ZERO WASTE EUROPE

Designing EPR

to foster the EU's competitiveness and strategic autonomy

Study

April 2025

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Contents

1. Executive summary

Extended Producer Responsibility (EPR) has evolved from a tool to finance waste management to a potential cornerstone of the EU's competitiveness.

The circular economy is increasingly regarded by the EU as a means to decrease dependencies on imported materials and thereby help build strategic autonomy. This study analyses EPR's historical development, current implementation challenges, and proposes a comprehensive framework to transform EPR into an enabler to achieve the EU's industrial, economic, and environmental goals.

Historical context and evolution of EPR

The concept of EPR originated in the early 1990s as a policy principle designed to extend producer responsibility throughout a product's entire lifecycle. However, when codified into EU law, EPR became primarily focused on financing end-of-life waste management. Since its introduction, EPR has been successfully implemented across various waste streams in the EU, including packaging, batteries, end-of-life vehicles (ELVs), and waste electrical and electronic equipment (WEEE).

While EPR has effectively mobilised resources for waste collection and helped develop recycling infrastructure, the learnings from 30 years of implementation reveal significant limitations:

1. **Limited impact on waste prevention**: despite the implementation of EPR systems, waste generation in covered sectors has increased rather than decreased. For example, packaging waste has grown by 20% per capita over the last 20 years.

2. **Minimal influence on design**: EPR fees represent such a small fraction of product costs (typically less than 2%, sometimes as little as 0.1%) that they rarely provide sufficient economic incentives for producers to change product design.

3. **Decline in reuse and repair**: the implementation of EPR has coincided with a significant decline in reuse systems and repair infrastructure. For instance, the share of refillable beverage packaging has plummeted across the EU. However, this correlation doesn't necessarily imply causality.

4. **Variable collection performance**: collection rates vary significantly across different waste streams and materials. While some sectors, like tyres, achieve collection rates of 95%, others - like batteries or plastic packaging - don't reach 50%.

5. **Insufficient cost coverage**: there are ongoing disputes between producers and local authorities regarding whether EPR fees adequately cover the full costs of waste collection and management.

6. **Lack of transparency of Producer Responsibility Organisations (PRO)**: some PROs lack proper monitoring and oversight, which is a problem for reporting data to authorities and for the companies to understand the value for money of their contributions.

7. **Free-riding**: some producers/importers place products in the EU market without paying the EPR fees, causing a comparative disadvantage to those who do.

8. **Fragmentation across the EU single market**: EPR is often mandated at the EU level but developed at the national level. As a result, companies have to deal with 27 different sets of rules and fail to exploit the potential of a single market.

The EPR Paradox

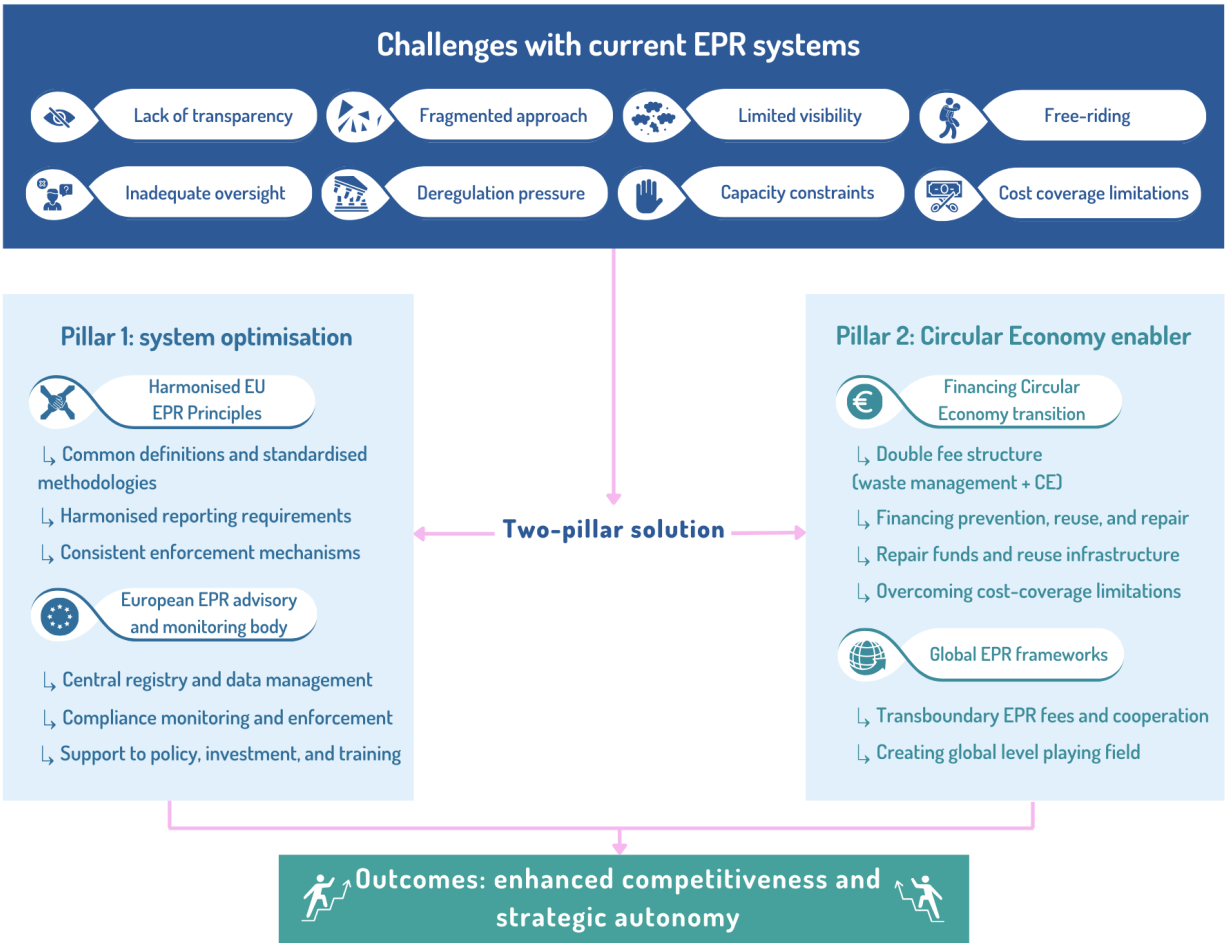
This study identifies what we term the "EPR paradox", which occurs when systems designed to manage waste become institutional barriers to waste prevention. When EPR systems optimise, or even just take care of waste management without addressing waste generation, they create powerful economic and political interests invested in maintaining the linear status quo rather than transitioning to more circular models.

EPR in a changing context

The global context has shifted dramatically since EPR was first implemented. Recent supply chain disruptions, energy security concerns, and increasing demand for critical raw materials for electrification and digital technologies have highlighted the EU's resource vulnerability. The targets in European legislation show how the EU can potentially extract more critical raw materials from waste than from European mines — positioning EPR as a strategic tool for resource security.

In this new context, EPR must evolve from a waste management financing mechanism to a catalyst for a systemic shift toward resource efficiency and circularity that underpins the EU's competitiveness and strategic autonomy.

A two-pillar approach to transform EPR



The study proposes a comprehensive framework to address current limitations and realise EPR's potential contribution to EU competitiveness and strategic autonomy by working in 2 pillars:

Pillar 1. System optimisation — oversight, monitoring and harmonisation

There are a number of challenges limiting current EPR effectiveness: lack of transparency, fragmented approach, limited visibility, free-riding, insufficient oversight, deregulation pressure, and capacity constraints. To address these challenges, two complementary actions are proposed:

1. **Harmonised EU EPR principles**: standardising definitions, calculation methodologies, reporting requirements, and enforcement mechanisms across the EU would simplify implementation and reduce administrative burden while avoiding a 'race to the bottom'. Key areas for harmonisation include:
    - Core operational frameworks - common definitions, centralised registry of producers, harmonised calculation methodologies and reporting requirements.

- Financial mechanisms – separate cost coverage from design incentives, harmonise economic incentives, comprehensive cost-coverage, transparent fee structures.
- Governance structures – unique PRO per country and waste stream, harmonised market entry procedures, standardised authorisation requirements, oversight mechanisms.
- Performance standards – free-riding monitoring, common quality standards, common metrics for prevention, reuse and repair.
- Market access rules – standardised cross-border rules, level playing field.

2. **European EPR advisory and monitoring body**. Creating a dedicated body to:
    - Reduce administrative burden through centralised registration and harmonised reporting.
    - Foster compliance through oversight and coordination with customs authorities.
    - Provide policy and advisory support.
    - Train civil servants and support the creation of new PROs.
    - Foster circularity through performance indicators and monitoring.
    - Design efficient systems and channel investment into circular infrastructure.

Such a body could be financed with less than 0.5% of current EPR fees and these costs would be more than compensated for by the substantial benefits from economies of scale across the European single market.

However, in the event of successfully implementing the system optimisation measures, there is the risk of triggering the EPR paradox (see above) and locking the system into an efficient waste management process, while discouraging moving to more resource-efficient options that prevent the generation of waste and preserve the value of materials and products. Hence the importance of applying simultaneously the measures included in pillar 2.

Pillar 2. From cost coverage to circular economy enabler

To enhance competitiveness, strategic autonomy, and reduce environmental impacts the EU has to generate more value per unit of resources. EPR must shift from managing waste to maximising material productivity and reducing reliance on virgin material imports. This requires:

1. **Expanding EPR to finance prevention, reuse, and repair:**
    - Creating EPR-financed repair and reuse funds to make repair economically viable compared to replacement (durable goods).

- Designing EPR schemes that finance both single-use and reuse infrastructure (packaging).
- Overcoming the current cost-coverage limitations in EU legislation (Waste Framework Directive [WFD] and sectoral legislation) to generate additional funds and create a real incentive for design change.
- Developing a double fee structure: one component for waste management costs (set nationally) and another for circular economy transition (harmonised at the EU level).

2. **Complementary policy measures:**
    - Introduce a material/resource use reduction target aligned with climate goals. Underpin this goal with appropriate financial incentives to limit the use of primary materials.
    - Waste prevention targets for individual product and waste streams (as in the new Packaging and Packaging Waste Regulation [PPWR] and WFD on food waste).
    - Strategic bans for unrecyclable or highly problematic materials or products.
    - Taxes and levies to influence consumer and producer behaviour.
    - Subsidies and tax breaks for circular alternatives.
3. **Connecting EPR systems globally:**
    - Developing transboundary EPR fee mechanisms to support waste management outside the EU without exporting EU waste challenges to other countries (enforcing the WFD and Waste Shipment Regulation [WSR]).
    - Creating global EPR frameworks to ensure proper treatment of waste globally.
    - Leveraging EPR to create a global level playing field that could enable the EU to become an importer rather than an exporter of waste (especially of critical raw materials).

Implementation recommendations

For effective implementation, the study recommends:

1. **For packaging and other fast-moving consumer goods:**
    - Design transition pathways from single-use to reuse.
    - Implement Deposit Return Systems (DRS) for consumption on the go.

- Create clear financial incentives for environmentally beneficial options.

2. **For durable and semi-durable goods:**
    - Establish repair bonuses to ensure repair costs remain substantially below new product prices.
    - Financial support frameworks for social economy actors in the repair and reuse sectors.
    - Support qualification programs for repair and upcycling skills.
    - Fund pilot projects and awareness-raising measures.
3. **For the European institutions:**
    - Amend Article 8 of the WFD to enable EPR fees to go beyond cost coverage of waste management.
    - Develop an EU-wide framework for harmonising EPR principles.
    - Create the institutional structure for an EPR advisory and monitoring body.
    - Proactively work towards global EPR frameworks to prevent waste dumping and resource leakage.
    - Consider environmental levies or taxation at the EU level, especially if EPR fees remain too low to act as a financial incentive for design change.

Conclusion

EPR has proven to be a useful tool for mobilising resources to manage waste, but it has yet to exploit its potential to drive circularity. To contribute to the EU's strategic goals of competitiveness and strategic autonomy, EPR must evolve beyond waste management to become a catalyst for resource efficiency and circularity.

The future of EPR lies not in perpetuating waste management but in enabling a systemic shift toward a circular economy. By implementing the proposed two-pillar approach, the EU can transform EPR into a cornerstone of sustainable development that drives innovation, creates green jobs, reduces environmental impacts, and strengthens the EU's competitiveness and strategic autonomy.

2. Introduction

Extended Producer Responsibility (EPR) has been a cornerstone of waste management policies in Europe for decades.

Initially created to shift the burden of waste management from municipalities to producers, it is today expected to deliver beyond its initial purpose and help increase EU competitiveness and strategic autonomy.

2.1. Purpose of the study

This study looks at the history of EPR design and implementation in Europe and worldwide, analysing what was EPR expected to deliver and whether they have effectively managed to deliver it. Drawing recommendations on how to improve the set-up and implementation of current and new EPR systems.

Beyond waste management, and bearing in mind the new EU priorities, the study also proposes ways to reimagine EPR as a tool to effectively contribute to EU competitiveness and strategic autonomy.

2.2. Methodology and approach

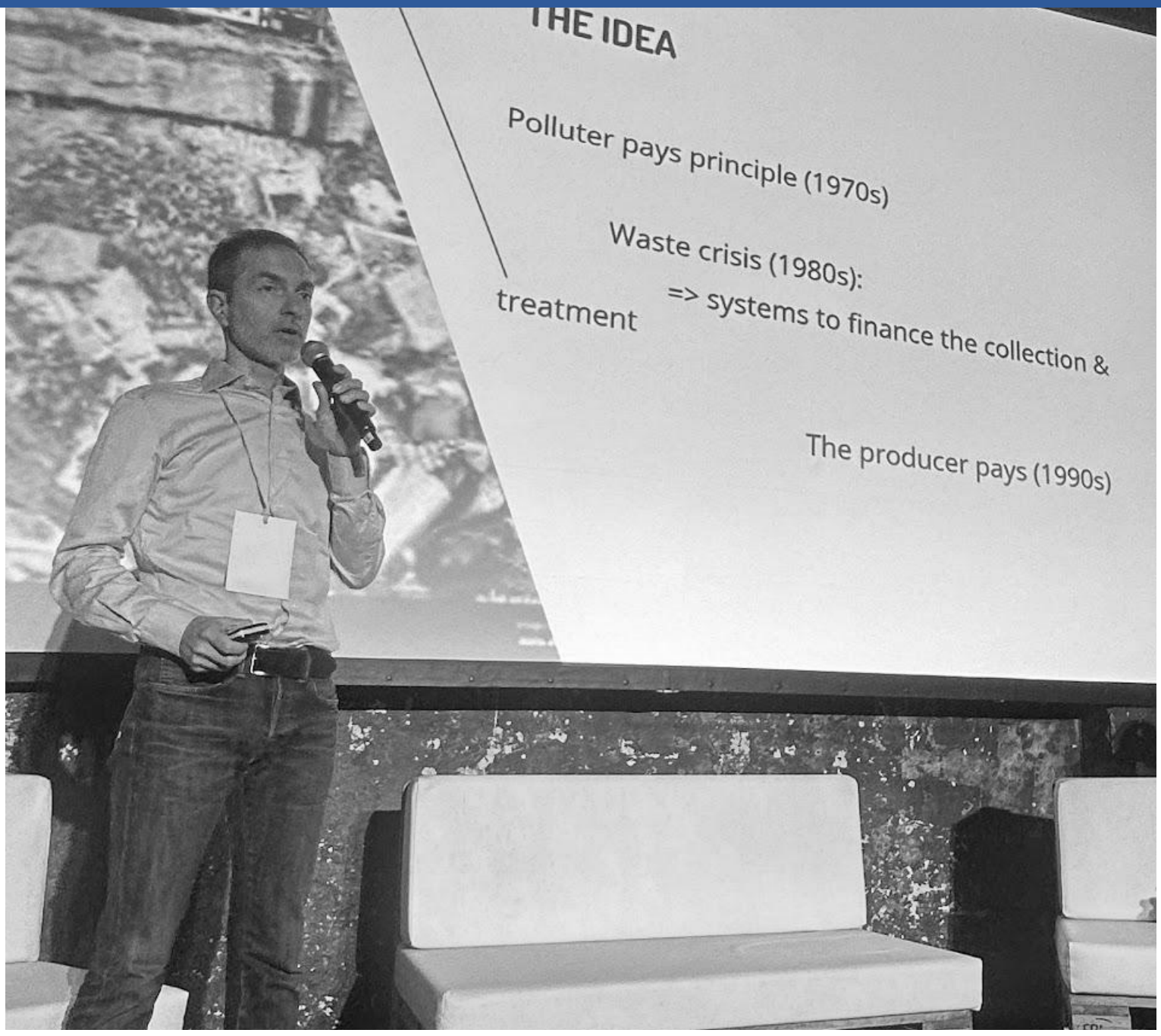
Drawing on case studies, desk research, expert insights, and emerging best practices, this research offers a roadmap for policymakers, industry leaders, and environmental advocates to transform EPR into a powerful catalyst for effective resource management in the 21st century.

The first part of the study draws on the experience from 30 years of EPR implementation. It also incorporates analysis from other EPR systems rolled out worldwide and offers a critical analysis of what EPR systems have delivered and how they have shaped the political agenda.

The second part of the study analyses the role that EPR is expected to play in the current EU agenda and presents proposals to design EPR in a way that it can contribute to increasing competitiveness and strategic autonomy in the EU.

Part 1

Historical context, analysis, and challenges of 30 years of EPR



3. Historical context and evolution of EPR

Waste management was invented the day unwanted materials ceased to have enough value for the (informal) economy to take care of them.

When the value of these materials is higher than the cost of collecting and treating them, there are enough drivers for collection and treatment to be (in)formally organised. However, when the cost of collecting and treating waste is higher than the value of the material, it is highly likely that this material will end up in the environment... unless someone pays for this difference.

The price and value of waste are not stable and can fluctuate over time, subject to variables such as changing supply and demand, lack of access to credit or long payback periods. When left to the market alone, the same waste that makes economic sense to collect today will be either littered or end up in unsorted waste the moment the cost of collecting and recycling is higher than producing a new item with virgin materials.

Plastic waste is a paradigmatic proof of this. For most polymers, the cost of collecting and treating plastic waste substantially exceeds the value that one can extract from the material; as a consequence, it is prone to end up in the environment, landfilled, or burnt unless a system is set up to pay and organise for the collection and treatment of this waste.

3.1. Origins of EPR

The economic boom following World War II led to further industrialisation and environmental challenges. In response, some governments and international bodies began to consider more systematic approaches to environmental protection. This period saw the emergence of the idea that those who cause environmental damage should bear the costs of managing and mitigating that damage.

The OECD's 1972 *Guiding Principles Concerning International Economic Aspects of Environmental Policies* stated that *"the polluter should bear the expenses of carrying out the measures decided by public authorities to ensure that the environment is in an acceptable state."* This principle was intended to prevent distortions in international trade and investment and to ensure that the costs of pollution control were internalised by polluters rather than being borne by society at large. It also assumed that if polluting was made more expensive, the price tag would act as an incentive for producers to reduce pollution.

The 1972 United Nations Conference on the Human Environment in Stockholm further cemented the *Polluter Pays Principle (PPP)* in international environmental policy. Principle 16 of the *Rio Declaration on Environment and Development*, adopted at the 1992 Earth Summit in Rio de Janeiro, reiterated the importance of the principle, stating that national authorities should endeavour to promote the internalisation of environmental costs and the use of economic instruments, taking into account the approach that the polluter should, in principle, bear the cost of pollution.

It was in this context of using cost internalization as an incentive for producers not to pollute where the concept of *Extended Producer Responsibility (EPR)* was proposed by many, and theorised by professor Thomas Lindhqvist. Whereas the PPP focuses broadly on ensuring that polluters bear the costs of pollution, EPR is a tool which specifically targets producers, extending their responsibility beyond the production phase to include the entire product lifecycle. Lindhqvist defined EPR as:

a policy principle to promote total life cycle environmental improvements of product systems by extending the responsibilities of the manufacturer of the product to various parts of the entire life cycle of the product, and especially to the take-back, recycling and final disposal of the product

The wording was clear about extending the responsibility of the producer and the principle was intended to be used to influence upstream as much as downstream measures. However, back in the 1990s, European municipalities were increasingly feeling the costs of waste management and this was going to have a key impact in the implementation of the EPR concept. Waste volumes and complexity were increasing and more expensive disposal methods such as sanitary landfills and incinerators were making the costs unbearable. In this context, the idea of making producers pay for the end-of-life of the products and packaging they placed in the market was a way to finance the increasing waste management costs, and this is what turned the EPR idea into law in some countries. EPR was later was embedded in the EU law (art 3 of Waste Framework Directive [WFD] 2008/98/EC) which defines it as:

'a set of measures taken by Member States to ensure that producers of products bear financial responsibility or financial and organisational responsibility for the management of the waste stage of a product's life cycle.'

Whereas Lindhqvist left the options open for EPR to work upstream, the EU definition clearly sets the scope of EPR to deal with "the waste stage of a product's life cycle".

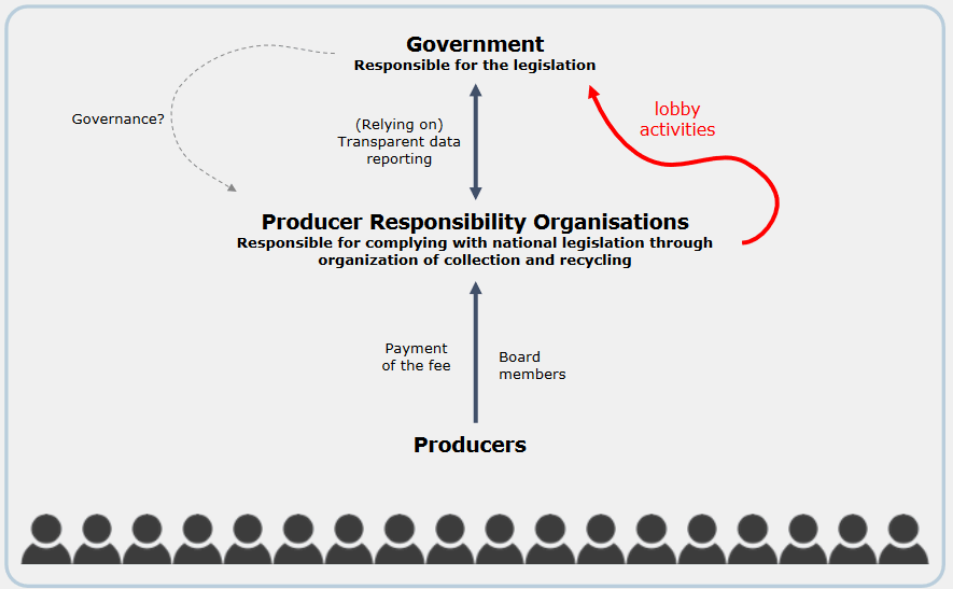
Progressively, EPR gained acceptance and the EU adopted a range of producer responsibility laws covering packaging, batteries, waste electrical and electronic equipment (WEEE), end-of-life vehicles and, more recently, also textile waste. Some countries have decided to expand the scope of EPR to cover a lot more sectors (France has 24 sectors covered by EPR). At the global level, over 500 operational EPR-based schemes have been found. Today, EPR has become a key tool for financing and organising waste management activities as prescribed by European legislation.

Because of EPR's role in implementing the PPP, there has often been the expectation that EPR would be a tool to reduce pollution, not only by preventing waste from ending up in the environment but also by preventing waste generation altogether. Indeed, one of the criticisms of the approach has been to what extent the PPP could become a right to pollute ("I pay; therefore, I can pollute").

A much less studied aspect is the socio-political role that PPP and EPR have played in normalising pollution. EPR is presented as a technical solution to deal with a technical problem: i.e. there is a waste problem and those who placed this waste in the market should pay for its management. It is assumed that producers have an interest in reducing pollution in order to reduce cost but, as we will see later on, this assumption has proven to be wrong and one can argue that often the PPP has become a right to pollute principle.

Any technical solutions such as EPR, incineration, or chemical recycling are not neutral and have to be understood in the context they are introduced and how they shape reality, reinforcing or weakening existing and/or emerging systems. Creating new structures and systems will always influence the policies that are to come and not always in a positive manner. In countries with consolidated EPR systems, especially in those with only one Producer Responsibility Organisation (PRO) per waste stream, these PROs have emerged as extremely well-funded political lobbies with considerable impact on the political agenda. This role might have been planned or not, but it is a fact that consolidated PROs are today very strong political players with access to knowledge, funding, and high-level contacts and relatively little oversight by public authorities. The power of PROs to shape the realities in which they operate, and from which they benefit is, therefore, considerable.

Figure 1: Functioning of a Producer Responsibility Organisation[1]

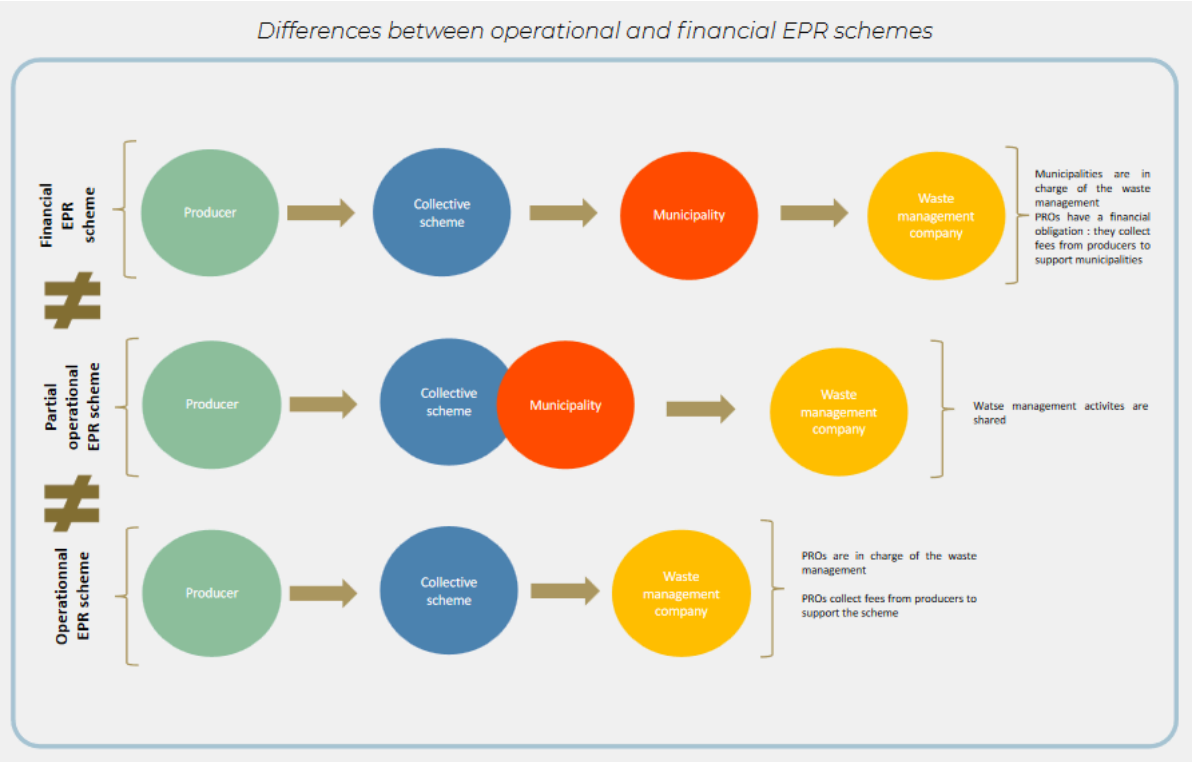


[1] "Let's Reshape for a Game Changing Policy Tool That Supports Prevention, Reuse, Separate Collection and High-Quality Recycling." Fair Resource Foundation. 2024. fairresourcefoundation.org/wp-content/uploads/2024/04/EPR-Position-Paper-Final.pdf.

3.2 Implementation of Extended Producer Responsibility

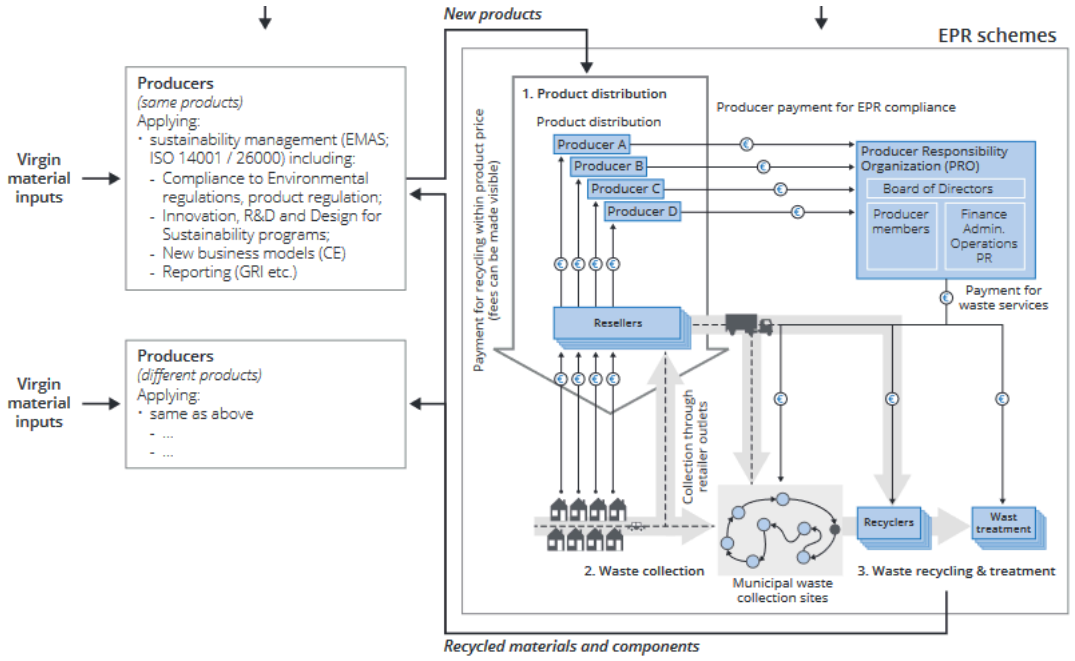
EPR literature delves into the different degrees of financial responsibility and organisational/operational responsibility of producers. The former defines the degree of producers' involvement in covering the costs of administration, collection and communication of running the system; whereas the latter defines to what extent producers are involved in the operational service of the provision.

Figure 2: Differences between operational and financial EPR schemes[2]



[2] "Let's Reshape for a Game Changing Policy Tool That Supports Prevention, Reuse, Separate Collection and High-Quality Recycling." 2024. Fair Resource Foundation. fairresourcefoundation.org/wp-content/uploads/2024/04/EPR-Position-Paper-Final.pdf.

Figure 3: EPR schemes in the context of wider policies and regulations (contextualising the presentation by (Mayers and Butler 2013)[3]



Globally, EPR is considered a policy principle, meaning there is no strict way to implement it. As a result, different countries have used different approaches. Defining how to implement EPR systems is crucial to ensure cross-consistency and coherence and ease the comparison between the different performances.

The way EPR is codified in EU law makes it clear that producers *"bear financial responsibility or financial and organisational responsibility for the management of the waste stage of a product's life cycle"*; whereas the financial responsibility is much less ambiguous in the US, which define EPR as *"policies that place a shared responsibility for end-of-life product management on producers."*[4]

Many countries in the global south have been adopting EPR laws with a high degree of divergence in the approach regarding financial and operational responsibility. For instance:[5]

[3] Vermeulen, W.J.V., C.W. Backes, M.C.J. de Munck, K.Campbell-Johnston, I.M. de Waal, J. Rosales Carreon, M.N. Boeve, (2021) Pathways for Extended Producer Responsibility on the road to a Circular Economy, White paper based on a literature review and the results of a Delphi study, on the experiences with EPR in the Netherlands, Utrecht University, Circular Economy and Society Hub, Utrecht ISBN: 978-90-6266-600-3.
www.uu.nl/sites/default/files/White-paper-on-Pathways-for-Extended-Producer-Responsibility-on-the-road-to-a-Circular-Economy.pdf

[4] "National Recycling Strategy: Part One of a Series on Building a Circular Economy for All Objective A: Improve Markets for Recycling Commodities." 2021. U.S. Environmental Protection Agencia (EPA).
www.epa.gov/system/files/documents/2021-11/national-recycling-strategy-executive-summary.pdf

[5] "Mismanaged sachets: will EPR solve the plastic problem? Insights from India, Indonesia, the Philippines and Vietnam." 2024. Dr Dominc Hogg for Break Free From Plastic.
www.breakfreefromplastic.org/wp-content/uploads/2024/11/Final_Mismanaged-Sachets-D-Hogg.pdf

- **India** has separate policies on EPR for different streams, such as plastic, e-waste, and batteries. For the EPR system that focuses solely on plastic packaging, and despite having set recycling targets, the law does not clarify operational or financial responsibilities. Instead of delineating that producers should pay for the collection and treatment, it opts for a system of tradable certificates that cannot deliver on cost coverage since producers only pay the credits generated by the waste that is collected, not bearing responsibility for what is not. Without proper financial coverage, it will be hard to ensure that plastic waste will be collected and the recycling targets met.
- In the **Philippines**, the EPR law mandates the collection of plastic packaging but doesn't enforce recycling. Instead, it allows for incineration and co-processing; and, in lack of recycling targets and clear definition of financial responsibilities, the EPR law is not having much impact.
- In **Indonesia**, the EPR law does not clarify the operational and financial responsibilities between producers and local authorities, and this ambiguity allows producers to argue against responsibilities. It is good that it sets targets for waste reduction, and less good that there are no collection or recycling targets. Overall, the lack of measures to enforce these targets makes the EPR law rather toothless.

These are just some examples that serve to present the different approaches to EPR across countries. One can observe that key challenges with EPR implementation include unclear roles/responsibilities, funding uncertainties, modest targets, auditing gaps, and limited packaging redesign or reuse drivers. Recommendations emphasise clarifying operational and financial responsibilities, setting enforceable recycling targets, requiring full producer funding for collection/recycling systems, establishing coordinating bodies, auditing compliance, and using economic instruments to influence packaging design and reuse.

A legitimate question for the right promotion and use of EPR in the future is to analyse under which conditions the rollout of EPR systems can contribute to improving both the environmental and economic situation. For instance, comparing the EU with the American style of EPR implementation, one can claim that systems that make producers financially responsible deliver much better collection rates than systems with shared or unclear responsibilities. Another learning of the last 30 years is that EPR systems with a unique PRO per stream (provided this PRO is well designed and monitored) are more efficient than systems with multiple PROs, which, due to the competition between them, makes information sharing much more difficult and drive prices to the bottom in detriment of the environmental impact.

Not all EPR systems are the same nor produce similar outcomes. For instance, European EPR systems based on product take-back requirements (which commonly involve establishing either mandatory or voluntary recycling and collection targets for specific products or materials and assigning responsibility to producers or retailers for end-of-life management to achieve these targets) deliver an average of 65% recycling rate for

packaging waste[6] (plastic packaging recycling being at 39%)[7]. However, if we single out EPR systems run with a Deposit and Refund System (DRS), which will be compulsory for plastic and metal beverage packaging in most EU countries in 2029, the average collection rate would be above 90%.

Other EPR schemes in the Americas with a lot less clarity on the way EPR should be implemented (shared responsibility makes it unclear who should pay for what, who is responsible for the collection, etc.) manage to collect much fewer recyclables. American countries implementing EPR for packaging comprise Chile, Brazil, Colombia, Mexico, the US (partially) and Uruguay[8] – some of them through a shared responsibility between producers and public authorities, and others with a clearer delineation of responsibilities. However, they all share a lack of proper governance and reporting. After 20 years of EPR law, Uruguay reported a 4% recycling rate in 2022, and others are only slightly above this figure. In general, the quality of the data is poor; and besides the packaging which has intrinsic market value – such as glass, cardboard, metal, or bottle PET – it is fair to say that EPR has not provided much of a change in terms of collection or recycling rates.

In Asia and Africa, most collection happens outside EPR systems and is mainly driven by the market value of recyclables. As a result, PET, PP, or HPDE is normally collected, whereas waste with less value, such as LDPE or sachets, is not.

[6] "Packaging Waste Statistics."2023. Eurostat.
ec.europa.eu/eurostat/statistics-explained/index.php?title=Packaging_waste_statistics#Waste_generation_by_packaging_material.
[7] EU Packaging Waste Generation with Record Increase." 2023. Eurostat.
ec.europa.eu/eurostat/web/products-eurostat-news/-/ddn-20231019-1.
[8] Iniciativa Regional para el reciclaje inclusivo (IRR), 2018

4. Analysis performance of current EPR systems

After having considered the initial thinking of the EPR concept and how it works, we will now proceed to analyse how its rollout has impacted waste generation, ecodesign, reuse, repair, collection, just transition, governance, and transparency for the main waste streams where EPR has been implemented in the EU: packaging, tyres, ELVs, batteries, and WEEE.

4.1. EPR and durability/waste generation

The countries with the longest track record of EPR policies worldwide are the EU member states. Most EPR systems for packaging were rolled out in the 1990s when different types of EPR systems were set up, as well as the corresponding PRO, which is responsible for organising the funding of the collection of packaging which was normally delegated to the local authorities. In the early 2000s, all the EU countries had EPR systems in place as mandated by the WFD (2008/98/EC).

As of today, the EU mandates producers to set up EPR systems for batteries, end-of-life vehicles (ELVs), packaging, WEEE, and some single-use plastics such as cigarette butts, fishing nets, or textile waste. Some - such as packaging, batteries, WEEE, and ELVs - have well-established EPR systems, whereas others are under construction.

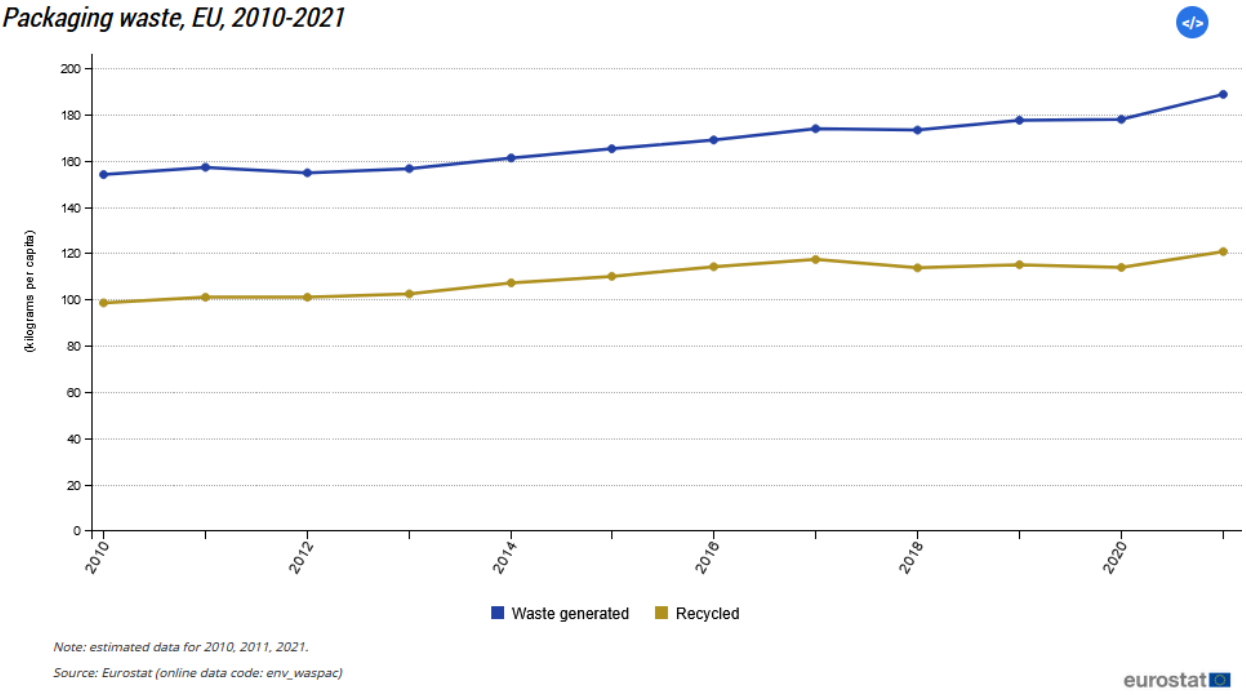
The well-established EPR systems have been successful in making producers pay for the collection of part of their waste and have allowed for the construction of collection, recycling, and disposal infrastructure across Europe. Data from the last decades shows that this resulted in an increase in collection, recycling, and incineration rates, which could have diminished the sector's environmental impact had it not been for a substantial increase in either resource use or/and waste generation.

The evolution of waste streams over the last decades shows a strong correlation between waste generation and the implementation of EPR policies.

For packaging, since the implementation of EPR policies in the late 1990s and according to the latest EU-wide data available, packaging waste collection grew to stabilise at 67% in 2011, whereas packaging waste generation

has increased 20% per capita in the last 20 years. Plastic packaging, in particular, has increased 27% in only 10 years.

Figure 3: Generation and recycling of packaging waste in the EU 2010-2021[9]

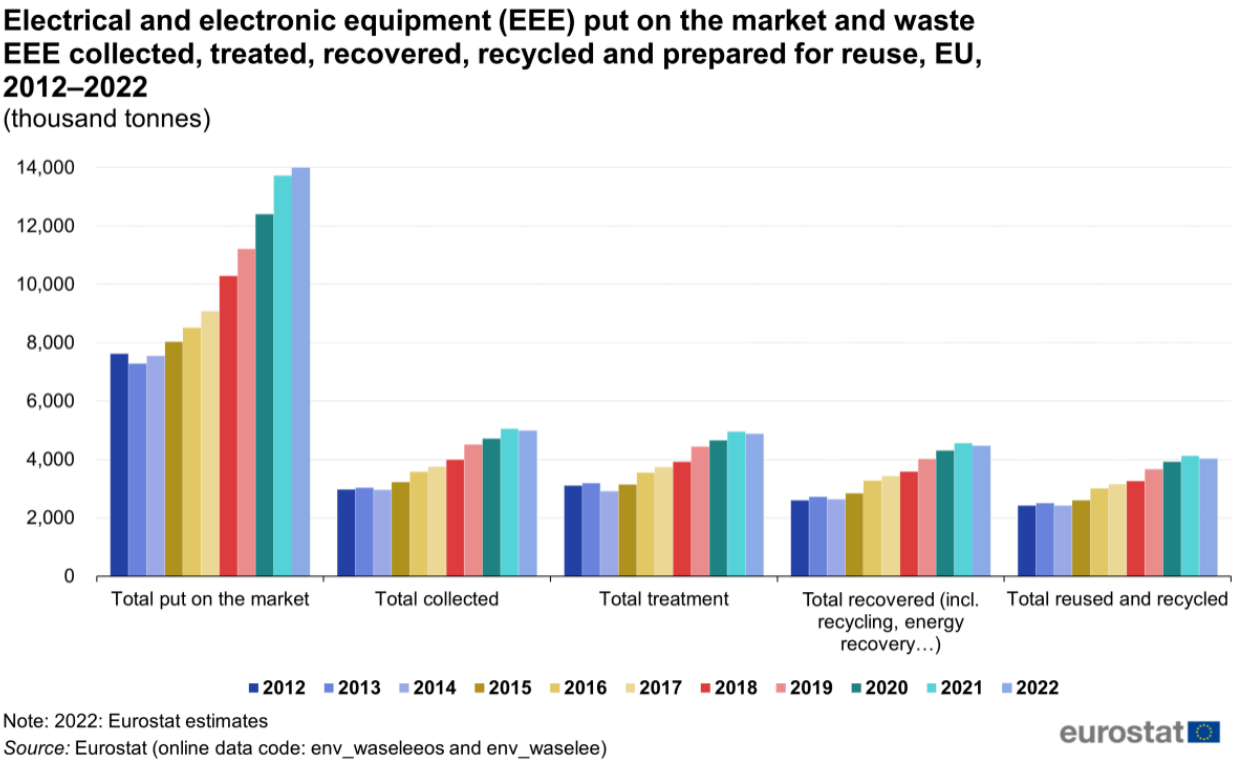


For electrical and electronic products, which will end up becoming WEEE, the tendency over the last decades has been to reduce their product lifespan across multiple categories. Be it because of miniaturisation or increased complexity (both rendering access to materials and repair more difficult), perceived obsolescence, or intentional design obsolescence, the fact is that the proportion of appliances replaced within five years of purchase due to a defect increased;[10] and despite efforts on the right to repair, repairing an electric appliance is often less economically appealing than buying a new one. The reduced lifespan of electrical and electronic products, combined with the more than doubling of sales, has caused an increase in the WEEE generation that coincides with the implementation of EPR systems, which for WEEE entered into force in 2003.

[9] Available at www.eurostat.eu

[10] Lehmphul, Karin. 2016. "Einfluss Der Nutzungsdauer von Produkten Auf Ihre Umweltwirkung: Schaffung Einer Informationsgrundlage Und Entwicklung von Strategien Gegen „Obsoleszenz"." Umweltbundesamt. 2016. www.umweltbundesamt.de/publikationen/einfluss-der-nutzungsdauer-von-produkten-auf-ihre-1.

Figure 4: Electrical and electronic equipment (EEE) put on the market and waste EEE collected, treated, recovered, recycled and prepared for reuse, EU, 2021-2022[11]



When it comes to vehicles, the EU has seen the registration of cars increase from 200 million in 2000 to 256 million in 2023, whereas the end-of-life vehicle (ELV) numbers remained more or less stable, with 6 million reported in 2006—the same amount as reported in 2019. Since 2019, ELV has decreased to 4,67 million in 2022.

In countries that have implemented EPR in other waste categories, waste generation has always increased. For instance, France has the highest number of running EPR systems with 24 streams and, according to Ademe,[12] it has seen how waste has increased across all categories covered by EPR systems since 2017.

The key question to address is the amount of causality is in this correlation. For packaging, one can argue that European and national legislation, since Directive 94/62/EC was adopted, has actively prioritised single-use packaging over prevention and reusable packaging (by setting recycling targets and not prevention or reuse targets); and, within single-use packaging, it prioritised light-weighing (EPR fees are to be paid by weight,

[11] "Waste Statistics - Electrical and Electronic Equipment - Statistics Explained." 2024. Eurostat. ec.europa.eu/eurostat/statistics-explained/index.php?title=Waste_statistics_-_electrical_and_electronic_equipment.
[12] "Accueil - Agence de La Transition Écologique." ADEME -The French Agency for Ecological Transition. www.ademe.fr/en

which prioritises lighter materials like plastic over heavier ones such as glass). These are drivers that explain the rise of plastic packaging and waste generation in general.

On the other hand, it is also true that other sectors, such as textile waste or WEEE, have seen a significant increase in waste generation in the same period and same countries, and this happened in the absence of EPR. It can also be argued that, in the Global South, the rise of single-use packaging happened before EPR was implemented, and it was precisely waste generation that caused international reports[13] and institutions[14] to call for the need to roll out EPR in these countries to manage the existing waste.

However, there is also no evidence that implementing EPR alone has led to a reduction in waste generation. In any case, if this were the case, it would be equally hard to find causality in that correlation since EPR on its own is not a tool designed to prevent waste but rather to manage it.

There have been attempts to use EPR to address ecodesign and waste generation by setting different EPR fees for different materials and applications depending on aspects such as weight, recyclability or hazardousness. This is known as eco-modulation of fees. After years of application, experience shows that this eco-modulation is not significant enough to have an impact on either design or waste generation (by influencing consumer or producer behaviour).[15] Typically, EPR fees represent less than 2% of the cost of product or packaging (sometimes as little as 0,1%)[16] and modulating such a small fraction doesn't have enough impact to influence ecodesign. For instance, in 2024, the Belgian PRO FostPlus, considered to be state-of-the-art EPR, was charging an EPR fee of 0,0646 EUR per kg of PET and 0,0591 EUR per kg of steel. If a PET bottle weighs on average 15gr (8-10gr for water, 20-23gr for carbonated drink), this level of EPR fees means that the consumer pays 0,0009 EUR per bottle. In other words, paying 100 times less than 1 euro cent for a product which costs between 1 and 3 EUR means that the overall potential incentive for better design represents between 0,00009 and 0,00003% of the cost of the product. On the other hand, for a producer placing a small amount of 100 million PET bottles in the market, the fee will amount to around 1,500 EUR. The magnitude of the figures is consistent with the goal to influence ecodesign (production) and will not have any impact on consumers' behaviour.

Moreover, the EU mandates eco-modulation to stay within the limits of cost-coverage (art 8a, WFD 2008/98), so there is very limited room for using EPR eco-modulation as a proper economic incentive.

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[13] Stemming the Tide, 2015, Ocean Conservancy

[14] "Extended Producer Responsibility, Updated guidance for efficient waste management". 2016. Organisation for Economic Co-operation and Development (OECD).
www.oecd.org/en/publications/extended-producer-responsibility_9789264256385-en.html

[15] Gottberg et al., 2006; Kautto, 2006; OECD, 2006; Tojo, 2006a; Mayers, 2007; Subramanian, Gupta and Talbot, 2009; Kemna, 2011; Huisman, 2013; Kunz, Mayers and Van Wassenhove, 2018.

[16] Vermeulen, W.J.V., C.W. Backes, M.C.J. de Munck, K.Campbell-Johnston, I.M. de Waal, J. Rosales Carreon, M.N. Boeve, (2021) Pathways for Extended Producer Responsibility on the road to a Circular Economy, White paper based on a literature review and the results of a Delphi study, on the experiences with EPR in the Netherlands, Utrecht University, Circular Economy and Society Hub, Utrecht ISBN: 978-90-6266-600-3.
www.uu.nl/sites/default/files/White-paper-on-Pathways-for-Extended-Producer-Responsibility-on-the-road-to-a-Circular-Economy.pdf

A multistakeholder task force set up by the WEEE Forum and bringing together producers and producer organisations agreed that:

"It is impossible to have a wide, comprehensive, and ambitious scheme where EPR financial contributions do not exceed "the costs that are necessary to provide waste management services in a cost-efficient way" (as stipulated in legislation), and yet has a discernible effect on consumer and producer behaviour."[17]

4.2. EPR's influence on repair and reuse

When we observe the evolution of reuse and repair over the last decades since the rollout of EPR systems in Europe, we can find an even more acute correlation between the rise of planned obsolescence and single-use packaging and the demise of repair and reuse systems.

4.2.1. Reuse in the packaging sector

In the EU, the share of refillables in the beverage market has plummeted in the last decades even though the Waste Hierarchy, enshrined in EU law since 2008, clearly states that reuse should have preference over recycling and disposal. However, whilst recycling was given the means to be rolled out with definitions, methodologies, targets, and the obligation to implement EPR systems for several waste streams, reuse was not given any of these. The legislation purposely conflated "preparation for reuse" with "recycling". Art 11 of the WFD (2008/94) set targets which could be achieved with reuse or recycling:

(a) by 2020, the preparing for re-use and the recycling of waste materials such as at least paper, metal, plastic and glass from households and possibly from other origins as far as these waste streams are similar to waste from households, shall be increased to a minimum of overall 50 % by weight;

(b) by 2020, the preparing for re-use, recycling and other material recovery, including backfilling operations using waste to substitute other materials, of non-hazardous construction and demolition waste excluding naturally occurring material defined in category 17 05 04 in the list of waste shall be increased to a minimum of 70 % by weight;

Since the 1990s, the EU waste policy has been all about providing legal certainty and financial and legal instruments for recycling and incineration to replace landfilling, whilst the upper levels of the waste hierarchy were neglected. Unsurprisingly, waste generation has increased, and repair and reuse rates have plummeted across the board. Table 1 shows how refillable beverage packaging has gone from being the most used system to deliver soft drinks, beer, and cider to almost disappearing. The only exception is Germany - the only country

[17] "Eco-Modulation of Fees for 'Greener' Products: Concerns and Challenges | WEEE Forum." 2021. WEEE Forum. weee-forum.org/ws_news/eco-modulation-of-fees-for-greener-products-concerns-and-challenges.

in Europe which, back in the day, set minimum reuse quotas that were instrumental in keeping the refillables market alive.

Table 1: Change in refillables market share for beer & soft drinks, 1999-2019[18]

Change in refillables market share for beer & soft drinks, 1999-2019

Countries	Market share refillables 1999	Market share refillables 2019	Difference (in percentual points)
Denmark	93%	13%	-80%
Finland	80%	4%	-76%
France	9%	3%	-6%
Germany	73%	54%	-19%
Romania	70%	13%	-57%
Bulgaria	74%	22%	-52%
Hungary	63%	11%	-52%
Spain	35%	25%	-15%
Sweden	44%	4%	-40%

For the non-beverage packaging sector, the decline in the use of reusable packaging has probably been even more abrupt given the lengthening of supply chains and the rise of big distribution, which typically requires more packaging in detriment to the refill/bulk systems that were used when supply chains were shorter.

Again, despite the strong policy drivers at the European and national levels to prioritise single-use packaging over reusable packaging, the correlation between the implementation of EPR and the demise of reuse may not imply causality, since global data indicates that the replacement of refillable packaging with single-use has been a global trend. The decline of refillables has not happened at the same speed everywhere, with countries such as Indonesia where refillables have gone from omnipresence to marginality; whereas, in countries such

[18] "What We Waste Dashboard - 2019." 2024. Reloop Platform. www.reloopplatform.org/what-we-waste/what-we-waste-dashboard

as the Philippines, refillables were still the majority of packaging by 2019. Regardless, the global trend of replacing reusable packaging with single-use packaging is clear.

Figure 5: Sales (units) by year, refillables and not refillables worldwide[19]

4.2.2. Reuse and repair in WEEE, tires and ELVs

When it comes to repair and reuse in the non-packaging sector, the situation is slightly differen,t given the comparatively more durable nature of cars, tyres, and/or electronic equipment.

Logically, the higher the value of the product, the higher the incentive to repair it, provided the item is repairable and spare parts are available. That is, if a car breaks, the cost of repair will generally be far below the cost of purchasing a new one; whereas if a pair of headphones breaks, the cost of repair can easily be higher than the cost of replacing them. Large household appliances fall somewhere in between. However, as their prices have declined over the past few decades, they have shifted from durable, highly repairable items to cheaper products with shorter lifespans. When these newer appliances break, the repair cost often represents such a large portion of the product's value that repairing them becomes economically unattractive. As much as this tendency has coincided with the implementation of EPR systems for WEEE, little causality can be found since EPR fees for WEEE, ELVs, and tyres are clearly dedicated to waste management.

For tyres, repair in the form of tyre retreading completely follows the market in the sense that it is a reality for commercial/heavy-duty tyres (trucks, buses, aircraft) because it costs 30 to 50% less than buying new tyres. Still, it's a practice that has almost disappeared for passenger vehicles because of the less clear economic case

[19] "What We Waste Dashboard." 2024. Reloop Platform. www.reloopplatform.org/what-we-waste/what-we-waste-dashboard

and other considerations. Similar to WEEE, the EPR fees do not cover retreading costs and focus on end-of-life management.

Overall, as with waste generation, whilst the causality between EPR rollout and decrease in reuse quotas and repair is not clear, there is evidence that no EPR system to date has contributed to moving up the Waste Hierarchy from recycling to reuse or prevention, and if design for repairability or reusability has happened, it's because of other policy measures such as ecodesign rules.

Making repair affordable is a key pillar of a universal right to repair. The Right to Repair Directive (EU 2024/1799), which EU Member States must transpose into national law by July 2026, takes some initial steps in this direction but remains insufficient. In the meantime, several countries are addressing high repair costs at the national level by introducing repair funds and bonus systems to partially subsidise repairs.

Financial incentives like repair bonuses have proven highly effective in increasing access to repair, as seen in France and Austria. However, their rollout is often constrained by limited public funding. A more sustainable approach would require producers to contribute through EPR, ensuring long-term support for affordable repair options.

4.3. EPR and collection

As we have seen in Chapter 3.1, to date, EPR in the EU is a policy designed to finance the management, collection, and treatment of waste. Overall, it has been the main funder for the collection of the streams defined by law and the second most important source of funding to build and run waste infrastructure, only after taxpayers' money channelled via public institutions into waste management operations.

As a result, the recycling (and sometimes the collection) rates for the product categories covered by EPR schemes have tended to be much higher than for those not covered by them.

For tyres, around 95% of the tyres put on the market are collected.[20] For ELVs, according to Eurostat, around 6-7 million ELVs are officially treated through authorised treatment facilities annually in the EU, representing approximately 85-88% of the estimated total number of vehicles reaching end-of-life status each year. However, a significant discrepancy exists between new vehicles registered and ELVs collected. Studies estimate that approximately 3-4 million vehicles annually cannot be accounted for in official ELV statistics, mainly due to exports of vehicles outside the EU.[21]

[20] "National Figures (Tonnes)."2024. European Tyre & Rubber Manufacturer Association (ETRMA). www.etrma.org/wp-content/uploads/2024/03/2021-End-of-Life-Tyre-Recover.pdf

[21] "Assessment of the implementation of Directive 2000/53/EU on end-of-life vehicles (the ELV Directive) with emphasis on the end-of-life vehicles of unknown whereabouts". 2016. Oeko Institut. elv.whereabouts.oeko.info/fileadmin/images/Consultation1_Docs/Handouts_additional_suggestions.pdf

Packaging waste recycling is at 67%, although this figure hides the different performance of different materials, with plastic packaging waste ranking at lowest with 46% in 2020,[22] whereas glass packaging was at the highest with 80% in 2022.[23]

The EU-wide collection rate for portable batteries has gradually increased from around a 25% average in 2012 to approximately 45-48% by 2020 but also showed a big disparity in the collection of different types: lead-acid industrial and automotive batteries have the highest collection rates (nearly 100% in many countries), whereas lithium-ion batteries have significantly lower collection rates, and button cells and other speciality batteries often have the lowest collection rates.

The EU has addressed the relatively low collection rates of both battery[24] and packaging waste with the approval of regulations in 2024, which put in place more stringent measures and targets to increase collection and quality recycling.

4.3.1. EPR and DRS

Deposit and Return Systems (DRS) are EPR systems in which consumers pay a small deposit when purchasing a product, which is refunded when they return it. So far, this singular type of EPR is mostly used in the packaging sector for beverage containers, although it is increasingly used for the food for take-away reuse sector.

DRS delivers capture rates for packaging well over 90%, often twice as much as other EPR systems deliver for materials such as plastic packaging. This is why European packaging and plastic legislation highly encourages it. In the Single-use Plastics Directive (SUPD), DRS is encouraged by mandating high separate collection targets - 90% of PET bottles by 2029. In Packaging and Packaging Waste Regulation (PPWR),[25] DRS is explicitly mandated for single-use plastic bottles and metal cans (up to 3L) to achieve the 90% target by 2029.

In addition to delivering high collection rates, DRS is a powerful tool to fight littering. In Estonia, after introducing a DRS for beverage containers, the share of beverage containers amongst littered items along roadsides dropped from 80% to below 10%. In Germany, the share of beverage containers amongst total litter dropped from 20% (in 1998)[26] to "almost zero" two years after introducing a DRS on one-way beverage containers in 2005.

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[22] "Plastics - the Facts 2022." 2022. Plastics Europe. plasticseurope.org/wp-content/uploads/2022/10/PE-PLASTICS-THE-FACTS_V7-Tue_19-10-1.pdf.
[23] "Collection Rates of Glass Containers for Recycling - UNESDA." 2024. UNESDA unesda.eu/our-priorities/collection-rates-of-glass-containers-for-recycling/
[24] Regulation (EU) 2023/1542 of the European Parliament and of the Council of July 2023 concerning batteries and waste batteries, amending Directive 2008/98/EC and Regulation (EU) 2019/1020 and repealing Directive 2006/66/EC. 2023. Official Journal of the European Union.eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32023R1542
[25] Final agreed text, pending formal approval: data.consilium.europa.eu/doc/document/ST-7859-2024-INIT/en/pdf
[26] "Global Deposit Book 2022."2022. Reloop Platform. www.reloopplatform.org/global-deposit-book-2022

A key lesson from the 30 years of experience in the implementation of EPR systems is the importance of planning well from the outset. Given the well-documented superior performance of DRS systems over other EPR systems, it is important that these systems are given priority over the others. There are three reasons for this:

- Firstly, it is much easier to implement DRS from the beginning than implementing it once other EPR systems are running. The European experience shows how PROs, once created, may actively prevent the creation of DRS. Indeed, DRS will not only remove the most recyclable (and valuable) fractions from EPR - making it more expensive to run (per unit of material) - but also exposes the intrinsic problem of allowing mostly non-recyclable packaging in the market.
- Secondly, whereas other EPR systems finance infrastructure for waste management, DRS systems are the only EPR systems whose infrastructure can handle both single-use and reusable packaging. According to the Waste Hierarchy, reuse is above recycling, so having a system that can handle returnable packaging as well as single-use one is a cheaper and easier way to organise the transition from waste management to resource management.
- Thirdly, from a cost-coverage perspective, DRS is much more comprehensive than other EPR systems since producers take responsibility for all the packaging separately collected (over 90%), whereas EPR systems working with open street containers often collect more from sorting mixed waste than from the separate collection system (whilst producers only pay for the latter).[27]

Despite the advantages of DRS over other EPR systems for some waste streams, since the 1990s, the EU's packaging legislation mandated EPR and other measures to manage waste but omitted any mention of DRS or reuse systems. Only in 2021, the Single-Use Plastic Directive (SUPD), and in 2024 the Packaging and Packaging Waste Regulation (PPWR), started amending this situation with concrete measures to introduce DRS systems to increase collection rates and start reintroducing reuse.

As a result of the latest legal requirements, in Q1 2025, the EU had 15 countries using DRS for beverage containers (plus Norway and Iceland) and 7 that approved implementation in the coming years (Portugal, Luxembourg, Spain, Greece, Cyprus, Poland, and Czech Republic plus the UK) aiming to meet the 90% separate collection target for 2029.

There has been some exploration of introducing DRS for non-packaging applications[28] but, for the moment, this type of EPR is constrained to packaging.

[27] See 4.4.1.

[28] Article 57 of EU Batteries Regulation 2023/1542 includes provisions related to Deposit and Return Systems to improve collection rates.

4.4. EPR and cost coverage

In an EPR system as it is organised in Europe, producers pay a fee proportional to the volumes they place in the market, which should be enough to cover the costs of running the system (administration, communication, and waste management) to meet existing targets.

According to European EPR legislation, the contribution by producers is to be administered by a PRO which then pays the local authorities in charge of collection for the above-mentioned costs. Many stakeholders in Europe complain about the fact that PROs do not cover all the costs of collection and management, for instance:

"If we compare the 1.6 billion EUR in net costs with the approximately 644 million EUR paid by Citeo to local authorities in 2021, we find that local authorities have 1 billion EU left to pay," says an Amorce spokesperson, France's main local governments union. Citeo said it cannot comment on the case but added that, in 2021, it supported local authorities with 847 million EUR. A spokesperson added: "*Through these eco-contributions from marketers, Citeo finances 73% of the gross reference costs of collection, sorting, and treatment of household packaging.*"

In Italy, representatives from municipalities and civil society claim[29] that *"considering that CONAI (PRO for packaging) has reimbursed municipalities with amounts ranging annually between 650 million EUR and 700 million EUR — covering only about 40% of the costs — municipalities should receive double that amount starting not only from 2025 but also retroactively from 2023. This amounts to around 1.5 billion EUR, which will somehow need to be absorbed by local finances, which are already strained by various budget cuts."*

Norwegian municipalities are not much happier. Svein Kamfjord, director at the umbrella organisation for public waste companies Samfunnsbedriftene, said: *"We pay more than one billion NOK [around 88.6 million EUR] per year for handling plastic packaging waste that the producers should have financed".*[30]

In any country where EPR is implemented, there are always discrepancies and claims that the producers are not paying enough.

Cost coverage is a topic that is generally not completely resolved anywhere. The higher the capture rates by the collection system financed by the producers, the higher the cost coverage since less waste escapes into the environment; hence, it reduces the speculation about the cost of, for instance, cleaning the ocean (an option which has not even been considered given the impossibility to accomplish, let alone to pay for it).

[29] Ercolini, Rossano. "Nel Nuovo Accordo Quadro Sulla Raccolta Differenziata Il Punto Di Vista Dei Cittadini Deve Contare." February 26,2025. Il Fatto Quotidiano. www.ilfattoquotidiano.it/2025/02/26/rifiuti-accordo-raccolta-differenziata-comuni/7890280

[30] "Producers Wield Power over Plastic Pollution." 2023. Investigate Europe. www.investigate-europe.eu/posts/producers-wield-power-over-plastic-pollution

One of the main PPP principles, which EPR is meant to implement, is cost internalisation. Full cost internalisation is only possible when 100% of the waste is collected and treated; zero leakage into the environment is hard to achieve. For instance, the collection rates of packaging using a DRS or tyres both well above 90% present a very different story for cost coverage than small batteries, most WEEE, or light-weight packaging which collects under 40%.

Cost externalisation has been and continues to be one of the main drivers for a linear economy. Traditional reuse systems require reverse logistics and washing infrastructure, making the system leak-proof but more expensive. In contrast, the current system (in which the cost of dealing with waste and pollution is externalised on the environment and public authorities) makes single-use systems comparatively more competitive. Although implementing real full-cost coverage would be the most effective way to change the system, producers cannot afford the cost of cleaning the environment. However, despite the legitimate claims from some local communities affected by waste that they didn't generate, nowhere are EPR fees considered retroactively and legacy waste is a liability that societies seem to have to accept.

Whilst EPR systems need to adapt to different local realities, they should all aim at full cost coverage, and the fees should be high enough to, at least, pay for the service of running the system.

4.4.1. EPR comprehensiveness

Regarding costs, most existing EPR schemes have the legal obligation to cover the costs of collection and recycling only for the waste that is separately collected; the cost of non-collected waste is not subject to payment by PROs and is borne by local administrations. Although legal texts set collection and/or recycling targets, the partiality of the cost coverage has the effect of PROs implementing sub-optimal collection schemes in order to keep their financial liability as low as possible.

This has been the case for packaging waste in most of Europe since EPR schemes were implemented; packaging recovered from the mixed waste stream has had a big contribution to meeting targets, although local administrations have financed this cost. Moreover, some EPR schemes had historically focused on valuable packaging, keeping difficult-to-recycle materials directly out of their scope. Only recently have some European countries included costs of separating packaging present in mixed waste within the scope of EPR.

For instance, in the metropolitan area of Barcelona, 61% of lightweight packaging is recovered from sorting it from mixed waste, and only 39% is separately collected via the EPR system. This is a relatively widespread case of non-comprehensive EPR, since most of the collection and management costs are shouldered by tax-payers and not by the producers.

Figure 6: Tonnes of collected packaging waste in the metropolitan area of Barcelona[31]

This data is for lightweight packaging including cardboard boxes but excludes glass packaging.

To prevent the loss of valuable materials in the mixed waste stream due to inefficient collection systems, costs for mixed waste stream management should be included within the scope of PROs, and a special (higher) fee could be implemented for materials/products failing to meet existing targets.

Too often, failing to meet set targets has no consequence for PROs. A possible solution could be that strict infringement procedures should be included in PRO authorisation to prevent the targets from being met.

Economic contribution to municipal collection schemes should not be seen as the aim of EPR, but as a basis from which higher-performing systems (such as DRS or other economically incentivised collection schemes in retailers) could be included in the mix of solutions aiming to make EPR as comprehensive as possible.

4.5. The EPR paradox: can a technical tool fix a sociopolitical problem?

Waste management is often presented as a technical issue and rarely considers the nature of a problem that is not technical but socio-political. Waste is a human creation, and it can be designed out of the system if the

[31] "Gestió de residus a l'àrea metropolitana, Indicadors 2023". 2024. AMB - Area Metropolitana de Barcelona. docs.amb.cat/alfresco/api/-default-/public/alfresco/versions/1/nodes/af830bcb-13fa-44fe-8cf5-c28f96fc6d10/content/resultats%202023%20-%20seminari%20261124_V%C3%ADctor%20Mitjans.pdf?attachment=false&mimeType=application/pdf&sizeInBytes=1375734

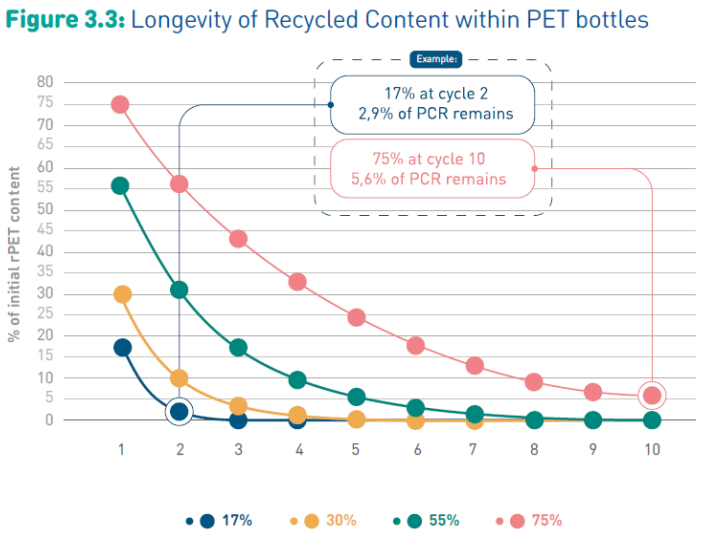
right incentives and regulatory frameworks are in place. For instance, single-use plastic sachets didn't exist 30 years ago: they are a human invention that suited a certain social and economic context. It is a choice to accept managing this waste or to change the context so that a better option can replace it. If we take the example of plastic bags, many countries decided not to use EPR but rather ban or tax them; as a result, plastic bags have almost ceased to be a problem in many countries. It's a political choice to decide whether to manage a waste or to phase it out.

After decades of active marketing, the public and most policy-makers have come to believe that recycling is the solution to waste generation. As much as recycling is needed, it should remain a last-resort option as reflected in the Waste Hierarchy. Anything produced should consider how it will be dealt with at its end of life. The fact is that any recycling process has losses, and the only way to recover 100% of a material and its value after using it is by avoiding that it becomes waste.

For instance, PET bottles are the plastic application with the world's highest collection and recycling rates. However, from the point of view of material and value preservation, such a fast-moving consumer good means that, after a few months of having produced the bottle and having consumed, collected, and recycled it, there will be no recycled content left at all.

In the graph below, one can see how, due to the losses of any recycling process – if one assumes the cycle of production, bottling, consumption, collection and recycling of a PET bottle to be one month; and assuming the highest recycling rate possible (75% material recovery of every PET bottle) – after 10 months only 5% of the recycled content is left. At current average PET recycling rates, no recycled content is left after only 4 cycles.

Figure 7: Longevity of recycled content within PET bottles[32]



[32] "How Circular Is PET?" 2022. Eunomia Research & Consulting for Zero Waste Europe. zerowasteeurope.eu/library/how-circular-is-pet

At the same time, there are systems that run with refillable PET bottles, in which every bottle does more than 20 rotations before being recycled. For the sake of comparison with single-use bottles, this means that using the same pace of consumption of one cycle per month, if the reuse system guarantees 20 rotations before recycling, most of the recycled content of the same PET bottle will be circulating in the system 10 years after. The decision between having the material and use value last either months or decades has more to do with political will and social norms than technicalities.

The more EPR is presented as a technical solution, the less we can address the roots of the problem, which happens to be sociopolitical and not technical.

EPR systems are designed to manage waste: the more waste it circulates, the more money it will get to manage; and the more money involved, the more political influence against change it will gather. The more EPR is optimised, the less incentives there are to change the system. EPR systems are a tool that can be useful to mobilise resources to implement the right policies. Still, the experience so far is that, due to a lack of proper legislative frameworks, they do not solve the waste problem and, instead, they tend to institutionalise waste.

That is when the **EPR paradox appears,** and the **system presented as the key to fixing the waste problem becomes the roadblock that stops progress and actively fights against any idea or plan to increase resource productivity via reduction of waste generation**.

The EPR paradox reflects that EPR is a tool that could have been used better. At the beginning of this section, we have analysed how the origins of EPR are traced back to the implementation of the Polluter Pays Principle, and one can agree that this is something that EPR has partially managed to deliver. The PPP implicitly assumed that producers would have an interest in reducing pollution if they had to pay for it. Experience shows that producers prefer to pay for the pollution as long as the business is profitable and that the PPP doesn't necessarily deliver when it comes to an overall reduction of environmental impact.

In this time of EPR consolidation for some waste streams and rollout for others, it is paramount to make the right use of this tool, putting it to the service of a competitiveness and strategic autonomy agenda that should reduce waste generation and pollution.

5. Conclusion of Part 1: challenges with the current interpretation and implementation of EPR

30 years of EPR policies in Europe present a useful set of data and experiences that can help to draw some conclusions and recommendations for the future.

Firstly, **there is a notable difference between the policy principle as it was theorised in the 1990s and the policies that were enshrined into EU and national laws**. Whereas the former aimed to include the responsibility for the full lifecycle of products and packaging, the latter clearly prioritised the management of the end-of-life phase. The coexistence of these two approaches has created confusion and false expectations as to what EPR should or could deliver.

Secondly, **EPR policies seem to be a well-accepted tool for implementing the PPP as producers face acceptable costs and local administration has an income to handle collection systems. Nevertheless, the lower the collection rates, the less often producers are made responsible for managing the end-of-life of the products they place in the market**. In this way, while there is some room to improve on some fronts, EPR is generally perceived to be the right way to finance waste management.

Despite the introduction of the waste hierarchy in 2008 and the mandate to eco-modulate EPR fees in 2018, the EU EPR legislation has been clear that the focus of EPR is waste management. As a result, and despite the circular economy narrative, EPR has not contributed significantly to keeping the value of resources, reducing waste generation, or improving reuse or repair.

EPR is a system that can finance and organise waste collection but, alone, it does not provide a real economic incentive for designing products to be more circular. As a result, the existence of a waste collection system conveys the impression that because waste is collected, it will be recycled, even when this is not true for many waste streams (single-use plastic sachets or beverage cartons in packaging, synthetic fibres blended with natural fibres for textiles, etc.).

Thirdly, **the governance of EPR systems seems to make all the difference when it comes to their performance, which varies extensively** from country to country, system to system, and waste stream to

waste stream. Transparency and proper monitoring have proven to be key for systems to perform. In this sense, EPR systems with multiple PROs competing against each other are less efficient than systems with a single PRO. Within systems with single PROs, those with proper transparency and monitoring mechanisms work much better than those where PROs get a life of their own and get to report data which doesn't correspond to reality.

Fourthly, **despite EPR being perceived as just a tool in the toolbox of waste management, the reality is that this tool has unrivalled power to mobilise funding and exert political influence**. The financing for communication campaigns, building infrastructure, paying for collection, influencing public policies, and so forth turns EPR systems into political creatures capable of generating their own political agendas and pushing them forward with more resources than any other player.

Therefore, as useful as EPR systems are in mobilising financing for collection, sorting, and treatment, the fact that they mobilise hundreds (when not thousands of millions of euros) and put them in the hands of PROs who have an interest in making the system run as cost-effectively as possible - and waste managers who want to manage as much waste as possible - makes up a series of interests which can create a lock-in effect into a waste-based system, even when better alternatives exist. When so much money is at play, the PROs can decide to mobilise politically by paying expensive lobbies or communication campaigns to prevent a better system which would challenge its economic model. For instance, for some years, the most important lobbies opposing the implementation of DRS in the EU have been the PROs running the EPR system.

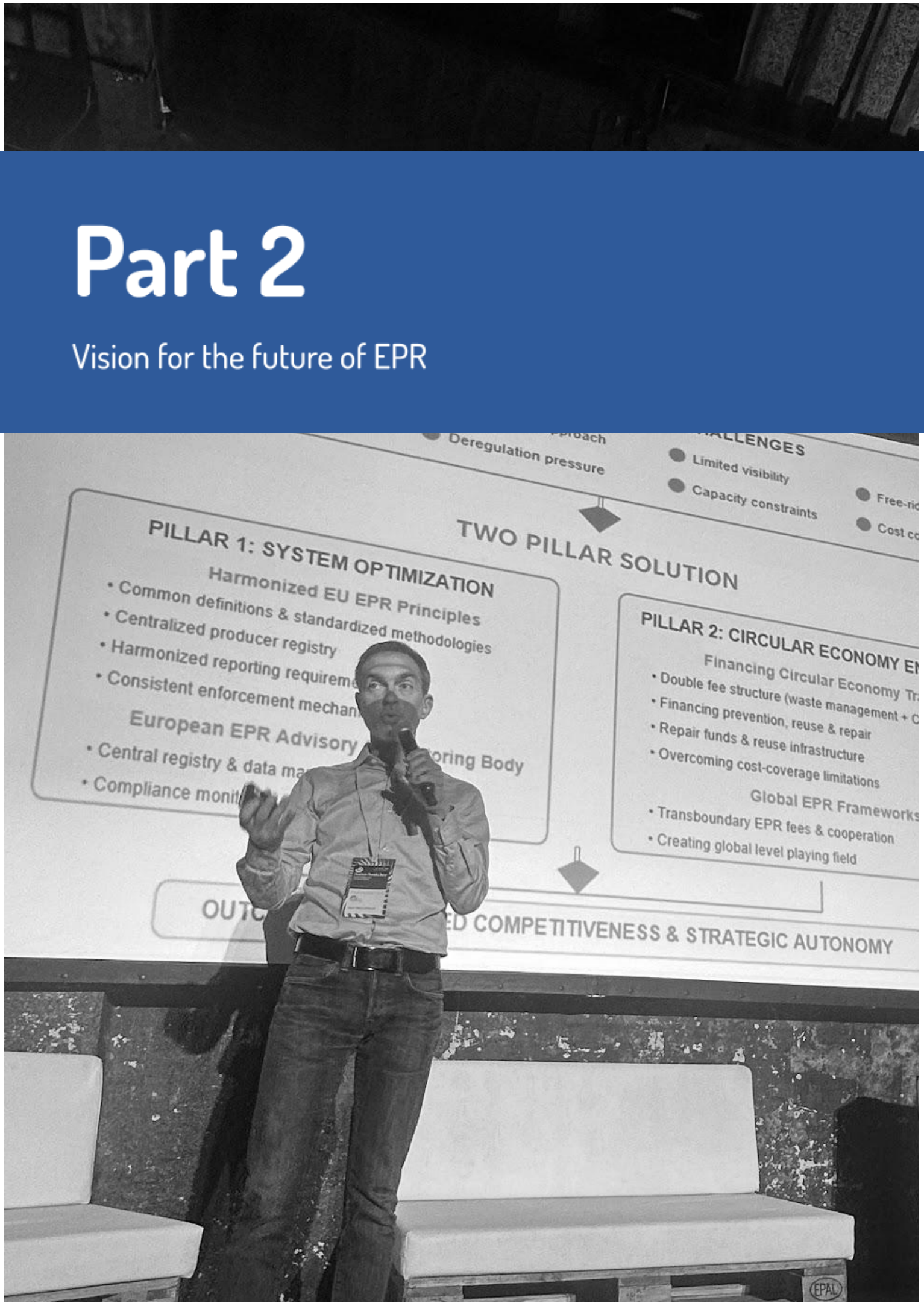
Regardless of how legitimate the reasons can be to oppose changing the *status quo*, building a system which will mobilise lots of political and economic interests and even change the behaviours of citizens comes with lots of big implications. For this reason, EPR policies cannot be planned in isolation, or they risk stalling environmental policies in the future and costing producers and taxpayers a lot of money.

Lastly, EPR has been, to date, a tool sometimes mandated at the EU level but always implemented at the national level. As a result, **EPR has not used the potential of the single market and has sometimes undermined it** by exporting waste which was covered by EPR fees paid in one country to another country without transferring the corresponding EPR fees. Moreover, it has been very rare for producers to be aware of how their fees were being used or the fate of their products, sometimes finding out through the media that they were illegally exported and dumped in a country outside the EU borders. As EPR systems become generalised across sectors and achieve maturity, there is increasing demand for better traceability and monitoring, as well as harmonised reporting.

All in all, EPR has come a long way from the 1980s, when it was first touted as a way to finance waste collection in depauperised municipalities; today, it has proven to be a key part of the future of waste management. However, the needs of the late 20th century differ greatly from the current EU needs and EPR, as well as any other EU policy, must adapt to serve the EU's future instead of its past.

Part 2

Vision for the future of EPR



6. From a waste management tool to an enabler of increased competitiveness and strategic autonomy

EPR was conceived by T. Lindhqvist as a **"policy principle to promote total life cycle environmental improvements of product systems by extending the responsibilities of the manufacturer of the product to various parts of the entire life cycle of the product".**

The socio-political context of the 1990s with its rising waste management costs turned EPR into the most effective waste management tool to finance collection and treatment systems. This is clearly reflected in how it was codified into EU law, with the definition of EPR in the waste framework directive stating **"that producers of products bear financial responsibility or financial and organisational responsibility for the management of the waste stage of a product's life cycle".**

In 2015, the European Commission launched its first Circular Economy Action Plan[33] in the struggle against the linear economy. The EU was moving from its "moving from landfilling to incineration" focus, which was the policy priority during the 1990s and early 2000s, to focus on closing the loop - mainly by increasing recycling. During this decade, the EU has been championing a narrative of circularity, producing extensive legislation to increase recycling rates. It is in this context that EPR coverage has been extended to new waste streams (textiles, fishing nets, cigarette butts, etc.), and the concept of eco-modulation of EPR fees has been hailed as the way to incentivise better design.

The global context has been imposing a new reality on the EU since 2020. The COVID-19 crisis from 2020-2023 brought about a serious supply chain disruption for basic materials, and the invasion of Ukraine in 2022 exposed the EU's extreme dependence on foreign energy supply. The rise of Artificial Intelligence and the overall electrification drive only exacerbate the EU's chronic dependence on basic materials to run effective industrial machinery.

[33] "First circular economy action plan". 2024. European Commission. environment.ec.europa.eu/topics/circular-economy/first-circular-economy-action-plan_en

This new context adds another purpose for the former waste management tools, which subsequently became circular economy tools and today must serve an agenda of competitiveness and strategic autonomy. The Draghi report[34] notes:

"The EU is building a stockpile of rare earths that could be recycled. Unlike for fossil fuels, significant potential lies in the circular economy to ensure the supply of critical raw materials. The EU is at the forefront of the circular economy and has already increased its use of secondary raw materials (more than 50% of some metals, such as iron, zinc, or platinum, are recycled, covering more than 25% of the EU's consumption)."

In practice, this means that the EU can mine more critical raw materials from products that became waste imported from abroad than from European mines – although this shouldn't downplay the latter's importance. It also means that what in waste terminology is called 'prevention and reuse' becomes 'resource efficiency' in competitiveness jargon, which is at the forefront of EU priorities.

In this new framing, **EPR must be more than a cost-coverage tool to finance waste management: it must be an enabler for a different way of producing and consuming, which shall underpin the Union's competitiveness agenda**.

For the reasons explained in Chapter 3, for some waste streams (such as packaging) EPR has financed an impressive infrastructure to enable collection and recycling, which will have to be expanded to accommodate reuse and prevention practices. For some other waste streams (such as textiles), the infrastructure will be designed and built in the coming years, which offers a great opportunity to implement a system designed to deliver the best outcomes. EPR for batteries and WEEE will have to be further improved for competitiveness and strategic autonomy instead of just waste management.

The Draghi report also identifies the *"multiple obstacles preventing the Single Market for the circular economy. For most product/material streams (except e.g. certain metals), secondary raw materials are more expensive compared to primary raw materials, and recycling tends to be more expensive than landfilling. The economics however tend to change if the negative environmental externalities associated with the resource-intensive (energy, carbon) production of primary raw materials would be internalized. Another obstacle is the lack of investment in infrastructure for circularity. This investment gap not only relates to product design, R&I and circular economy business models, but crucially also to the basic infrastructure for separate collection, sorting, preparing for re-use and recycling. Finally, obstacles with respect to an uneven playing field in terms of waste criteria hinder a Single Market for circularity. This happens across Member States and even regions, with very heterogeneous approaches to the end of waste, leading to a fragmented Single Market with high administrative burden and costs for businesses, and low recycling rates, but also vis-à-vis third countries undermining the integrity of the recycled content obligations and leading to a loss of critical EU recycling capacity since recyclers cannot compete with the subsidised imports".*

[34] Draghi, Mario. "The Draghi Report on EU Competitiveness." 2023. European Commission. commission.europa.eu/topics/eu-competitiveness/draghi-report_en

In such a scenario, and given the EU's priority to increase its competitiveness and strategic autonomy, this will hardly be possible when competing against countries with cheaper access to materials and energy and lower social and environmental standards. The way things stand, **an important competitive advantage for the EU must be built on efficient resource use. This can only be achieved by changing the economic drivers that shape the market dynamics so that preserving material value in circulation makes economic sense.**

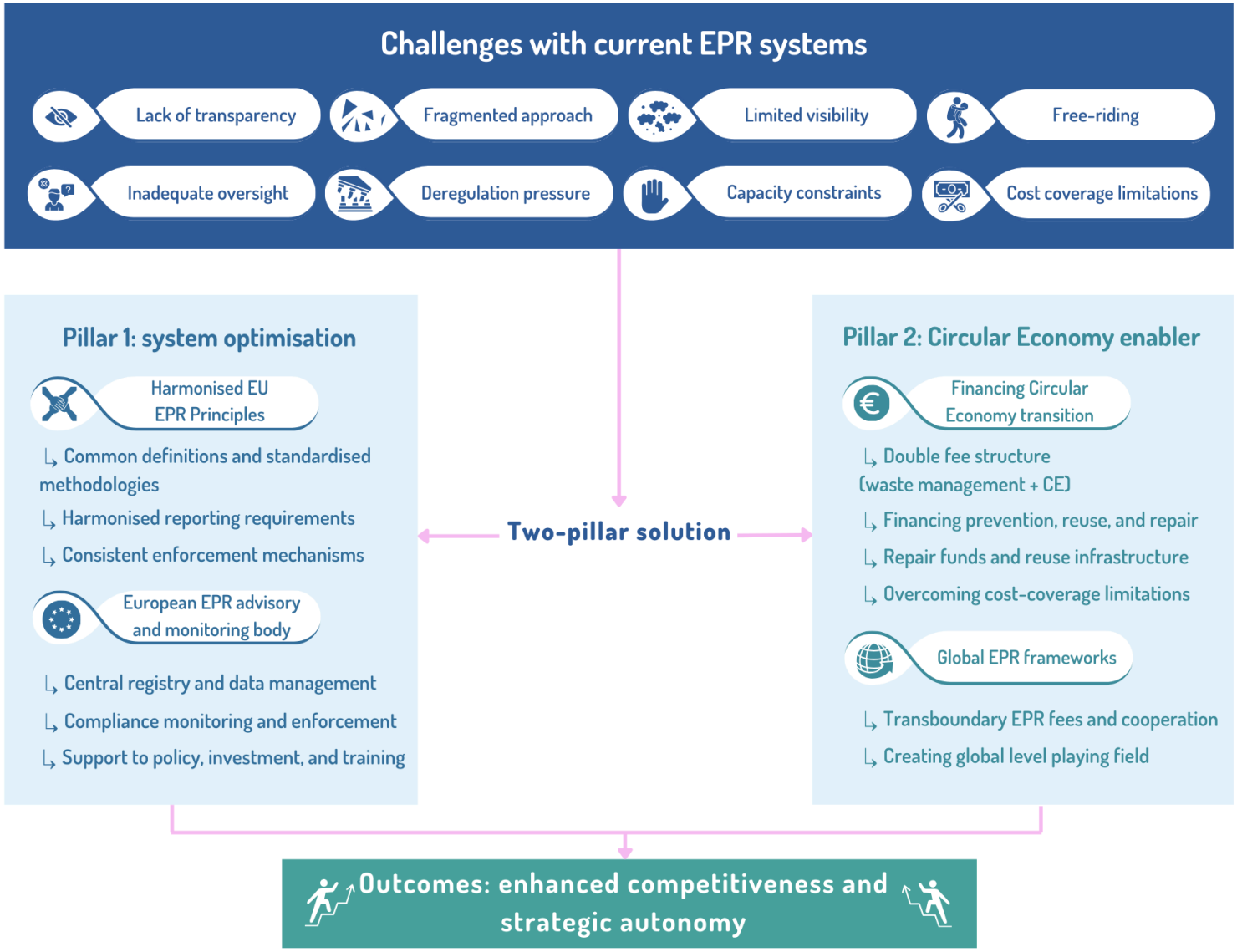
Therefore, the Draghi report's recommendations are correct in pointing out that a circular economy will only be economically feasible when the market prices internalise the cost of externalities; the right infrastructures for circularity are built; and the potential for an EU single market is fully exploited. The European Environment Agency (EEA) has been consistently pointing out the need to further internalise costs for the EU to reap the benefits of a circular economy, and the PPWR confirms that waste prevention is the most efficient way to improve resource efficiency.[35] Now the recommendations of the economists seem to go in the same direction as those of the environmental scientists. Without the internalisation of externalities, resource efficiency will not make economic sense, and the EU will not be able to mine the materials it needs from the waste it produces, thereby undermining its competitiveness and strategic autonomy.

EPR alone cannot deliver a circular economy, but it certainly can play a major role in helping internalise costs, financing new circular economy infrastructure, and strengthening the single market. This places this veteran waste management tool in a privileged position to drive change. To do so, a number of measures will have to be adjusted.

These measures can be divided into two pillars. The first one concerns system optimisation to fix challenges of current EPR systems, exploiting economies of scale that can be provided by a single market that is well-protected against free-riding; and the second one is about making EPR contribute to the rollout of circular economy infrastructure.

[35] Packaging and Packaging Waste Regulation, EC/2025/40, recital 119. 2025. European Commission. eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=OJ:L_202500040

Figure 8: EPR transformation framework: a two-pillar approach to make producer responsibility work and deliver circularity



7. Specific recommendations

7.1 System optimisation – oversight, monitoring and harmonisation

As explored in Part 1 of this study, there are a number of issues which prevent the correct functioning of current EPR schemes and the quick and smooth creation of EPR schemes for new waste streams. EPR systems face seven main challenges that prevent making the best of the existing system:

Lack of transparency

When a company participating in an EPR system receives the bill from the PRO, the amount is normally calculated according to the weight and sometimes units of the product it reported placing on the market, sometimes modulated according to the product's circularity.

As of today, this company rarely knows the real cost for PROs to manage their waste. Equally, there is no information about the cost-efficiency of the systems nor the cost related to the performance of the system.

Fragmented approach

Different calculation methods, reporting requirements, PRO behaviours, and processes across countries make EPR systems costly, administratively cumbersome, and prevent exploiting the potential benefits of the single market. Harmonising some methods and processes can make life easier for companies selling in the EU and help to prevent free-riding.

Limited traceability

Moreover, it is often hard for the company to know whether their product will be effectively recycled or exported; and, when their waste is effectively exported, its fate is not always clear. In either case, the EPR fees that the producers pay for managing their waste do not travel with the waste.

Free-riding

There is a lack of information on the extent to which free riders are selling into the EU market without paying EPR fees, as well as a lack of enforcement into monitoring these EPR fees. As for compliance with other provisions, this is particularly relevant for e-commerce products sold at lower price points.

Inadequate or limited oversight

Sometimes, it is hard for a producer or government to rely on the information provided by the PRO - be it because of how the system is set up (for instance, EPR systems with several PROs make transparency of information impossible because of competition) or the way the system is run (e.g. in cases when PROs have been reporting unfounded data without proper oversight).[36]

Deregulation drive

In the current political environment, some stakeholders propose deregulation as the solution for EU competitiveness and envision EU companies competing against US or Chinese companies on a cost basis. However, given the Old Continent's competitive disadvantage in terms of resources and energy, it is highly unlikely that such a strategy will deliver anything other than further outsourcing of production. In other words, the EU cannot win a battle using the tools mastered by its competitors. Instead, the EU must double down on its strengths.

Capacity constraints on the side of legislators

An increasing number of EPR systems are in operation, with more to be established in the coming years. Some of them are mandated at the EU level, some at the national level. This represents a substantial burden for public institutions to design and monitor existing and new systems, and a burden on companies in terms of understanding and compliance.

Whilst there is an argument to speed up the creation of EPR systems at the EU level in a harmonised way, the lack of resources to support these processes results in delays, lack of coherence, and challenging reporting. For instance, given the slow speed of development of EPR for textiles at the EU level, some countries like France, Hungary, Latvia, and the Netherlands started developing systems before the EU mandated a harmonised system to be ready for the obligation for the separate collection of textiles that entered into force in 2025. As a result of this delay, European municipalities do not have the funding to implement the collection of textiles, and large volumes will continue to be destroyed, impacting the EU's policy-making credibility. Lastly, harmonising EPR for textiles, including existing systems, will be more difficult than if the system had been created at the EU level from scratch.

By streamlining the design and implementation of new EPR systems through the harmonisation of rules and structures, the EU could put in place EPR systems in a much faster and more efficient manner.

Given EPR's experience and track record, there is general consensus about the need to place almost all products put in the European market under EPR, which clashes with public institutions' structural capacity to design those. **At the current development speed, it will take many decades before EPR systems for**

[36] "Analysis of Compliance with the Targets for the Separate Collection Rate of Plastic Beverage SUPD Bottles up to 3 Litres in Spain". 2024. Eunomia Research & Consulting for Alianza Residuo Cero and Zero Waste Europe. zerowasteeurope.eu/library/analysis-of-the-separate-collection-rate-of-plastic-beverage-bottles-up-to-three-litres-in-spain

many products can be fully functional and deliver the competitiveness and strategic autonomy the EU wants to achieve in the coming years.

To address these 7 challenges, two complementary sets of actions would be of help:

1. Developing harmonised EU EPR principles that are common for different product categories so that new EPR systems can be set up faster and in a more harmonised way.

2. Creating a European EPR advisory and monitoring body to guide, organise, and manage data and support the creation of EPR systems in a way coordinated with EU industrial goals.

7.1.1- Harmonised EU EPR principles

Harmonisation of EPR principles at the EU level could simplify the implementation of current EPR systems and streamline the design and implementation of new ones.

Based on 30 years of EPR implementation experience, and recognising the limitations of harmonisation, these are the key principles that could be standardised at the EU level:

Core operational framework

1. Common definitions of producer, product categories, and EPR obligations across all Member States.

2. Centralised registry of producers to improve tracking and compliance.

3. Standardised calculation methodologies for collection targets and fee structures.

4. Harmonised reporting requirements to ensure data comparability between Member States.

Financial Mechanisms

1. Separate cost coverage from economic incentives for design change. Eco-modulation of EPR fees has created confusion without delivering improvements in product design or consumer behaviour. Economic incentives (such as environmental taxation) harmonised at the EU level and in line with other harmonised product policies (e.g. Ecodesign for Sustainable Products Regulation [ESPR]) could drive design change and ensure the functioning of the single market while generating additional funds that could be reinvested in circular practices.

2. Comprehensive cost coverage - including prevention, repair, and reuse infrastructure; cost of treatment of waste subject to EPR ending up in mixed waste stream; data management; and border monitoring to prevent locking into a linear economy.

3. Transparent fee structures defining the costs that must be borne by producers.

4. Standardised calculation methodologies for the cost incurred by municipalities for collection, transportation, and separation of waste.

Governance Structure

1. Unique PRO per country and waste stream rather than competing PROs, provided the system is properly designed to guarantee performance and oversight.
2. Harmonised market entry procedures, streamlining whether PROs or public authorities monitor which products can enter the market.
3. Standardised authorisation requirements for PROs.
4. Harmonised oversight mechanisms for supervising PRO performance.

Performance Standards

1. Consistent enforcement mechanisms against free-riders in the EU market.
2. Effective border monitoring to address the increasing volume of imported products circumventing EU environmental standards and EPR fees.
3. Common quality standards for treatment, recycling, and recovery operations.
4. Metrics for prevention and reuse to move up the ladder of resource productivity.

Market Access

1. Tackling free-riding from imported products.
2. Standardised cross-border rules for online sellers and importers.
3. Level-playing field between EU-produced goods and imports regarding environmental compliance costs.

7.1.2- A European EPR advisory and monitoring body

The harmonisation of EPR principles is a precondition to exploit the potential of EPR. Yet, on its own, it will be insufficient to deliver the structures needed to optimise EPR schemes, let alone the capacity to create EPR systems for new waste streams easily. In this regard, there is a missing piece in the institutional architecture of EPR in the EU.

In the current EPR architecture, and to deliver on the need for monitoring and compliance, some stakeholders have proposed the creation of an independent advisory and monitoring body[37] also named *EU-wide Eco-modulated EPR Delivery* (SEED) to increase compliance, reduce administrative burdens, and address free-riding (i.e. producers selling in the EU market without paying the EPR fees).

However, there are more roles that such a body could consider playing, and which would substantially advance the development of the European circular economy. A non-exhaustive list includes:

- **Reducing administrative burden**
    - Act as a central registry (one-stop-shop) for any producer or retailer who wants to sell in the EU and is obliged by an EPR system.
    - Harmonise reporting requirements.
- **Fostering compliance**
    - Act as a repository of information and watchdog for proper and correct reporting on cost-coverage and achieving collection, reuse and recycling rates, and alert Member States and EU institutions about any suspicion of false reporting.
    - Ensure Member States and PROs are compliant with EU EPR legislation.
    - Coordinate with customs authorities and monitor waste import-export to prevent social and environmental dumping.
    - Monitor online selling platforms against potential free-riding.
- **Policy and advisory support**
    - Provide information to Eurostat and EU institutions as well as national authorities.
    - Share best practices, but also technical recommendations, to improve EPR schemes and potentially advise policy-makers to harmonise EPR schemes in Europe.
- **Training**
    - Train civil servants and officials at different levels, as well as companies, on compliance.
    - Provide support to the creation of new EPR systems inside and outside the EU.
- **Fostering circularity**

[37] "Extended Producer Responsibility Schemes." 2024. FEAD - European Waste Management Association. fead.be/position/fead-position-paper-on-extended-producer-responsibility-schemes

- Create and monitor performance indicators for the producers to better understand the value for money of their contributions.
- If EU-level eco-modulation is introduced, the body shall contribute to designing the fee structure, manage and monitor their correct application, and evaluate whether they achieve the purpose of influencing ecodesign.
- If eco-modulation is replaced or complemented with EU circularity taxes (taxes or levies in favour of more circular/sustainable production and consumption), the body can advise on the tax level, monitor their impact in terms of achieving circularity goals, and channel the revenue into 'circular' initiatives.

- **System design**
  - Assist in the setting up of efficient and transparent PROs and their national monitoring frameworks.
  - Ensure compatibility of EPR systems across the EU.
  - Act as a clearing house for transnational EPR fees.
  - Create and monitor the necessary instruments to enable transboundary EPR systems.
- **Channeling investment into circularity infrastructure and supranational oversight**
  - Organise/coordinate the investment of a part of the EPR fees and/or revenues from taxes or levies into European infrastructure to move up the Waste Hierarchy (complement the national infrastructure and the investment of prevention, reuse, and recycling infrastructure in line with the EU objectives on this front).
  - Finance the custom controls to have the means to monitor borders against free-riding properly.

7.1.2.1. Institutional structure options

Such a platform or body can be designed to be part of the EU institutional structure and a fully independent not-for-profit private entity.

The EU already has European registries such as the Registration, Evaluation, Authorization, and Restriction of Chemicals (REACH), a registry for chemical substances managed by the European Chemicals Agency (ECHA); or the European Product Registry for Energy Labelling (EPREL), which the European Commission itself manages. Given the purpose of this new structure, it could make sense to have it hosted by the European Environment Agency and follow a similar compliance process as with REACH, where the European

Commission is responsible for monitoring enforcement by Member States, but the registry itself is hosted by ECHA. The way REACH is financed (mainly by industry fees and charges, but also with contributions from the EU general budget) could also set a precedent for financing such a platform.

Such an arrangement would have the credibility of having a public institution host and manage the structure. However, this setup also has some shortcomings - like the slower speed of implementation or the potential lack of resources to finance such a structure. Indeed, the speed at which ECHA or REACH operate makes it unsuitable for a tool that is expected to deliver results in the mid-term.

Instead, following the setup of PROs, a lighter, more expedited and agile private structure under the supervision of the European institutions, but financed by a tiny fraction of the EPR fees, could provide more agility to the structure.

7.1.2.2. Financing the platform

There is insufficient information about the amount of money channelled through EPR systems in the EU and, thus, it is hard to speculate about potential budget contributions. Considering that packaging producers today spend between 7 and 11 billion EUR to pay for the EPR fees in Europe, dedicating 1% of this budget to run such a platform would bring a budget similar to what ECHA receives for managing REACH (around 100 million EUR). If the other EPR systems for ELV, WEEE, tyres, batteries, etc. and the upcoming ones on textiles and others would contribute, it is possible that, with less than 0,5% of all the EPR fees in Europe, the Union would be able to finance a platform which can substantially improve the performance of systems; and provide much bigger gains through the exploitation of the economies of scale of a 500-million consumers single market.

Implementing the measures proposed in this section would increase the efficiency of EPR systems, reducing costs for producers, tapping into the economies of scale of the single market, and reducing free-riding. However, because of the EPR paradox (see Chapter 4.5), improving the efficiency of EPR systems without building the necessary circularity drivers in the system risks locking the EU in a waste-based linear model. As important as improving the system's efficiency is to have EPR contribute to moving beyond recycling and becoming a circular economy enabler focused on more effective ways to preserve the value of materials.

7.2. From cost coverage to circular economy enabler

Since the 1990s, EPR has aimed to maximise waste collection to reduce environmental impact and pollution. Part 1 of this study shows that it has largely succeeded in this goal while also providing some recycled content which slightly contributed to reducing the dependence on virgin materials. However, achieving this objective

required little focus on leveraging the EU single market's economies of scale, ensuring proper information flows for assessing material recovery, or planning infrastructure to optimise resource use.

To enhance competitiveness and strategic autonomy, EPR must shift from simply managing waste to properly increasing material productivity and reducing reliance on virgin material imports. This requires complementing system optimisation with value maximisation measures that integrate industrial and waste policies, ensuring the latter serves the former.

Optimising the current system reduces costs, improves efficiency, and enhances data accessibility. However, as discussed in Chapter 4.5, an optimised linear system remains inferior to a fully circular system. EPR was originally designed to internalise the costs of a linear model but, in the transition to a circular economy, it must finance both systems and the shift between them. If EPR continues to fund only the collection and sorting of linear processes, it risks becoming a barrier rather than an enabler of circularity.

To assess how an optimised EPR system has to be designed also to maximise the circularity, two types of approaches are needed: one that looks at the accompanying policy measures, and another that looks at the fee structure of EPR systems so that they contribute to financing the infrastructures to increase circularity.

7.2.1. Accompanying measures to make EPR contribute to a circular economy

Despite the billions of euros that EPR systems move in Europe, it is codified in EU legislation as a waste management tool rather than a circularity one. Therefore, all other things being equal, the only way EPR can help reduce the absolute environmental footprint is by either collecting and recycling waste at rates higher than waste is generated or by having stable or declining waste generation whilst growing recycling.

Part 1 showed how material use and waste generation for the waste streams covered by EPR in Europe have been growing faster than that stream's collection and recycling rate. **Therefore, capping or reducing waste generation whilst increasing recycling is one way to increase material circularity (under the assumption that there is no material substitution).**

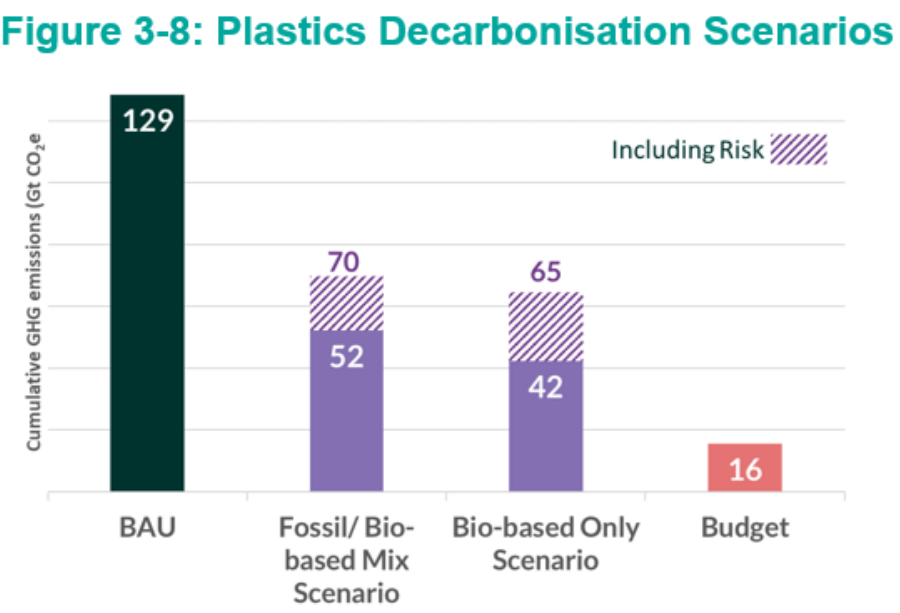
In 6.2.2, we will see what EPR-related measures can help increase material circularity. Outside EPR, some measures could contribute to increasing material circularity and reducing raw material consumption. So far, policies tend to regulate existing material flows but with the implicit assumption in the policy that resources are unlimited. The only way to ensure that material circularity increases and environmental impact declines is by ensuring that the use of resources and/or waste generation is either capped or reduced. In a scenario of capped or declining resource use, pollution, or waste generation, any increase in recycling will provide an absolute increase in resource productivity. In any other situation, the benefit of EPR and recycling will always be relative since the environmental impact will continue to increase in absolute terms.

Capping resource use

Let's consider a scenario where the global community respects the climate agreement of staying under 1,5°C warming. When it comes to plastic use the, Interngovernmental Panel on Climate Change (IPCC) estimates that plastic production and management uses 2% of all CO_2eq emissions - that is 1,2Gt of the approximately 50 Gt of CO_2eq emitted yearly. Complying with the Paris Climate Agreement means emitting a maximum of 400 Gt of CO_2eq until 2050.[38] If the proportion of all materials used – cement, steel, copper, etc. - would remain stable, this would mean that the carbon budget for plastic production would be around 16 Gt. For reference, without a cap on production and under current growth projection rates, the plastic sector alone would consume 125Gt - more CO_2 than the global carbon budget available for aluminium, cement, and iron & steel combined.

If such a cap on plastic production were imposed, for instance 16Gt, the importance of EPR as a tool would grow exponentially since recycling would be key to accessing materials that today are too cheap to produce from fossil sources. It would also mean that non-recyclable polymers would automatically be phased out or redesigned, as the comparative cost of single-use unrecyclable plastic would be too expensive to use only once or twice.

Figure 9: Plastics decarbonisation scenarios[39]



Once a cap on resource use is decided — imposed by government decision or by the inability to obtain it in the market at an acceptable price — a tradable scheme can drive the highest value of resource allocation.

[38] "Is Net Zero Enough for the Materials Sector? Analysing the decarbonisation pathways for key materials sectors and their ability to meet globan carbon budgets" 2023. Eunomia Research & Consulting for Zero Waste Europe. zerowasteeurope.eu/library/is-net-zero-enough-for-the-materials-sector

[39] *ibid.*

Prevention targets

A prevention target to stop and curb waste generation combined with ambitious collection targets and proper ecodesign can be an effective way to increase circularity. A good example of this approach is the PPWR's art 43.[40] The Regulation sets a waste prevention target for packaging of 5% by 2030, 10% by 2035, and 15% by 2040, combined with high collection, reuse, and recycling targets. It is important to note the nuance of targeting a whole sector (packaging) instead of a material (plastic) to prevent material substitution.

Reuse or repair targets can be seen as a way to prevent waste when the reuse systems are designed to deliver very high collection or life extension rates.

Other tools which can complement EPR systems are:

Bans. For certain unrecyclable, heavily littered, or toxic products or streams for which alternatives exist, it makes more sense to consider banning them instead of setting up an EPR system. An example of this approach is in the EU Single Use Plastic Directive,[41] which bans some products that are highly littered, unrecyclable, and for which alternatives exist. As a general principle, and to prevent lock-in situations, it makes sense to consider bans before setting up EPR systems since many products or materials are better off replaced than managing them when there is no recycling technology or secondary market for the recyclate. For items such as fishing nets, for which alternatives are hard to find, setting up an EPR system can make sense.

The bans must be well-designed, and loopholes must be avoided as much as possible. For instance, partial bans - such as bans based on the thickness of plastic bags - can create solutions that only make the problem worse if lightweight single-use bags are replaced with heavier "reusable bags" that are used only once.[42] Bans should be material-neutral as much as possible to avoid material substitution.

Taxes and levies. Taxes are more politically challenging and resource-intensive to organise and operate than restricting market access. Still, they can be a good complement to influence consumer and producer behaviour and steer the market to more sustainable materials or products. For instance, in Ireland, a levy on plastic bags of 0,15 EUR reduced the use of plastic bags 40 times and raised 200 million EUR in 10 years[43] - much more effective than what an EPR system could have delivered regarding waste prevention.

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[40] Regulation (EU) 2025/40 of the European Parliament and the Council of 19 December 2024 on packaging and packaging waste, amendeding Regulation (EU) 2019/1020 and Directive (EU) 2019/904, and repealing Directive 94/62/EC. 2025. Official Journal of the European Union. eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L_202500040

[41] Directive (EU) 2019/904 of the European Parliament and of the Council of 5 June 20219 on the reduction of the impact of certain palstic products on the environment. 2019. Official Journal of the European Union. eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32019L0904

[42] Chandran, Pinky. "Bans, Clean-Ups, Recycling Push: Why All of This Has Failed to Beat Plastic Pollution." 2023. Citizen Matters. citizenmatters.in/plastic-pollution-solutions-beyond-bans-clean-ups-recycling

[43] Anastasio, Mauro, and Nix, James. 2016. "Plastic Bag Levy in Ireland." 2016. Institute for European Environmental Policy (IEEP). ieep.eu/wp-content/uploads/2022/12/IE-Plastic-Bag-Levy-final-1-1.pdf

A ban on a material or product can also be understood as an infinite tax. Therefore, a good path towards a phase-out that allows time for the alternative to scale up can be to set up a tax starting at a low level and increasing over time.

Subsidies. Some systems, especially when they don't have the competency to set taxes or bans, may opt for subsidising the alternative to the product or packaging whose use we want to reduce. Subsidies can work in some circumstances, but they have the disadvantage that the taxpayers have to pay twice: first for the subsidy and later for the waste fee. Let's imagine a municipality that decides to subsidise the implementation of a reuse system for take-away packaging. On the one hand, it has to use taxpayer money to cover the costs of cleanup and collection of single-use packaging for take-away; and then use taxpayer money to create the subsidy to pay for the reuse infrastructure. Moreover, there is the danger that the situation could return to the initial position when the subsidy is withdrawn.

Cap-and-trade. There is literature about the benefits of implementing a cap-and-trade system to use market forces to reduce the environmental impact, especially in cases of "grandfathering". However, experience with projects such as the EU Emissions Trading System is living proof that these systems are slow in delivering environmental benefits, and that bans or taxes are a much better way to obtain results in the short term.

All in all, any existing or new EPR system that doesn't include any of these accompanying measures will not be able to reduce the absolute environmental impact of the system unless the reduction happens because of external factors such as economic or social downturn. The success of any future EPR system lies in the capacity to be implemented in coordination with other policy tools with a clear sense of direction for reducing the overall environmental impact.

7.2.2. EPR as a tool to finance prevention, reuse, and repair

EU legislation clearly places EPR as an enabler for recycling. The most recent EU legislation pushes circular measures in the form of recycled content targets for metals (6% for lithium and nickel, 16% for cobalt and 85% for lead) and plastics (10 to 35% for plastic packaging applications, 25% plastic in vehicles, plastic in batteries), and mandating that at least 25% of critical raw materials consumption in the EU comes from recycling. EPR is a key tool to finance the collection infrastructure needed to deliver these levels of recycled content.

The PPWR goes a step beyond by establishing recyclability performance grades and mandating modulation of the EPR fees based on recyclability performance. Design for Recycling will be developed by 2028 and compulsory as of 2030.

Beyond recycling, the ESPR establishes a framework for setting ecodesign requirements for specific product groups to improve their environmental sustainability, including some interesting tools such as the Digital

Product Passport, which will provide some ecodesign drivers in the future. These ecodesign requirements will undoubtedly improve aspects critical for increasing the preservation of the value of products and the materials in them; but whereas end-of-life materials have a whole system organised around them to capture the remaining value, such a system is almost completely lacking in the side of preventing products from becoming waste.

Initiatives such as the Right to Repair Directive (2024/1799) complement the ESPR in promoting more sustainable consumption by increasing the repair and reuse of goods within and outside the legal guarantee. The prevention and reuse targets in the PPWR also provide some legal drive on non-waste measures.

The challenge is that, while collection and recycling are supported by strong financial tools (such as European and national funding for recycling infrastructure [through grants and loans], as well as EPR fees paid by producers to fund collection and sorting) other key circular economy measures like reuse, repair, repurposing, refurbishing, and prevention receive little to no financial support. This difference in funding for waste management *versus* waste prevention is above 1000 orders of magnitude. This is counterintuitive given the higher added value of preventing waste *versus* managing waste and the priorities that the Waste Hierarchy is expected to indicate.

Public funding for repair and reuse infrastructure has so far been insufficient. It is as important as mobilising EPR fees for this purpose. but falls outside the focus of this study, which focuses on the future repurposing of producer responsibility. Focusing on the use of EPR fees to finance the advancement of reuse and repair practices, there are several considerations to consider:

Firstly, one of the main reasons for throwing away a product which could be reused, repaired, or refurbished is the lack of economic incentive to do so. If mending a jacket, repairing a kettle, upholstering an armchair, or reusing packaging is less economically attractive or more logistically challenging than buying a new one, the obvious choice is to dispose of it and buy a new one, no matter how sustainable or ecodesigned the item is. Therefore, there is a clear need to bridge the economic gap which makes value preservation and material circularity uneconomical.

Secondly, whereas the current EU definition of EPR defines it as "*a set of measures taken by Member States to ensure that producers of products bear financial responsibility or financial and organisational responsibility for the management of the waste stage of a product's lifecycle",* the original policy principle developed by T. Lindhqvist in the 1990s defines it as *"a policy principle to promote total life cycle environmental improvements of product systems by extending the responsibilities of the manufacturer of the product to various parts of the entire life cycle of the product"*. Hence, the original policy principle developed a decade before the EU definition seems to be 30 years ahead of EU policy-making, already encompassing circularity and strategic autonomy.

Thirdly, the current policy bias towards financing waste management and financially neglecting value preservation in products and services is hardly defendable if the EU competitiveness strategy is to be based on maximising resource productivity and investing in quality and safety as a competitive advantage.

Lastly, the main critical - and yet unavoidable - challenge to address if EPR coverage is to include measures devoted to preventing products from becoming waste is the cost increase that this might represent for producers. A largely avoided topic in 10 years of the EU circular economy narrative is who should finance the transition from a linear to a circular economy. As a result, investment in circular systems and activities has been symbolic and completely out of scale with EU policy goals. Some producers, such as Decathlon or IKEA, have taken the initiative to take back products to give them a second life; and others, such as Nestle or Carrefour, have launched some reuse schemes, but nothing close to a concerted collective action to finance value preservation at scale. The challenge of how to finance the optimisation of the linear economy via more and better recycling, and how to, in addition, finance the transition into a circular economy, remains unresolved. What is hardly arguable is that the EU won't get to the latter by investing solely in the former.

It is important to note that the EU is already including this approach in Article 51 (3) of the PPWR: *"Member States shall ensure that EPR schemes and DRS allocate a minimum share of their budget to financing reduction and prevention actions"*. There are a growing number of EPR systems which are already seeing their responsibility go beyond waste management:

- The **French** Anti-Waste and Circular Economy Law (AGEC), enacted in 2020, mandates EPR systems to explicitly finance reuse and repair activities. This is achieved by establishing a dedicated Repair Fund financed by EPR contributions from producers. The fund provides financial incentives, known as "repair bonuses," to consumers who repair their out-of-warranty electronic appliances, textiles, and footwear. For packaging, the law sets the goals for reusable packaging (10% by 2027) and mandates the French packaging PROs to devote a percentage of their budget to finance its rollout.

- In the **Netherlands**, EPR regulations mandate that producers finance reuse and repair activities, particularly within the textile sector. Under the *Extended Producer Responsibility for Textiles Decree*, effective from July 1, 2023, producers are responsible for organising and funding systems that ensure the collection, reuse, and recycling of textile products they introduce to the Dutch market.

- **Sweden** has expanded its EPR system to include repair obligations, particularly for electronics and appliances; and introduced tax incentives to make repairs more economically viable, with producers contributing to the system.[44]

- In Austria, recent EPR frameworks include mandatory financing for preparation for repair activities for WEEE and reuse activities for packaging as part of the DRS system for single-use.[45]

- In Belgium, **Flanders** has EPR requirements that include financing for reuse centers.

[44] Swedish Waste Ordinance (2020:614) amending the Swedish Ordinance on Producer Responsibility for Electrical and Electronic Equipment (2014:1075)
[45] Verpackungsverordnung 2014 amended in 2021 and Elektroaltgeräteverordnung - EAG-VO

Despite the national efforts mentioned above, the lack of harmonised action and clear legal guidance at the EU level on reuse and repair activities undermines the financing potential that EPR systems can play in the transition towards a circular economy.

Moreover, the amount of funding mobilised by pioneer EPR systems to promote reuse and repair is vastly insufficient to mainstream circular practices. For instance, in 2024, France was the country with the biggest investment in reuse infrastructure for packaging worldwide thanks to the funding from EPR fees. And yet, the most important investment in the world to support packaging reuse was around 50 million EUR in 2024 - an important and unprecedented amount, and yet rather small in comparison with the budget spent to manage single-use packaging (which in France is in the order of 1000 million EUR per year). For the sake of comparison, European plastic manufacturers will invest 2,6 billion EUR in 2025 in chemical recycling which, if allocated proportionally in Europe, would amount to an investment of 390 million EUR in France alone[46]. That is 8 times more investment into a (so far) high-risk and low-yield-bearing technology than investing in a proven system which preserves close to 100% of the yield after the first use.

Even more telling is that, even if EPR were to finance the whole reuse system for packaging at the national level, the financing need would probably be higher than the current cost of running the single-use system, which raises the question of how much the public sector should be involved in financing the transition.

For this reason, it is crucial for the EU's goals to include concerted action to finance reuse and repair activities by mobilising both public funding through grants and loans and private funding via producer responsibility schemes.

Public funding can come from the general budget of the municipality, region, country, or EU, but it can also be raised by directing the income generated by a levy on single-use packaging, clothing, or any other item which must undergo the transition from a linear to a circular system. Consumers would pay this levy, and as such, it is not a producer responsibility fee. Still, it illustrates a way to combine public, private, and individual contributions to finance the transition to a circular economy. Such revenue could be used to build public infrastructure for reuse – even if it is privately operated - which would have the advantage of providing more accountability and transparency on the process and ensure that the reuse infrastructure is (co-)designed by public bodies in cooperation with producers, rather than by producers alone.

This issue goes back to structuring the EPR systems' operationalisation: in Europe it is normally the local authorities who organise the collection, whereas producers pay for the costs and intervene at the sorting and/or recycling stage. It makes sense that reuse infrastructure follows a certain approach that makes it recognisable and interoperable beyond the local level, and this requires some sort of coordination of local authorities under the guidance of the national or supranational bodies. Hence, the revenues of such a tax could also be used to set up a new PRO charged with the implementation of the reuse transition with the

[46] "European Plastics Manufacturers Plan 8 Billion Euros of Investment in Chemical Recycling." 2021. Plastics Europe. plasticseurope.org/media/european-plastics-manufacturers-plan-7-2-billion-euros-of-investment-in-chemical-recycling-2

involvement of local authorities, brands, and other players. This alternative collaborative governance approach to building infrastructure for reuse and repair could provide better governance and oversight and serve a public good purpose instead of only focusing on maximising economic efficiency by externalising costs on society.

7.2.2.1. Different ways to articulate EPR for reuse and repair

There isn't a single approach to implementing EPR for reuse or repair, and local circumstances should inform the best organisational arrangements.

For fast-moving consumer goods:

- **Packaging reuse:**
    - For products currently sold in single-use packaging without viable recycling options, authorities should design transition pathways to reuse systems with clear plans to phase out single-use options.
    - For products that are mainly consumed on the go, such as beverage packaging or take-away food packaging, a dedicated EPR system that integrates reuse and single-use options into the same infrastructure and a system with a deposit and return system.
    - For products that will continue to be sold pre-packaged, brands should cover the collection and treatment costs for single-use and reusable packaging, with a clear transition plan toward reuse when environmentally beneficial.
    - The role of PROs in such an EPR system for reuse - be it a branch of the PROs for single-use or creating a specific PRO to manage reuse - can range from financing the new reuse systems, financing the costs of brands to join a reuse scheme, to designing and running them.
- **Reuse of hygiene items such as nappies, wipes and sanitary pads:**
    - Currently there are no EPR schemes for such items; but given the prevalence of these items in the waste composition analysis, its little or non-existent recyclability,and the costs they represent for municipalities,[47] it can be envisaged that, if the EU sets the right framework for streamlining the creation of new EPR schemes, it should be relatively straightforward to set up EPR for these fast-moving consumer goods.
    - When EPR systems for hygiene items are designed, they should include the financing of nappie reuse systems, which would be operationalised by local or regional authorities. This can

[47] Cabrera, Alba, and Garcia, Rosa. "Single-use menstrual products, baby nappies & wet wipes" 2019. Break Free From Plastic, Reloop, Rezero, and Zero Waste Europe. zerowasteeurope.eu/wp-content/uploads/2019/12/bffp_single_use_menstrual_products_baby_nappies_and_wet_wipes.pdf

take the shape of a reuse fund to set up and subsidise reuse systems or a direct contribution per used and washed nappie.

For durable and semi-durable consumer goods:

- **Textiles and footwear (semi-durable and non-durable):**
    - Repair bonuses should ensure that repair costs remain substantially lower than the price of a new product. The approach used by France establishes an EPR-financed repair fund known as "Bonus Réparation," which provides consumers with direct discounts on repair services to make repair cost-competitive *versus* replacement for new items.
    - EPR should also finance the work of social economy actors active in repair or reuse, financing qualification programmes for repair skills by supporting pilot projects that, for instance, aim at reusing components as spare parts, and funding information and awareness measures.
    - Finally, EPR funds should also contribute to reforming the collection, sorting, and treatment systems in order to promote the repair and reuse of discarded products (as well as components).
- **Electric and electronic appliances**
    - This can follow a similar approach to that of textiles and footwear combined with some DRS options to incentivise the return of the most critical and/or less collected items.
- **Batteries**
    - This can follow a similar approach to that of textiles and footwear combined with some DRS options to incentivise the return of the most critical and/or less collected items such as portable batteries.
- **Furniture and mattresses**
    - This can follow a similar approach to that of textiles and footwear.
- **Tyres**
    - Given the fluctuating price for retreading operations for heavy-duty tires, the case could be made for PROs to set a Repair Fund similar to textiles and electronics to cover the difference in price between buying new and buying retreaded tyres, which could substantially increase material productivity of tires when it makes environmental sense.

To effectively implement EPR-financed repair funds, several key principles should be followed:

- Funding amounts must be substantial enough to incentivise repair over replacement. The French program aims to keep repair costs below 33% of the new product price, which is identified as a psychological threshold for consumers.
- Certification for repair businesses should be standardised, simple and accessible to prevent excluding smaller operators.
- Independent stakeholders should be involved in decision-making about fund implementation to ensure balanced perspectives.
- A wide range of products should be eligible to maximise consumer participation.
- Robust communication strategies are essential to ensure consumers are aware of the programme.
- Data collection on repairs conducted and their environmental impacts should be systematic to evaluate and improve the system.

7.2.2.2.The role of fee ecomodulation in reuse and repair

Ecomodulation of EPR fees can help promote reuse and repair by adjusting producer fees based on a product's environmental performance. Lower fees incentivise repairable and durable products, while higher fees discourage designs that hinder repair.

By using ecomodulated fees, EPR systems can directly finance repair activities - such as consumer repair bonuses, training programmes for repair professionals, and support for social economy actors engaged in reuse. Circular business models, such as leasing or product-as-a-service schemes, could also receive financial incentives, making reuse more economically viable.

A well-designed ecomodulation system aligns producer responsibility with circular economy goals by rewarding sustainable design and funding repair-first initiatives. By shifting financial support from waste disposal to reuse and repair, EPR can help reduce resource consumption, cut emissions, and extend product lifespans, fostering a truly circular economy.

However, the big caveat of ecomodulation is whether it will be at a significant level to trigger changes in the production or consumption of the product. Currently, WFD's art 8a limits EPR fees to the cost coverage of waste management, which means that EPR fee ecomodulation is insufficient to have a significant impact on product design.[48] Indeed, if the intention is to influence producer or consumer behaviour, the legislation would have to allow going beyond cost coverage or, in its default, go for a tax, which is a much better instrument to influence consumer behaviour. Otherwise, in general, taxes/subsidies/rebates/ecomodulation harmonised at the EU level are a better tool to drive consumer behaviour than ecomodulating EPR fees at the national level.

[48] "Eco-Modulation of Fees for 'Greener' Products: Concerns and Challenges | WEEE Forum." 2021. WEEE Forum. weee-forum.org/ws_news/eco-modulation-of-fees-for-greener-products-concerns-and-challenges.

There is a big potential for EPR to play an active role in financing and providing the economic incentives to transition towards a circular economy, but it will require the vision and political will from the EU institutions to seize the opportunity and build the system optimisation features elaborated in 6.2.1.

7.2.3. Creating a level playing field beyond EU via global EPR frameworks

Waste knows no borders and it has almost become a commodity. However, EPR fees struggle to be as movable as the waste to which they are supposed to be attached, and this results in environmental damage and a lost opportunity to recirculate materials. Whilst there is some coordination for some EPR systems, there is no such thing as a global EPR or transboundary EPR fee.

And yet, the creation of EPR systems in the EU and worldwide is accelerating. From a situation in which EPR was basically happening in the EU, we are moving towards a scenario where EPR systems are being set up everywhere and for many waste streams. Whilst there is some incomplete harmonisation of principles in the way they are being set up in the EU, the rest of the world is a lot more heterogeneous, and the performance of EPR systems widely varies from country to country.

At the same time, the EU is a big exporter of recyclable materials (plastics, metals, and paper and cardboard), electronic waste, textile waste, and mixed waste for incineration. Despite recent amendments to the EU Waste Shipment Regulation, waste will continue to be exported and imported, albeit under more stringent rules, which raises the question of how much interconnection there should be between EPR systems inside and outside the EU.

Currently, the main receivers of EU waste have either weak, non-functioning, or just non-existing EPR systems, but there is a clear trend towards creating EPR systems across the board. The idea of creating global EPR frameworks charged with ensuring consistency in producer obligations, fee structures, and recycling targets across different countries is taking shape mostly for semi-durable and durable goods such as textiles or electronics.[49] Unlike national EPR schemes, global EPR would require producers selling internationally to contribute to waste management, regardless of where the product is discarded.

Considering that one of the main reasons for EU waste exports to take place is the quest for lower treatment costs, often due to lower social and/or environmental standards, the creation of global EPR frameworks represents an opportunity for the EU to create a level-playing field with waste management from outside the EU. Such a scenario would play in favour of waste staying in Europe and ensuring proper treatment instead of waste following the cheapest route.

[49] "#STOP WASTE COLONIALISM – Stop Waste Colonialism." 2025. stopwastecolonialism.org

Creating global EPR frameworks is also an economic opportunity for European solution providers to help set up collection and recycling infrastructure in third countries.

Lastly, they would not only ensure European waste gets properly recycled but, above all, create the conditions for European waste to remain in the EU for treatment and generate economic activity in the continent. If a level playing field were created, and given the advanced recycling infrastructure in Europe, the European waste trade balance could be inverted. The Old Continent could become an importer of waste, which would contribute to meeting the strategic autonomy of critical raw materials goals while solving waste problems in countries with no infrastructure to manage them.

WFD's Art 8.5 mentions the plans to produce guidelines on organising cross-border cooperation. The EU's mid- and long-term strategy on competitiveness and strategic autonomy must be proactive in setting global EPR frameworks.

7.2.4. Overcoming cost-coverage as a barrier to circularity

A critical point for the use of EPR as a tool to support EU competitiveness and strategic autonomy is the limitation imposed by the WFD's Article 8(5) , making clear that financial contributions paid by producers must not exceed the costs necessary to provide waste management services in a cost-efficient way.

As primarily written, the legislation establishes EPR as a cost-coverage mechanism rather than a funding source for broader circular economy initiatives. While there is some flexibility in defining legitimate waste management costs and objectives, the explicit ceiling in Article 8a(4)(c) creates a legal barrier to using EPR fees to fund activities beyond waste management.

Interestingly, Article 8(2) encourages Member States to take measures to promote product design that reduces environmental impact and waste generation. While not directly permitting higher fees, this provision establishes product design improvement as a legitimate objective of EPR policy.

The history of EPR in the EU provides enough proof that at current levels of cost coverage, the price signals of EPR are insufficient to drive change in business models, let alone product design, thereby contradicting the policy principle that inspired the European legislation. However, from a legal perspective, the dual purpose of EPR of delivering cost coverage and ecodesign incentives proposed by Professor Lindhqvist has proven problematic since policy tools are normally best suited and consequently oriented at delivering not more than one outcome. There are two possible ways forward:

1. **Amending WFD's art 8** to allow EPR fees to align with the circular economy goals and go beyond cost coverage. It doesn't solve the problem of the dual purpose of the instrument, but the design of the EPR

fees can break up the cost coverage fee and the ecomodulation part to effectively target two outcomes with one fee. An additional challenge is that ecomodulation of EPR fees is typically organised to drive recyclability and not repair or reuse; hence, ecomodulating to support recyclability, toxicity, and reuse and repair simultaneously can prove challenging. This setup also doesn't address the problem of harmonising fee structures, which can create loopholes.

2. **Setting a double fee structure**. One fee would focus on delivering the cost coverage of waste management activities, and the other one would focus on driving producer and potentially consumer behaviour to deliver on the system change required to transition towards a circular economy.

The first variable could be a fee – calculated by weight - paid by producers to compensate for the costs of collection and treatment of the product or packaging placed in the market. This variable is very much linked to the local conditions. Hence, it makes sense that it is set at the national level, since the cost of collection and treatment varies from country to country based on several factors (transport distances, energy prices, labour costs,...).

The second variable would serve the function of providing incentives for ecodesign and potentially influencing consumer behaviour. It would be set up on top of the collection and treatment costs. Depending on the product's or packaging's technical characteristics - such as recyclability, carbon footprint, litterability, etc. - the fee would be higher or lower. The revenue from this fee would be dedicated to financing the transition to a circular economy, building reuse and repair infrastructure, consumer-facing campaigns, data collection and management, etc. This second variable can be harmonised at the supranational level, thereby providing clear guidance for producers as to what is considered more or less sustainable and, this way, avoiding market fragmentation. Table 2 illustrates the **double fee structure for EPR**, breaking down the fees and their purposes:

Table 2: Double fee structure for EPR

FEE TYPE	BASIS FOR CALCULATION	PURPOSE	LEVEL OF IMPLEMENTATION	USE OF REVENUE
Waste management fee	Weight-based (per product/packaging)	Covers costs of collection, transport, and treatment	National level (reflecting local costs)	Waste collection, sorting, recycling, and disposal
Ecodesign & circular economy fee	Product characteristics (recyclability, carbon footprint, litterability, etc.)	Incentivises ecodesign and sustainable consumer behaviour	Supranational level (harmonised across markets)	Funding reuse & repair infrastructure, awareness campaigns, data collection & management

This dual structure ensures cost coverage while also driving systemic change toward circularity.

8. Conclusion

EPR has proven to be a useful tool for mobilising resources to manage waste when the legislation provides the right guidance, but its potential to drive circularity remains largely untapped.

This study analysed how the use of EPR during the last decades has neither prevented the increase in waste generation nor helped to advance reuse or repair agendas. Hence, its contribution to circularity has remained limited to advancing recycling.

The study presented ways EPR could contribute to the EU's strategic goals of competitiveness and strategic autonomy by increasing circularity and (co-)financing the transition to a circular economy. This will require looking into ways to address the challenges of the current implementation of EPR related to system optimisation while developing new ways to address the new challenges the EU faces today, further deepening into the original purpose of the original policy principle of EPR, and addressing the responsibility for the whole lifecycle of products.

Whilst the industry and several stakeholders seem interested in advancing some aspects of producer responsibility, it is important to address the challenges of EPR holistically and effectively. Failing to tackle the role of EPR beyond waste management or as a tool to create a global playing field and focusing on system optimisation risks undermining the EU's economic and industrial agenda.

Perhaps **the most important learning is that the future of EPR lies not in perpetuating waste management, but in catalysing a systemic shift towards resource efficiency and circularity**. By addressing these critical aspects, EPR can become a cornerstone of sustainable development, driving innovation, creating green jobs, reducing environmental impacts and increasing EU's competitiveness and strategic autonomy.

9. Glossary of terms and acronyms

- **CE**: Circular Economy
- **Circular Economy**: an economic system aimed at eliminating waste and preserving the value of materials over time.
- **DRS: Deposit Refund System**. A system where consumers pay a small deposit when purchasing a product, which is refunded when they return the empty container.
- **Ecodesign**: an approach to designing products with special consideration for the environmental impacts during their whole lifecycle.
- **Ecomodulation**: adjusting EPR fees based on the environmental criteria of products.
- **ELVs**: End-of-Life Vehicles.
- **EPR**: Extended Producer Responsibility. A policy approach where producers are given significant responsibility for the treatment or disposal of post-consumer products.
- **ESPR**: Ecodesign for Sustainable Products Regulation.
- **Just Transition**: ensuring that the shift towards environmentally sustainable economies and societies is as fair and inclusive.
- **OECD**: Organisation for Economic Co-operation and Development. An intergovernmental economic organisation with 38 member countries.
- **PPP**: Polluter Pays Principle. The principle that those who produce pollution should bear the costs of managing it to prevent damage to human health or the environment.
- **PRO**: Producer Responsibility Organisation. An entity set up to implement EPR on behalf of multiple producers.
- **PPWD**: Packaging and Packaging Waste Directive. EU legislation aimed at harmonising national measures concerning the management of packaging and packaging waste.
- **PPWR**: Packaging and Packaging Waste Regulation. EU legislation on packaging and packaging waste that replaced the PPWD as of 2024.
- **REACH** - Registration, Evaluation, Authorisation, and Restriction of Chemicals.
- **Reusable Packaging:** packaging which has been designed to accomplish multiple trips and uses.

- **Single-use Packaging**: Packaging designed to be used only once before being disposed of or recycled.
- **SUPD**: Single-Use Plastics Directive. EU directive aimed at reducing the impact of certain plastic products on the environment.
- **Waste Hierarchy**: a ranking of waste management options according to what is best for the environment. The order of priority is: prevention, reuse, recycling, and disposal.
- **WEEE** - Waste Electrical and Electronic Equipment.
- **WSR** - Waste Shipment Regulation.

Zero Waste Europe (ZWE) is the European network of communities, local leaders, experts, and change agents working towards a better use of resources and the elimination of waste in our society. We advocate for sustainable systems; for the redesign of our relationship with resources; and for a global shift towards environmental justice, accelerating a just transition towards zero waste for the benefit of people and the planet.
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Zero Waste Europe gratefully acknowledges financial assistance from the 11th Hour Project. The sole responsibility for the content of this material lies with Zero Waste Europe. It does not necessarily reflect the opinion of the funder mentioned above. The funder cannot be held responsible for any use that may be made of the information contained therein.

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Date: April 2025

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