU Member State. Data sourced from the CIRCPACK Recycling Intelligence Platform (2026 update).

Table D.1. EPR system profiles by Member State.

Country	Year	Structure	Key PROs	Fee modulation	Municipality role
Austria	1993	Competitive, mixed	ARA, Interzero, Reclay	Advanced DfR: surcharges for non-recyclable composites; PCR bonuses in force since 2026	Collection; reimbursed by PROs via VKS
Belgium	1994	Collective (household vs industrial), non-profit	Fost Plus, Valipac	Full net cost: 2026 Green Dot rates based on net recycling costs; penalty rates for obstructive items	Execute collection; full cost compensation
Bulgaria	2004	Competitive, non-profit	Ecopack, Ecobulpack	PPWR aligned: grade-based fees (A to C); lower fees for mono-materials	Manage local infrastructure; contract with PROs
Croatia	2005	State-managed, non-profit	FZOEU (State Fund)	DRS-linked incentives; flat fees for non-DRS streams with recyclability surcharges	Collection; paid by State Fund for transport and treatment
Cyprus	2002	Single PRO, non-profit	Green Dot Cyprus	Sortability tiers: material-specific bands; higher rates for mixed or non-sortable plastics	Partner in collection; Green Dot funds infrastructure
Czechia	2002	Single PRO, non-profit	EKO-KOM	Material-based: surcharges for multi-layer or non-recyclable plastics; discounts for mono-materials	Primary collectors; EKO-KOM pays for coloured bin network
Denmark	2025	Competitive, mixed	VANA, ERP Denmark	PPWR aligned: recyclability grades A to E; 100%+ surcharges for Red-rated items	Collect waste; PROs provide 100% cost coverage
Estonia	2004	Competitive, non-profit	TVO, ETO, Eesti Pakendiringlus	PPWR aligned: EU-wide performance grades; fees linked to sorting efficiency	Manage local sites; PROs fund public collection
Finland	1995 / 2004	Single PRO, non-profit	Rinki (Sumi Oy, SPT Oy)	Eco-fee tiers: detailed plastic rates; bonuses for high-purity mono-resins	Collect from residential; PROs pay service compensation
France	1992	Competitive, non-profit	Citeo, Adelphe, Léko	Highly advanced: bonuses for standard sorting labels; maluses above 50% for disruptive inks or non-recyclable multi-layers	Collection and sorting; PROs reimburse 100% of net optimised cost

Country	Year	Structure	Key PROs	Fee modulation	Municipality role
Germany	1991	Competitive, for-profit	DSD, Landbell, Interzero	PPWR aligned: mandatory tiered fees based on recyclability grades (A to E) and PCR content	Coordinate collection via Dual System; funded by PROs
Greece	2001	Competitive, non-profit	HERRCO, Antapodotiki	Green fees: surcharges on PVC and complex composites; discounts for mono-materials	Operate Blue Bin network; HERRCO provides trucks and bins
Hungary	2023	State concession	MOHU (MOL Group)	Standardised fees: flat environmental fees per kg; focus on mandatory DRS targets	Centralised under MOHU concession; municipalities as operational hubs
Ireland	1997	Single PRO, non-profit	Repak	Plastic pledge: surcharges on non-recyclable plastics; rebates for 30%+ recycled content	Manage civic amenity sites; Repak subsidises collectors
Italy	1997	Single PRO (consortium), non-profit	CONAI + 7 consortia	Highly segmented: plastic has 9 fee bands (A1.1 to C); paper has 8 levels; complex multi-layers around 20x higher	Collect waste; reimbursed by CONAI via ANCI-CONAI agreement
Latvia	2003	Competitive, for-profit	LZP, Zaļā josta	Tax-exemption model: membership grants 100% exemption from Natural Resources Tax; high rates for non-recyclable polymers	Establish waste zones; PROs fund full collection network
Lithuania	2003	Competitive, non-profit	Žaliasis taškas, PTO	Traffic light (RAG): Green, Amber and Red ratings; fees penalise Red non-recyclable composites	Own the waste; PROs pay full cost coverage including transport
Luxembourg	1995	Single PRO, non-profit	Valorlux	Incentive-based: higher rates for recycling disruptors; bonuses for high PCR	Partner in Blue Bag system; Valorlux finances collection
Malta	2004	Competitive, non-profit	GreenPak, Green MT	Material-difficulty fees: litter fees for FMCG packaging introduced in 2026	Local councils organise collection; PROs reimburse
Netherlands	2014	Single PRO, non-profit	Verpact	Recycle check: rewards for high-recyclability plastic; surcharges for non-recyclable laminates	Organise collection; Verpact compensates 100% of costs
Poland	2026	Non-profit (state)	NFOśiGW (State Fund)	New packaging fee: graduated fees per kg based on material	Reimbursed by State Fund for 100% of selective collection costs
Portugal	2017	Competitive, non-profit	SPV, Novo Verde, Electrão	Bonus and penalties for recyclability	Execute collection; receive compensation from PROs

Country	Year	Structure	Key PROs	Fee modulation	Municipality role
Romania	2016	Competitive, non-profit	OIREPs (e.g. Eco-Rom)	Material-specific surcharges for non-recyclable types	Responsible for local sorting; OIREPs reimburse costs
Slovakia	2016	Competitive, non-profit	NATUR-PACK, ENVI-PAK	Recyclability bonuses: lower fees for easily recyclable streams; penalties for mixed plastics	Responsible for bins and trucks; PROs pay 100% of operational costs
Slovenia	2004 / 2026	Competitive, non-profit	Slopak, Interzero, Recycla	PPWR aligned: fees modulated based on recyclability grades (A to C) and PCR content	Perform collection; PROs reimburse costs via market-share contracts
Spain	1997 / 2025	Competitive, non-profit	Ecoembes, Ecovidrio, Envalora	Granular: detailed 2026 tariffs with neutral values and percentage surcharges or rebates for design features	Manage sorting and collection; funded by PROs via regional agreements
Sweden	1994 / 2024	Competitive, non-profit	NPA (Näringslivets Producentansvar), TMR	Recyclability-based: fees depend on material purity; emphasis on recyclable at scale	Full operational control; PROs provide 100% cost coverage

Source: CIRCPACK Recycling Intelligence Platform (2026 update). The Year column indicates when the EPR system was first established or most recently reformed. Fee modulation descriptions reflect the May 2026 tariff schedule. Note that the structural classifications used in the body of the report follow the 2023 reporting period, so reforms completed after 2023 (for example Poland's 2026 packaging fee and Finland's coordination model) appear in this table before they affect the body's groupings.

Glossary

CONAI (Consorzio Nazionale Imballaggi) Italy's national packaging consortium, a non-profit umbrella organisation that coordinates seven material-specific consortia covering paper, glass, steel, aluminium, plastic, wood, and bioplastics.

DfR (Design for Recycling) The practice of designing packaging so that it can be effectively collected, sorted, and recycled within existing infrastructure. Some PROs offer technical DfR support, including guidelines, testing protocols and engineering consultancy, to producers.

DRS (Deposit Return System or Scheme) A system in which consumers pay a small deposit on beverage containers at purchase and recover it when returning the empty container. Primarily used for PET bottles, glass bottles, and aluminium cans. Most EU Member States now operate a DRS or have one in implementation.

Eco-modulation The practice of adjusting EPR fees based on the environmental characteristics of packaging. Fees can be modulated by recyclability, recycled content, material type, or format. A granular eco-modulation system differentiates fees at the packaging format level; a basic one applies flat rates per material.

EPR (Extended Producer Responsibility) A policy principle under which producers bear financial and operational responsibility for managing the end of life of their packaging. Producers pay fees to a PRO, which uses the funds to finance collection, sorting, and recycling.

Fost Plus Belgium's PRO for household packaging. Belgium's industrial and commercial packaging is handled separately by Valipac.

Full-scope DRS A deposit return system that covers all of the principal single-use beverage container streams: plastic bottles (mainly PET, in some markets also HDPE), aluminium and steel cans, and single-use glass bottles. The opposite is a partial-scope DRS, which covers only one or two of those streams. Full-scope schemes are operated by Germany, Finland, Estonia, Lithuania, Latvia, Hungary, Croatia, Denmark and Iceland (EEA), with Romania having launched a full-scope DRS in late 2023. Partial-scope schemes operate in Sweden, the Netherlands, Slovakia, Malta, Ireland, Austria, Poland and Portugal, where live coverage is limited to plastic bottles and cans. The PPWR sets a minimum DRS scope from 2029 that will narrow the gap between partial and full-scope systems.

Material-specific recycling rates Adjusted recycling rates estimated by CIRCPACK for each major material group and plastic sub-category. These rates account for sorting and reprocessing losses at each stage of the material flow, producing figures that are typically lower than standard Eurostat-reported rates. The methodology is described in Appendix B; the full technical documentation is available separately on request.

MOHU Hungary's state waste management concession holder, a MOL Group subsidiary that took over EPR operations in July 2023 under a 35-year concession. Centralises fee collection and waste operator contracting.

MRF (Materials Recovery Facility) A plant in which collected recyclable materials are sorted by type and grade before being sent to reprocessors. MRF efficiency directly affects the quality of secondary raw materials, and therefore the real recycling rate achieved.

PCR (Post-Consumer Recycled content) Recycled material recovered from end consumer waste streams and used in new packaging in place of virgin feedstock. The derived term PCR content refers to the share of this recycled material incorporated into a finished packaging item, usually expressed as a percentage by weight. The PPWR sets mandatory minimum PCR content thresholds for plastic packaging from 2030.

PMD Plastic, Metal, and Drink cartons. The name of Belgium's lightweight packaging collection stream (the blue bag). Used throughout this report when referring to Belgium's kerbside collection system.

pp (percentage points) The difference between two percentage values. For example, a change from 50% to 63.4% is a difference of 13.4 pp.

PPWR (Packaging and Packaging Waste Regulation) Regulation (EU) 2025/40, which entered into force in 2025. It replaces the 1994 Packaging and Packaging Waste Directive and sets binding recycling targets by material, minimum recycled content requirements, recyclability standards, and deposit return system requirements across the EU, among other obligations.

PRO (Producer Responsibility Organisation) The body that manages EPR obligations on behalf of producers. PROs collect fees, contract waste operators, report data, and in most countries coordinate the collection infrastructure. Some markets have a single PRO; others have multiple competing PROs.

SUPD (Single-Use Plastics Directive) Directive (EU) 2019/904, targeting the ten most-found single-use plastic items on European beaches. It bans certain items outright, mandates collection targets for beverage bottles, and requires tethered caps.

VerpackG (Verpackungsgesetz) Germany's Packaging Act (2019), which governs the country's multi-PRO system. It mandates eco-modulated fees, a central packaging registry (LUCID), and recyclability standards administered by the ZSVR.

Waste Framework Directive 2008/98/EC, the foundational EU legislation on waste management. It defines waste, sets the waste hierarchy (prevention, reuse, recycling, recovery, disposal), and establishes the legal basis for EPR.