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EPR in the EU Plastics Strategy and the Circular Economy: A focus on plastic packaging

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Table of Contents

List of Tables

List of Figures

List of Boxes

List of acronyms used

ADF	Advance disposal fees
C/I	Commercial / industrial
CPR	Collective producer responsibility
DIY	Do it yourself
DLF	Swedish Food & Drinks Retailers Association
DRS	Deposit refund scheme / system
ELV	End-of-life vehicles
EPR	Extended producer responsibility
EU	European Union
EUR	Euros
GDP	Gross domestic product
GHG	Greenhouse gas(es)
GPP	Green public procurement
HDPE	High-density polyethylene
HH	Household
IPR	Individual producer responsibility
LCA	Lifecycle assessment
PEF	Product environmental footprint
PET	Polyethylene terephthalate
PLA	Polylactic acid
PMD	Plastic, metal and drink cartons
PP	Polypropylene
PPE	Polyphenylene ether
PPWD	EU Packaging and Packaging Waste Directive
PRO	Producer responsibility organisation
SvHD	Trade Association for Grocery of Sweden
UK	United Kingdom
UNEA	United Nations Environment Assembly
WEEE	Waste electrical and electronic equipment
WTE	Waste to energy (incineration)

Executive Summary

Introduction

This study provides policy recommendations to input into the ongoing development of the EU Plastics Strategy and discussions on the Circular Economy Package, with a view to **encouraging more ambitious extended producer responsibility (EPR) to bring about a more sustainable use of plastics**, and in particular plastic packaging.

This study focuses on **packaging as the main user of plastics in Europe**, accounting for around 40% of plastics demand (Plastics Europe, 2016). Around 15.4 million tonnes of plastic packaging waste were generated in 2014 (Eurostat, 2017a), with **around 40% recycled in 2015** (Plastics Europe, 2016). However, **landfilling and incineration are still common** for plastic packaging waste (Plastics Recyclers Europe, 2016), and a large amount also ends up in the environment and oceans as **marine litter** (Jambeck et al, 2015).

Increasing recycling and reuse of plastic packaging is crucial to Europe's plastic waste management. EPR has the potential to play a key role in this.

EPR schemes for plastics in the EU

Twenty-six of the 28 EU Member States currently have EPR schemes in place for packaging waste. The Member States have taken **varying approaches,** for example collective (CPR) vs individual producer responsibility (IPR). Nine countries have **competing schemes**; 12 have only one scheme. Some producer responsibility organisations (PROs) assume only **(simple) financial responsibility**, whilst others have **partial or full operational responsibility**. Some schemes cover only certain types of packaging, i.e. **household/equivalent packaging** vs **commercial and/or industrial packaging**, or both.

All schemes include some **basic fee modulation** (charging differing fees to producers for each packaging material), with **fees for plastic and for composite packaging materials typically significantly higher** than fees for other packaging materials (Pro-Europe, 2017d) (for example EUR 211 per tonne for PET/HDPE and EUR 246 for drink cartons compared with EUR 124 for steel, EUR 33 for aluminium, EUR 21 for glass and EUR 17 for paper/card in the Belgian Fost Plus scheme (Fost Plus, 2015b, 2017e)). Some schemes charge **specific fees for different types of plastic** (e.g. PET/HDPE, beverage cartons, expanded polystyrene, bio-plastics/bio-degradable plastics and plastic bags).

Only a few schemes have more advanced **eco-modulation of fees** (e.g. applying no fee to reusable packaging, higher fees for non-sortable / non-recyclable packaging, or higher fees for packaging with additives that disrupt recycling). The most notable examples are CITEO in France and CONAI in Italy.

Strengths and weaknesses of existing EPR

EPR schemes have several **strengths**. They have helped to create more efficient **separate collection schemes, reduce disposal**, and **increase recycling**. In many cases they **reduce the burden on public budgets** for municipal waste management and increase the **cost efficiency of collection and recycling** processes. They also contribute to the generation of separated, high quality secondary raw materials, supporting the **development of markets** and contributing to **resource security**. **Fee modulation** within EPR **has the potential to encourage producers towards eco-design**.

The existing application of EPR for plastics in the EU also suffers from several **weaknesses**. The **lack of a common approach** leads to **differing implementation and performances** across the EU. **Data is**

lacking to assess impacts of EPR schemes. In some cases, schemes are **not adequately controlled or monitored** to ensure effective/efficient functioning and producer compliance. **Existing (weight-based) fee structures** have led to a focus on light-weighting, which risks rewarding lighter but less recyclable materials. The preference for collective over individual schemes can **dilute responsibility and lead to free-riders**. Some EPR schemes **do not cover full waste management costs**. Finally, EPR measures have so far **largely failed to incentivise packaging producers towards eco-design**.

Opportunities and needs for more ambitious EPR

Enhanced EPR measures could help to improve EPR schemes in three main ways.

Firstly, they could help to **improve the implementation of legislation** (e.g. to attain existing and new, more ambitious, waste targets), and the **integration of EPR into environmental and circular economy objectives** (e.g. through wider application of EPR to other products). This would contribute to **reducing the environmental externalities of packaging waste** (e.g. natural resource depletion, GHG emissions and waste leakage to terrestrial and marine environments, with associated impacts).

Secondly, improved EPR could **enhance the market performance of existing schemes**. This could be done by: developing **clearer definitions** at the EU level to support harmonised approaches; ensuring **clear allocation of responsibilities** between stakeholders; ensuring maximum **cost coverage**; facilitating **fair competition**; and ensuring **transparency** on schemes' performance and costs.

Thirdly, changes to EPR could **deepen its scope**, and **strengthen the financial incentives for eco-design**. Economic incentives should be developed to favour circular products and business models (e.g. through harmonised criteria and the further application of modulated fees to **support the waste hierarchy** and incentivise more environmentally sustainable products).

Policy options for the future of EPR, including eco-modulation of fees

There are two key current windows of opportunity at the EU level to increase the ambition of EPR schemes regarding plastics: the publication of the **EU Plastics Strategy**, and the final adoption of the **EU Circular Economy package**. EPR can play a significant role in the implementation of both.

This study has identified several promising options for **eco-modulation of fees:**

1. Fee modulation based on aspects related to the **level of recyclability** of plastic packaging, accompanied by a **common EU definition of recyclability**:
    a. **Existence of technology to sort and/or recycle** the packaging: building on the experiences of the French CITEO and Italian CONAI schemes, and taking into account accessibility/feasibility and best available technologies;
    b. **Composite packaging** (i.e. packaging with different layers/components): modulating fees based on the separability and recyclability of the parts/layers of packaging;
    c. **Non-hazardous but disruptive additives** (e.g. opacifiers): these make items difficult to sort and/or contaminate the material stream, hampering recycling and the development of markets for secondary raw materials;
    d. **Packaging format design:** to favour packaging that can be properly sorted and recycled due to its format design (e.g. form/shape, labels, glues, inks, lids, pumps);
    e. **Hazardous additives:** including a means of identifying such packaging to determine additional fees or fines on responsible producers;
    f. **Existence of markets** to use secondary raw material: as with the new Italian CONAI fees;

2. Fee modulation based on the **amount of recycled content** of plastic packaging: including a definition of recycled content, quality standards, and a system of traceability for recycled material. Care should be taken to ensure recycled plastic is not diverted away from beneficial non-packaging applications.

3. Fee modulation based on **bio-based materials, biodegradability and/or compostability**:
    a. **Bio-based non-degradable plastics:** many can be recycled with fossil-based plastics;
    b. **Biodegradable or compostable plastics:** this offers future potential, but comes with challenges: lack of clarity on material properties and intended after-use pathways, potential cross-contamination with recycling streams, and related benefits and costs.

Other options for the basis of eco-modulation of fees that were considered but are not currently proposed as preferred options include: lifecycle assessment/Product Environmental Footprint (PEF) of a product; reusability of plastic packaging; size of packaging/number of units; and specific eco-design criteria for plastic packaging.

Several **general policy recommendations for EPR** have also been identified, which will be **of relevance to the implementation of the EU Plastics Strategy**:

1. **(Greater) harmonisation of EPR approaches**: e.g. through EU level legislation or guidance;
2. **Common definitions/standards**: including of EPR itself, the calculation of how much product is placed on the market, recycling rates, recyclability, biodegradability and compostability;
3. **Extend EPR to additional types/applications of plastics:** including more types of plastic products, e.g. plastic used in construction, agricultural plastics, medical and pharmaceutical packaging, foils, bulky plastics, disposable kitchenware, furniture, printer cartridges and carpets;
4. **Ensure full cost coverage of EPR schemes**: to ensure that the EPR fees paid by producers cover all collection, sorting and processing costs of the waste concerned;
5. **Increase EPR collection and recycling targets:** to allow ambition above and beyond the achievement of the collection and recycling targets set in EU waste legislation; and
6. **Increase transparency of information** on PROs: including on their fees, operating costs, functioning and performance, to allow a full evidence-based assessment of EPR schemes.

In pursuing these policy options, it should be noted that EPR does not function in a vacuum, and **coherence should be ensured between the objectives and implementation of EPR and other instruments**, including regulatory targets, bans, pay-as-you-throw schemes, waste taxes, product and material taxes, product standards, labelling, voluntary agreements, procurement policies, and information and awareness campaigns. Responsible choices by consumers are also crucial.

It should also be noted that **EPR functions largely around the recycling element of the waste hierarchy**. As such, it is preferable to final disposal and incineration (with or without energy recovery) of waste. However, it should be noted that prevention and reuse are preferred options according to the waste hierarchy. For this reason, **EPR schemes should be designed in such a way that they do not hamper, but rather encourage, actions related to prevention or reuse**.

EPR is therefore a vital part of the picture to **ensure that plastic and its value stay in the economy and out of the environment**, and to **support the transition to a sustainable circular economy**.

1 Extended producer responsibility, plastics and the circular economy

1.1 Introduction to the EPR principle

Extended producer responsibility (EPR) was originally defined 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*' (Lindhqvist, 2000). In doing so, EPR legislation, in principle, shifts the responsibility for, and costs of, negative environmental externalities of products from tax payers to producers, consistent with the polluter pays principle. The final aim of EPR is to address issues related to resource consumption and growing waste generation (Rezero, 2017); a key rationale being that producers are best suited to make the required changes to achieve a reduction in the environmental, social and economic impacts of their products.

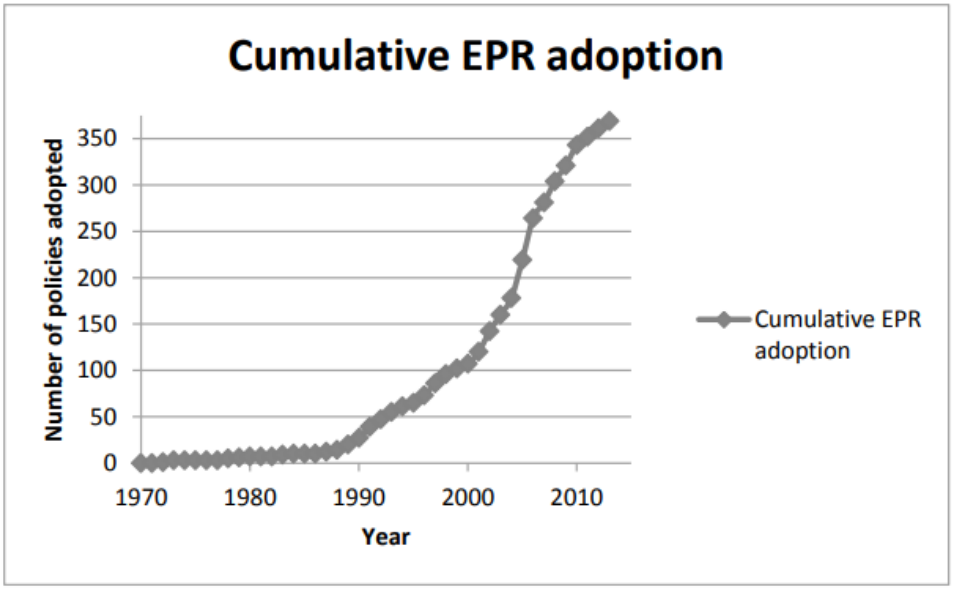
EPR is intended to achieve environmental improvements throughout the product life cycle and has two primary environmental goals. The first is to **provide incentives for manufacturers to design resource efficient and low impact products** (referred to in this report as 'eco-design'). The second is to **ensure effective end-of-life collection, environmentally-sound treatment of collected products and improved reuse and recycling**. At the core of the EPR approach is therefore to establish feedback loops, so that improvements in products' design help optimise their environmental performance and minimise the costs of end-of-life management. In this way, EPR is linked to both product design and mandatory policy targets, providing a link between product design and after-use treatment, and between policy and implementation. If used well, EPR can be one of the cornerstones of the transition towards a circular economy (Zero Waste Europe, 2017).

There are various types of EPR schemes, both mandatory and voluntary, imposing physical/ organisational, financial or informative responsibility on producers. The approach is implemented through a range of different administrative, economic and informative instruments, such as regulatory take-back requirements or market-based deposit refund systems. Often a combination of instruments are applied, which is also likely to be more efficient than adopting single instrument policies such as advance waste disposal fees (Kaffine and O'Reilly, 2015).

The responsibility imposed can be *individual*, where a producer takes responsibility for its own products, or *collective*, where producers in the same product group pay a variable (often based on how much product they put on the market) or fixed fee for participation in a Producer Responsibility Organisation (PRO). A PRO is generally created by producers, and takes responsibility for the practical recovery and recycling responsibilities of its member producers (Bio Intelligence Service, 2015). Whatever the scheme, it should ideally ensure full cost coverage of end-of-life management of products (Zero Waste Europe, 2017). Generally, individual EPR (or 'IPR') tends to provide a stronger incentive for design changes as the feedback loop is more directly linked to individual brands. Collective EPR (or 'CPR') is, on the other hand, often more cost effective to implement and is by far the most common type of EPR scheme (EEA, 2017).

Since the introduction of the EPR approach in Europe in the early 1990s, and in particular over the past 15 years, its use has spread with some 400 EPR schemes currently in use globally, most of them in OECD countries (see Figure 1) (OECD, 2016).

Figure 1 Cumulative global EPR policy adoption over time (Kaffine and O'Reilly, 2015)



1.2 Plastics and EPR

Small consumer electronics are the products most widely covered by EPR systems (35%), followed by packaging (17%), tyres (17%), vehicles/auto batteries (11%) and other products (20%) (Kaffine and O'Reilly, 2015). This study, however, focuses on packaging as the packaging sector is the main user of plastics in Europe, accounting for around 40% of plastics demand (Plastics Europe, 2016). The use of plastic packaging in Europe has also led to an increase in plastic packaging waste over time, with 15.4 million tonnes of plastic packaging waste generated in 2014 (Eurostat, 2017a). Other uses of plastics in Europe are in building and construction (20% of total market share), the automotive market (9%), electrical/electronic equipment (EEE) (6%) and agriculture (4%), and it is noted that, as such, also the use of EPR for end-of-life vehicles (ELV), waste EEE (WEEE) and agricultural plastics have an impact on plastic waste (Plastics Europe, 2016).

The development of EPR in Europe has contributed to improvements in waste prevention, reuse and recycling (OECD, 2016). In 2014, 30% of the 25.8 million tonnes of post-consumer plastic waste generated was recycled and 40% was incinerated with energy recovery (Plastics Europe, 2016). Packaging shows the highest rate of recycling of all plastics applications (Plastics Europe, 2016), reaching 40% in 2015, although this is a low figure when compared with the 65% recycling rate achieved when all packaging materials are taken into account (Eurostat, 2016). Further, the recent drop in oil prices has contributed to a lower value of many recycled plastic materials, effectively creating an incentive to produce new plastic packaging from raw material rather than recycled material (see e.g. (WRAP, 2016).

At the same time, recovery or incineration of plastic waste in the EU-27 has increased in the past 15 years. While plastic packaging – consisting largely of oil – can be an effective medium for waste to energy (WTE) incineration, burning plastics requires sophisticated technology to prevent pollution by toxins and other harmful compounds. In addition, WTE capacity is unevenly spread across the EU, with a five-fold increase of international trade flows of waste for incineration between 2008 and 2013, spurring a debate about the most suitable solutions from a climate change mitigation perspective (Wilts et al, 2017). Finally, landfilling is still a common way to deal with plastic packaging waste (Plastics Recyclers Europe, 2016), and a large amount of plastic packaging waste ends up in the environment and in the oceans as marine litter each year (Jambeck et al, 2015). In the Ocean Conservancy's results

of beach clean-ups around the world, out of almost 14 million items collected, five of the ten most commonly found items (by the number of items found) are plastic packaging, with plastic beverage bottles the second most common type of item (Ocean Conservancy, 2017).

Increasing recycling and reuse of plastic packaging is crucial to Europe's plastic waste management, as plastic production, use and waste continues to increase, both globally and at the European level (Plastics Europe, 2016). To achieve this, product changes upstream are often required, i.e. 'eco-design', as the potential for plastic packaging collection and recycling begins at the product design stage. Several design factors make packaging unsuitable for repair and recycling, or have a significant negative impact on the economics behind it (EEA, 2017; Plastics Recyclers Europe, 2016). For instance, recycling can be hampered by the shape, colour and material composition of plastic packaging products, as well as the use of additives and hazardous substances. Design changes that reduce the use of plastics altogether might also be required in cases where there is a viable and more sustainable alternative material. EPR systems can be effective to achieve these goals, but lessons learnt after more than 20 years of EPR show that the current approach needs some adjustments. In particular, to date, EPR schemes have not achieved the upstream product design changes anticipated as a core rationale in EPR theory.

The modulation (i.e. variation) of fees charged to producers to participate in EPR schemes provides an important potential solution to these shortcomings of current schemes. Fee modulation rewards better designed products and penalises poorly designed ones. Fees can be modulated according to a range of product design criteria that have potential impacts on the end-of-life phase and environmental impacts, such as toxicity, durability, reusability, reparability and recyclability/ compostability[1] (Ellen MacArthur Foundation, 2017; Zero Waste Europe, 2017). Other factors can also be considered as a basis for fee modulation, such as labelling, public awareness and communication campaigns, where they support collection and/or treatment and a shift to steps higher up the waste hierarchy.

A recent study of 395 existing EPR schemes around the world has shown that policies that directly target product characteristics (such as weight, recyclability, etc.) provide the most direct incentives for eco-design changes (Kaffine and O'Reilly, 2015). The effectiveness of EPR schemes in meeting reuse and recycling targets also tends to increase when EPR is coupled with economic instruments such as landfill and incineration taxes, disposal bans for certain products or materials, packaging taxes and pay-as-you-throw schemes[2]. Instruments of this kind allow EPR systems to provide sound incentives for industries to improve their products and process (Zero Waste Europe, 2015) and encourage behavioural change of all actors in the product value chain (European Commission, 2014).

1.3 Policy context for EPR

EPR systems on plastics and plastic packaging have developed and expanded in response to the need to address the failures of the plastics economy. Plastics are identified as one of the five priority areas in the **EU Action Plan for a Circular Economy** (Bourguignon, 2017b; European Commission, 2017) and EPR features as a policy approach that can contribute to increasing plastics circularity (Bourguignon, 2017b). The transition to a circular economy offers potential to pursue global plastic waste objectives and to identify the policies which can best contribute to this aim (ten Brink et al, 2017). As indicated

[1] Note that compostable materials require separate collection as they are generally not compatible with the recyclables waste stream.

[2] One example mentioned in Zero Waste Europe (2015) is the Norwegian tax on one-way packaging. On top of a basic fee of NOK 1.1 (EUR 0.12), a graduated fee of a maximum of NOK 6,44 (EUR 0.68) (for cans) and NOK 4,32 (EUR 0.46) (for plastic bottles) can be reduced proportionally to the recycling rate of the packaging. See Section **Error! Reference source not found.** for more details.

above, in the context of plastics, such a transition requires actions to be taken throughout the whole life-cycle of plastic products. In line with the aims and objectives of EPR, a circular value chain can be obtained through improvements in redesign, reuse and recycling (Bourguignon, 2017b).

Key objectives of the forthcoming **EU Plastics Strategy** include improving the economics, quality and uptake of plastics recycling and reuse, together with reducing plastic leakage into the environment (e.g. as marine litter) and the dependence on fossil-fuels as a feedstock. The Strategy aims to address the challenges posed by plastics and contribute to the circular economy transition, therefore keeping the value of plastics in the economy and minimising waste (European Commission, 2017). The increasing presence of plastics in terrestrial and particularly in marine environments is an important global issue which warrants priority. Durability is one of the main properties of plastic products and has made plastic both highly successful and environmentally damaging (UNEP, 2016a). A resolution of the second session of the **United Nations Environment Assembly (UNEA-2)** highlights that combatting marine pollution, including plastic litter and micro plastics, requires the implementation of policies in line with the waste hierarchy (UNEP, 2016b, c). This implies a drastic change in our approach to plastics and plastic packaging within the economy. In order to 'rethink the plastics economy', the transition to a circular economy and the implementation of measures aimed at improving the management of plastics waste and preventing marine litter are essential (ten Brink et al, 2017).

The **Action Plan on Marine Litter** adopted during the German G20 presidency in July 2017 recognises the urgent need for action on marine litter. The G20 aims to support national and local initiatives to address the challenges posed by marine litter, including plastic items. Since waste from land-based sources represents the largest proportion of marine litter found in the world's oceans, measures aimed at reducing and managing land-based waste are prioritised. Among these, EPR represents a valid policy approach to promote waste prevention and resource-efficiency (G20 Germany, 2017).

In the EU, the EPR approach is introduced in the **End-of-Life Vehicles (ELV) Directive** 2000/53/EC, the **Waste Electrical and Electronic Equipment (WEEE) Directive** 2012/19/EU and the **Batteries Directive 2006/66/EC** (European Commission, 2014). In addition, Article 8 of the **Waste Framework Directive** 2008/98 sets some principles regarding the implementation of EPR by Member States and it is explicitly encouraged in the **Packaging and Packaging Waste Directive (PPWD)** where, although its implementation is not mandatory (European Commission, 2014; EUROPEN, 2013), the policy is considered to have significant potential to achieve the Directive's targets (Bourguignon, 2017a) as well as national packaging waste targets (EUROPEN, 2013). However, efforts are needed to ensure a more harmonised EU-wide approach to EPR (European Commission, 2014).

Member States have designed and implemented a wide variety of EPR policies for an increasing range of product groups. Recent developments in the EU include discussions in some Member States to introduce EPR for textiles and furniture (Bonnet, 2017). Some non-waste EU legislation also has indirect interactions with EPR, such as the EU Eco-design Directive. Additional schemes have been adopted by some Member States on products such as tyres, used oil and medical waste, which are generally outside the scope of EU legislation (OECD, 2014). Chapter 2 of this report explores EPR schemes in the EU in more detail.

1.4 Study objectives and methodology

The aim of this study is to develop specific, evidence-based policy recommendations to input into the ongoing development of the EU Plastics Strategy, with a view to encouraging more ambitious EPR to bring about a more sustainable use of plastics. It explores the existing landscape of EPR related to plastics in the EU, with a focus on packaging. It identifies some strengths and weaknesses of existing EPR approaches, and opportunities and needs for more ambitious EPR. In particular, the use of modulated fees is considered, since this offers significant potential to make EPR more effective in promoting eco-design and therefore a more sustainable use of plastics.

The methodology for the study has been to undertake an initial literature review and desk-based research into existing EPR schemes for plastics in the EU, followed by the development of three in-depth case studies on specific EPR schemes.

The project team has been supported throughout by a steering group comprised of the MAVA Foundation, European Environmental Bureau, Ellen MacArthur Foundation and Zero Waste Europe. In addition, a wider group of organisations with expertise on plastics EPR were invited to an expert roundtable and a report launch event during the study, and fed their thought into the development of the recommendations presented at the end of this report.

In addition to this report, a separate four-page policy options briefing has been developed, including a specific section looking at possible EU-wide criteria to modulate EPR fees.

2 Overview of EPR schemes in the EU

2.1 Existing EPR schemes in the EU

Assessing the effects of EPR schemes is difficult, for instance due to a lack of data and the difficulty of distinguishing EPR effects from other impacts (OECD, 2016). Both recycling rates of plastics overall and of packaging have increased over time in Europe (EUROPEN, 2015; Plastics Europe, 2016), and it is likely that the application of EPR in EU Member States has contributed to this, although the potential to use EPR to influence product design and drive environmental and economic improvements remains underutilised (OECD, 2016; Zero Waste Europe, 2017).

One aspect hampering the effectiveness of current EPR schemes is that different schemes are implemented in different ways across Europe, often as a result of lack clarity over a number of issues (see below), (EUROPEN, 2013). As a consequence, various bodies have outlined guiding principles to try to improve and harmonise the application of EPR:

- **Definition of EPR:** EU legislation defines EPR in general terms and a harmonised definition is lacking, leading to varying interpretations of its aims and objectives and differing results. Therefore, improving the implementation of EPR requires a definition common to all EU and national legislation (EUROPEN, 2013).
- **Allocation of responsibilities:** EPR schemes involve a number of actors, so shared responsibility is crucial for their success. The responsibilities of each stakeholder should be clearly defined for all national EPR schemes, and dialogue between public authorities and producers should be promoted (European Commission, 2014).
- **Cost coverage:** Sound EPR systems require a clear definition of cost coverage. Costs covered by collective EPR schemes are passed on to each producer, but the way in which this is done differs across schemes. Coverage of net costs for the separate collection and end-of-life products should be ensured by all EPR schemes. Producers' fees should reflect the actual management costs of their end-of-life products (European Commission, 2014).
- **Fair competition:** The implementation of different EPR schemes and the number of PROs can drive competition in the waste management sector. Ensuring fair competition requires a clear framework with set rules, surveillance and enforcement measures and transparency, as well as an independent third-party 'clearinghouse' in cases where there is more than one PRO (European Commission, 2014).
- **Transparency:** Effective EPR schemes require transparency, both on performance and costs. In addition, clearer and reliable data would allow for better monitoring of PROs, as well as the replication of best practices (European Commission, 2014).

2.2 EPR schemes in the EU related to plastics

Twenty-six of the 28 EU Member States have some form of EPR in place for packaging waste, as recommended by the Packaging and Packaging Waste Directive. Many of these schemes were implemented in the 1990s (with Germany the first, followed by France, Austria, Belgium, Luxembourg, Sweden, Spain, Portugal, Hungary, Finland, Ireland and the UK), with others being put in place in the early 2000s (European Commission, 2014).

As indicated earlier, other waste streams also contain plastics. It is therefore relevant to mention other EPR schemes, including those required by EU legislation for end-of-life vehicles (ELV) and waste electrical and electronic equipment (WEEE). In addition, several Member States have implemented EPR schemes for other specific types of packaging, including compound packaging (Austria), pesticide,

fertilizer, seed and plant packaging (France), and medical and pharmaceutical packaging (Portugal); agricultural films (Belgium, Finland, France, Germany, Ireland, Italy, Sweden, Spain); plastic foils (Austria); bulky plastics (Austria); disposable plastic kitchenware (Belgium, Latvia); furniture (France); and printer cartridges (France) (European Commission, 2014).

Existing EPR schemes in Europe are implemented using a range of different instruments. Around the world, the most common approach is various forms of take-back requirements (almost three-quarters of all schemes); while advance disposal fees (ADF) and deposit refund schemes (DRS) account for most of the rest (Kaffine and O'Reilly, 2015).

Product take-back requirements 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. In some cases, product take-back is arranged on a business-to-business basis (see e.g. Box 1 below).

Box 1 Svenska Retursystem

Sweden introduced an EPR scheme for packaging and all packaging materials in 1994 (SFS 1994:1235, today 2014:1073). In 1997, the Trade Association for Grocery of Sweden (SvHD) and the Swedish Food & Drinks Retailers Association (DLF) jointly launched 'Svenska Retursystem' – a separate company operating a system of reusable pallets and crates for grocery distribution. It is a circular, EPR-driven business model (see Figure 2). Svenska Retursystem's customers pay a user fee and deposit for crates and half-size pallets, and a daily rent and user fee for full-size pallets (Svenska Retursystem, 2017b). Crates and pallets are sent to material recycling at the end of their useful life. A 2016 LCA found that Retursystem's reusable crates reduced CO_2-equivalent emissions by 74% compared to equivalent corrugated cardboard packaging. Reusable crates also protect primary packaging and reduce product damage/wastage during transport (Svenska Retursystem, 2017c).

According to DLF, Sweden was the first country where food and drink retailers created a joint system for reusable distribution packaging (DLF, 2017). Today, Svenska Retursystem has 1,500 customers and its boxes are used for half of all fresh food deliveries. The company has 145 employees and 2016 turnover was almost EUR 63 million (Svenska Retursystem, 2017a). Benefits of Retursystem mentioned by producers include that producers know the exact measurements of crates and can calibrate packing systems accordingly, that pallets weigh 10 kg less than wooden pallets and that crates are vented and do not attract moisture (Svenska Retursystem, 2017b).

Figure 2 Svenska Retursystem – how it works (Svenska Retursystem, 2017b)

Advanced disposal fees (ADF) are fees levied on individual products at the point of purchase, based on estimated costs of collection and treatment. The fees may be used to finance end-of-life management of the products in question (OECD, 2016).

Deposit Refund Systems (DRS) add a surcharge on individual products at the point of purchase. The entire fee, or a portion of it, is refundable when the used product is returned to the point of sale or at specified waste management sites. The aim is to encourage take-back of the used product rather than to cover costs. DRS can exist as voluntary systems or as part of legislative agreements with producers. In Europe, DRS are most commonly used for metal and plastic beverage containers (and sometimes other types of packaging). European countries with DRS for PET bottles include Denmark, Finland, Germany, Netherlands, Norway and Sweden (Zero Waste Europe, 2010). Lithuania introduced a DRS for plastic (and metal and glass) beverage packaging in 2016 (Gražinti verta, 2015), and Flanders, Scotland and Catalonia are currently interested in introducing DRS (Bonnet, 2017).

2.3 Key features of EPR schemes related to plastics

The EPR schemes implemented in EU Member States have certain similarities but also some important differences. The following sections provide an overview of key features, similarities and differences.

2.3.1 Varying approaches to EPR

In broad terms, packaging EPR schemes in most of the EU-28 Member States feature a **mix of both collective (CPR) and individual producer responsibility (IPR)**; Italy uses only collective producer responsibility, whilst Denmark and Hungary have Government-led schemes (European Commission, 2014). Nine countries have more than one EPR scheme covering packaging materials, i.e. there is **competition between producer responsibility organisations (PROs)**, whereas 12 countries have only one scheme, i.e. there is no competition (European Commission, 2014).

2.3.2 PRO responsibility

The type of responsibility taken on by PROs also varies. In some cases, there is **only (simple) financial responsibility**, i.e. the fees paid by producers to their PRO are used to provide the financial means to set up and run take-back schemes and the processing of packaging waste. The Belgian VAL-I-PAC scheme for industrial packaging and the UK system of electronic Packaging Waste Recovery Notes (ePRNs) and Packaging Waste Export Recovery Notes (ePERNs) are examples of simple financial responsibility. On the other hand, the Czech EKO-KOM scheme, Dutch Afvalfonds Verpakkingen PRO and the French CITEO scheme exercise their financial responsibility through direct reimbursement contracts with municipalities and/or sorting plants (European Commission, 2014); the same is true for schemes in Spain, Austria and Sweden (EUROPEN, 2015). Under other schemes, PROs have **partial or full operational responsibility**, i.e. they are directly responsible themselves for the take-back schemes and waste processing. Examples include the Belgian FOST-PLUS scheme for household packaging which has partial operational responsibility, whilst the Austrian ARA scheme and German schemes have full operational responsibility (European Commission, 2014).

2.3.3 Categories of packaging covered

Some EPR packaging schemes deal with only household/equivalent packaging, others only commercial and/or industrial packaging, and some cover both categories of packaging, as shown in Table 1 below.

Table 1 Categories of packaging covered by EU EPR schemes

Household (H)/equivalent packaging only	Commercial (C)/industrial (I) packaging only	H and C/I packaging
Belgium: Fost-Plus **France:** CITEO (previously Eco-Emballages) **Germany:** Der Grüne Punkt - Duales System Deutschland GmbH **Spain:** ECOEMBES (will accept commercial/industrial under voluntary agreement if local entities collect it)	**Belgium:** VAL-I-PAC	**Austria:** ARA **Bulgaria:** Ecopack **Cyprus:** Green Dot Cyprus **Czech Republic:** EKO-KOM **Estonia:** ETO **Finland:** Finnish Packaging Recycling RINKI Ltd **Greece:** Hellenic Recovery Recycling Corporation **Hungary:** ÖKO-Pannon **Ireland:** Repak **Italy:** CONAI **Latvia:** Latvijas Zaļais punkts **Lithuania:** Žaliasis taškas **Luxembourg:** Valorlux **Malta:** Greenpak **Netherlands:** Afvalfonds Verpakkingen **Poland:** Rekopol **Portugal:** Sociedade Ponto Verde **Romania:** ECO - ROM AMBALAJE **Slovakia:** ENVI-PAK **Slovenia:** Slopak **Sweden:** FTI **UK**

Source: (Pro-Europe, 2017a, b, c)

2.3.4 Fees and fee modulation

All packaging EPR schemes in the EU include some very **basic fee modulation** since they charge differing fees to producers for each packaging material placed on the market. Fees for plastic and for composite packaging materials tend to be significantly higher than fees for other packaging materials such as paper, card, glass and metals (Pro-Europe, 2017d). For example the fees for plastic in the Italian CONAI scheme are EUR 188 per tonne, compared with EUR 45 for aluminium, EUR 16 for glass, EUR 13 for steel and EUR 4 for paper/card (CONAI, 2017c); whilst the Belgian Fost Plus scheme charges EUR 211 per tonne for PET/HDPE and EUR 246 for drink cartons, compared with EUR 124 for steel, EUR 33 for aluminium, EUR 21 for glass and EUR 17 for paper/card (Fost Plus, 2015b, 2017e). Within schemes that deal with both household (H) and commercial/industrial (C/I) packaging, the fees for C/I packaging are always either the same or lower than those for household packaging. Table 3 below summarises the fees for different types of plastic material within a number of EPR packaging schemes.

Some schemes charge **specific fees for different types of plastic packaging**. The most commonly differentiated plastic packaging materials being PET/HDPE, expanded polystyrene, bio-plastics/bio-degradable plastics and plastic bags. In cases where there is a specific fee for PET/HDPE, the PET/HDPE fee is lower than for other plastics in Belgium, Spain and Slovenia, higher in Cyprus, and currently the same in Lithuania and Romania. This may reflect the sorting and recycling infrastructure available in each country to process each type of plastic. PET is the most commonly recycled plastic packaging material in the EU. Around 1.8m tonnes of PET bottles were collected for recycling in 2015 (a 5% increase from 2014), and 59% of PET resin was recycled in the same year (a 2% increase from 2014) (European PET Bottle Platform, 2017). In 2014, bottle-to-bottle use became the main end market for

recycled PET in Europe (previously it was more commonly used for textile applications), and the average recycled content in PET bottles in Europe is currently 11.7% (European PET Bottle Platform, 2017).

A handful of schemes have **lower fees for bio-plastic or biodegradable plastic**[3] than other plastics (Austria, Germany, Latvia, Netherlands). A handful of schemes also have **specific fees for plastic bags**; in Portugal the fee is the same for plastic bags and general plastic packaging, whilst in Croatia and Hungary the fee for bags is higher (in Hungary the bag fee is extremely high if the plastic bag features advertising).

The majority of schemes also have **specific fees for beverage cartons** (which tend to be composite paper/card, plastic and/or aluminium foil) and other composite materials. Again, this is likely to reflect the fact that they require different processing to single-plastic packaging. In the majority of cases, the beverage carton fee is lower than that for general plastics. In schemes that have specific fees for both PET/HDPE and beverage cartons, the carton fee is higher in Belgium, Cyprus and Lithuania, lower in Luxembourg and Slovenia, and currently the same in Croatia.

Other interesting examples of fee modulation include the Czech Republic scheme applying no fee to reusable packaging, only to one-way/single-use packaging, and the various bases for eco-modulation in use within the French CITEO scheme and the Italian CONAI scheme (see Box 2 below).

Fee modulation is more relevant to CPR than IPR[4]. This is because there is greater scope within a collective scheme to differentiate between the products of the member producers, offering greater scope for fee modulation to have an impact on eco-design.

[3] A plastic material is defined as a 'bio-plastic' if it is either bio-based, biodegradable, or both. Bio-based materials or products are derived (or partly derived) from biomass (plants). Biodegradable means that the material can be converted by microorganisms available in the environment into natural substances such as water, CO_2 or compost (European Bioplastics, 2017c).

[4] Personal communication with Peter Borkey, OECD, 7 September 2017

Box 2 Comparison of fees and fee modulation in CITEO (France), CONAI (Italy) and Fost Plus (Belgium)

CITEO and Fost Plus are collective EPR schemes for household packaging waste in France and Belgium, respectively. The Italian CONAI scheme covers both household and commercial/industrial packaging. All three schemes apply some degree of fee modulation, but the extent of modulation, and in particular eco-modulation, differs (see Table 2).

Table 2 Comparison of fee modulation in CITEO, CONAI and FOST Plus schemes

	CITEO	CONAI	Fost Plus
Basic fee modulation	Based on weight and type of packaging material: Plastic, glass, paper/ cardboard, steel, aluminium, bricks, and other materials. + fee based on number of packaging units	Based on weight and type of packaging material: Plastic, glass, paper/ cardboard, steel, aluminium, wood, and glass.	Based on weight and type of packaging material: PET/HDPE, drink cartons, glass, paper/cardboard, steel, aluminium, other recoverable materials, and other non-recoverable materials.
Eco-modulation	Bonus/malus system for all packaging[2]: *Total fee = (weight fee + units fee) x bonus/malus* Bonus: fee is reduced by 4% - 24% Malus: fee is increased by 10% - 100%	Differentiated fees for plastic packaging[1]: A. Sortable/recyclable industrial waste (179.00 EUR/tonne) B. Sortable/recyclable household waste (208.00 EUR/tonne) C. Non-sortable/ recyclable waste (228.00 EUR/tonne)	None

[1] Rates from 2018 onwards
[2] Rates for the period 2018 - 2022

All three schemes apply fees based on packaging weight and material. Fost Plus has eight different rates, CITEO seven and CONAI six. CITEO has an additional progressive fee based on the number of packaging units.

Fost Plus does not have eco-modulated fees per se, although two elements of the scheme do incorporate an environmental dimension: the high fee for 'non-recoverable' materials (more than 10 times the fee for glass) and the scheme's link with an environmental tax on beverage containers that varies based on reusability. CONAI will impose differentiated fees for plastic packaging from 2018 onwards. Fees will vary depending on the recyclability and sortability of plastic packaging, as well as on the destination of packaging and packaging waste. CITEO applies eco-modulation to all packaging materials. A reduction in fee (bonus) is associated with packaging reductions, recyclability and sortability of packaging, and sorting awareness actions. Fees are increased (malus) for packaging that is disruptive, cannot be recycled/recovered, and/or hampers the recycling process.

A more detailed overview of these cases can be found in the Annexes to this report.

Table 3 Plastic packaging fees in EU-28 EPR schemes (most fees 2017)

	Rates EUR/kg								
	Plastic (general/ unspecified)		PET/ HDPE	Beverage cartons		Other composite material		Other	Notes
	H	C/I	H	H	C/I	H	C/I	C/I	
Austria (ARA)	0.61	-	-	0.58	-	0.61	0.1	Moulded containers (C/I): 0.07 Expanded polystyrene (H/C/I): 0.19 Bio-plastic/biodegradable plastic: 0.45 (H), 0.1 (C/I)	
Belgium (FOST-PLUS)	0.2823	-	0.2107	0.2455	-	0.2823	-	-	
Bulgaria (EcoPack)	0.08	0.08	-	-	-	0.1	0.1	-	NB Base fees - 10% and 20% discounts apply for timely reporting & payment respectively
Croatia (Eko-Ozra)	-	-	0.055	0.055	0.055	0.1	0.1	Plastic bags (H): 0.2	
Cyprus (Green Dot)	-	0.038	0.106	0.123	-	-	-	Other reusable (H): 0.131 Other non-reusable (H): 0.157	
Czech Rep (EKO-KOM)	0.206 Over 5l: 0.154	0.022	-	0.158	-	0.223	0.022	-	NB Fees for one-way packaging only; no fees for reusable packaging. HH = sales packaging; C/I = group/sales/transport packaging
Estonia (ETO)	0.409	0.109	-	0.105	-	-	-	-	NB C/I = transport/group packaging
France (Eco-Emballages / CITEO)[a]	0.312	-	-	0.247	-	-	-	-	NB Plus variable fee based on quantity of units; plus many bonus-malus options for eco-modulation
Germany (Der Grüne Punkt)	0.17	-	-	0.13	-	0.13	-	Organic materials (H): 0.02	NB These figures only include the Green Dot licence fee
Greece (HE.R.R.Co.)	0.66	0.66	-	0.57	0.57	-	-	-	
Hungary (Ökopannon)	0.185	-	-	0.062	-	0.185	-	Plastic bags with shopping-advertising: 6.16	
Ireland (Repak)[b]	0.0892	0.0892	0.0892*	0.0758^	-	-	-	-	*Plastic bottles ^Composite paper/plastic

	Rates EUR/kg								
	Plastic (general/ unspecified)		PET/ HDPE	Beverage cartons		Other composite material		Other	Notes
	H	C/I	H	H	C/I	H	C/I	C/I	
Latvia (Latvijas Zalais Punkts)	0.149	0.149	-	-	-	-	-	Bio-plastic (H/C/I): 0.033	
Lithuania (Žaliasis taškas)	0.081	0.081	0.081	0.122*	0.122*	0.125	0.125	-	*Predominantly paper/card
Luxembourg (Valorlux)	-	-	0.3703	0.2835	0.2835	-	-	Other recoverable (H): 0.4296 Other non-recoverable (H): 0.4725	
Netherlands (Afvalfonds Verpakkingen)	0.3876	0.3876	-	0.12	0.12	-	-	Biodegradable plastic (H): 0.0212 Deposit bottles (H): 0.0212	
Norway (Grønt Punkt)	0.147	0.123	-	-	-	-	-	Expanded polystyrene: 0.256	
Poland (Rekopol)	0.0046	0.0046	-	-	-	-	-	-	
Portugal (Sociedade Ponto Verde)[c]	0.2319	0.2319	-	-	-	-	-	Plastic bags: 0.2319 Multipacks: 0.1159	
Romania (ECO-ROM AMBALAJE)	0.133	0.133	0.133	-	-	-	-	-	
Slovenia (Slopak)	0.134	0.134	0.077	0.01	0.01	0.134*	0.134*	-	NB Packaging fee + Green Dot fee. *Predominantly plastic
Spain (Ecoembes)	0.472	-	0.377	-	-	-	-	-	
Sweden (FTI)	0.244	0.003* 0.22^	-	-	-	-	-	-	*Commercial packaging ^Manufacturer's packaging

Sources: All (Pro-Europe, 2017d) except a (Eco-Emballages, 2017), b (Repak, 2017), c (Sociedade Ponto Verde, 2017)

2.4 EPR in the context of non-EPR packaging-related policy instruments

EPR schemes, of course, do not exist in isolation; there are often other instruments that together make up the full landscape of packaging waste management.

Many EU Member States have **pay-as-you-throw schemes** in place, typically at the local level, whereby households are charged based on the amount of waste they generate. This incentivises households to sort their waste for recycling, thereby facilitating separate collection and facilitating and complementing EPR.

Taxes also form part of the picture. The **landfill taxes** that are currently in place in 20 EU Member States (CEWEP, 2017) often help to drive waste away from landfill towards preferable alternatives such as composting, recycling, and reuse. This can be particularly successful when teamed with bans on landfilling specific materials such as biodegradable and recyclable waste. Fifteen EU countries currently have landfill bans on various types of waste (CEWEP, 2017), with the seven countries that effectively ban post-consumer plastic waste from landfill seeing significantly higher rates of energy recovery (Plastics Recyclers Europe, 2016). **Packaging taxes**, typically applied to producers based on the amount of material they place on the market, are also in use in several EU countries, including Belgium, Bulgaria, Croatia, Denmark, Estonia, Finland, Latvia, Malta, Netherlands, Romania and Slovenia (Watkins and et al, 2017, forthcoming). Some taxes relevant to plastic packaging have direct links to EPR. For instance, the Finnish beverage packaging tax incentivises participation in the DRS by offering a lower tax rate for participants registered in a DRS system (Ettlinger, 2016).

As well as these economic instruments, regulatory frameworks (such as bans on harmful materials or products), product standards and labelling, green public procurement (GPP) and voluntary agreements all play a part in the wider policy landscape for packaging waste and have links to EPR. and have clear links to EPR. **Regulations** often set bans and/or targets to be observed or achieved by EPR schemes. **Standards** can help to encourage certain types of products or materials which can subsequently be differentiated by EPR schemes. **GPP** can help to encourage certain products and materials which might incentivise eco-design changes. **Voluntary agreements**, such as the sector innovation plans in the Netherlands[5], can encourage producers to develop their own innovation plans and objectives. In the Dutch case, the plans are passed to the Ministry of Infrastructure and the Environment (IenM) and used as a basis for future policy development (Netherlands Institute for Sustainable Packaging, 2017b).

A further analysis of the interactions between these aspects and EPR is outside the scope of this study.

[5] Thirteen sector innovation plans with specific and measurable highest attainable objectives have been approved and established to date, collectively representing 88% of the weight of packaging placed on the Dutch market by the following sectors: fruit and vegetables; foodstuffs; soft drinks, water and juices; online delivery; wine; cosmetics and soap; pharmaceuticals; technology industry; DIY industry; interior design and furniture; electronics; spirits; and gardening.

3 Strengths and weaknesses of EPR schemes

EPR schemes have had successful results in many countries, contributing to reduced waste generation and disposal and improved recycling rates. Nevertheless, the success of EPR schemes has also varied widely across countries (OECD, 2016) and some weaknesses can be identified. This chapter attempts to draw some general, and where possible more specific, conclusions on the strengths and weaknesses of current EPR schemes in the EU related to plastics.

3.1 Strengths of EPR schemes

EPR schemes are associated with a range of benefits which contribute to moving towards more sustainable production and consumption (OECD, 2014). In particular, EPR has contributed to the creation of more, and more efficient, **separate collection schemes** for specific waste streams, including plastic packaging (Bonnet, 2017). In this way they have contributed to **reduced disposal and increased recycling** rates for the materials concerned (see e.g. (Bonnet, 2017) (OECD, 2016) (Plastics Europe, 2016)). In the three case studies undertaken for this study (France, Italy and Belgium), the recycling rates for plastic packaging waste have gradually increased (or since 2009 in France remained relatively stable) following the introduction of EPR (see case studies in the Annexes to this report). Belgium currently has a recycling rate for all packaging and plastic packaging waste above the EU average (Eurostat, 2017b), and the country's reliance on a single collection scheme for household packaging is seen as one of the key strengths of the Fost Plus system (Adams, 2011). Another example of an EPR scheme that has led to increased recycling is the system in Korea, set up in 2003. The scheme charges an advanced disposal fee on producers and importers of materials and containers that are difficult to recycle, promoting the design of easier-to-recycle products. As a result, packaging recycling increased by 74% (Heo and Jung, 2014; OECD, 2016).

EPR also provides financial benefits. By shifting financial responsibility for the end of life/waste phase of products from local municipalities and public authorities to producers, EPR typically **reduces the burden on public budgets** (Bonnet, 2017), reducing the financial cost of municipal waste management (OECD, 2014). In addition, EPR encourages producers to optimise the cost efficiency of collection and recycling processes, therefore leading to lower waste management costs. With this objective in mind, EPR incentivises producers to reduce the amount of resources used in the production phase, or to reduce the amount of material considered difficult to recycle in order to reduce sorting and collection costs (OECD, 2014).

In addition, EPR helps to generate separated, high quality waste materials which can be more readily processed into raw materials, thereby supporting the **development of markets** for secondary raw materials. Indeed the French CITEO and Italian CONAI schemes take into account in their eco-modulation criteria the existence of markets for recyclate.

Investments in eco-design innovations represent an additional way to reduce waste management costs (OECD, 2014). In some cases, in particular where there is fee modulation based on eco-criteria, EPR can **encourage producers towards eco-design**, i.e. to design products that are more sustainable, recoverable, recyclable, reusable and less resource-intensive (Eduljee, 2017). Introducing incentive mechanisms such as fee modulation can therefore lead to increased reuse and recycling. One example of fee modulation for recyclability is CITEO in France, which is at the time of writing the only system in Europe which modulates fees according to plastic packaging recyclability. It uses a bonus/malus approach to create incentives for eco-design and recyclability of packaging by financially rewarding recycling-friendly packaging whilst also penalising packaging that is difficult to recycle (Bio Intelligence Service, 2015; Eco-Emballages, 2015a). The new fee structure of the Italian CONAI system, which will be introduced in 2018, has a clear focus on products' recyclability and sortability. When applied to

plastics, schemes of this kind can potentially have positive implications for global challenges such as plastic marine litter (Zero Waste Europe, 2015), even though this does not represent the main benefit of EPR instruments (Eduljee, 2017). There are also examples of EPR schemes which have had a positive impact on design aspects other than weight and material. The Japanese EPR scheme for packaging waste introduced the use of coloured plastic film labels, allowing coloured PET bottles to be replaced by transparent PET bottles. Such design innovation reduced collection costs and improved the quality of secondary resources (OECD, 2016).

Eco-design can also be promoted when EPR schemes are coupled with policies that set requirements based on waste weight rather than on units consumed, incentivising producers to design lighter products (OECD, 2014). Incentives to reduce the weight of packaging led the French Eco-Emballages (now CITEO) scheme reducing the weight of packaging entering the market by 106,000 tonnes between 2007 and 2012 (Eco-Emballages, 2015a). However, as explained later in this report, it is important to balance the resource efficiency benefits of lightweighting with the products' ability to be reused and/or recycled. In addition, fee modulation can encourage producers to shift to alternative non-plastic materials. EPR fees per tonne for plastic packaging materials tend to be significantly higher than fees per tonne for other packaging materials such as paper, card, glass and metals (Pro-Europe, 2017d). Arguably, this can support design of packaging with alternative materials. It is however very difficult to accurately identify the impact of EPR on eco-design in practice, and even harder to definitively attribute any changes to EPR policy (Eduljee, 2017). Nevertheless, more efforts certainly need to be made in this area to encourage far wider application of eco-design measures.

In addition to the above mentioned strengths, EPR can generate further broader benefits. For instance, the implementation of EPR schemes can promote **technological and organisational progress**, and contribute to **resource security** by diversifying the sources of material supply (OECD, 2014). Moreover, the contribution of EPR to the emergence and further development of recycling industries can lead to improvements in the organisation of supply chains (OECD, 2014, 2016). Through the development of the waste and recycling industry, EPR can contribute to job creation (OECD, 2016). Operations related to the industry, such as sorting, separation and collection of waste, represent important sources of local employment (Plastics Recyclers Europe, 2016). Recycling is expected to generate 50,000 new direct jobs by 2020, which are expected to impact the wider economy and generate an additional 75,000 indirect jobs in Europe. These figures may increase to 80,000 direct jobs and 120,000 indirect jobs by 2025 (Plastics Recyclers Europe, 2016).

3.2 Weaknesses of EPR schemes

EPR policies are associated with a number of challenges which can threaten the functioning of existing schemes.

The lack of a common approach to EPR schemes, and lack of a harmonised definition of EPR, have led to **differing implementation and performances** across the EU Member States (Bonnet, 2017). Accurately assessing and comparing the impacts of EPR systems is difficult for several reasons. The differences in existing schemes (e.g. CPR vs IPR, fee levels, governance, product coverage etc.) and a general lack of data both contribute to such limits. In addition, EPR schemes are only one part of the wider policy and instrument mix to address waste, therefore distinguishing their impacts from those of other instruments or policies is often challenging (OECD, 2016). Empirical assessments which enable the identification of the effects of EPR policies are therefore necessary (Kaffine and O'Reilly, 2015).

Many EPR schemes are characterised by a **lack of control/monitoring**, which is necessary for the schemes to function effectively and to ensure compliance by producers. Moreover, the lack of publicly available data is seen as representing a challenge to the operation of EPR systems, as in the case of

the lack of transparency on costs in the French Eco-Emballages scheme (Bio Intelligence Service, 2015). EPR schemes also often differ in their **cost coverage** and a lack of transparent information on this means that the true functioning of EPR schemes is not widely known, and their cost-effectiveness cannot always be determined easily (OECD, 2014). In some cases, the infrastructures supporting EPR schemes may not be organised in the most efficient way; for example the large number of sorting centres in France may be detrimental to operation of Eco-Emballages (now CITEO) (Bio Intelligence Service, 2015). It has been suggested that sorting of packaging waste in Belgium is often not done properly and that the increased economic value of collected packaging materials has led to scavenging (Regions for Recycling, 2014).

The effectiveness of EPR schemes is generally assessed by looking at **weight reduction of the products put on the market**. The use of such an indicator inevitably leads to creating incentives for producers to place on the market lighter products, which in many cases still have features that hamper recycling, for example single-use lightweight packaging, with obvious negative implications on product circularity (Zero Waste Europe, 2017). This was the case in Sweden where a packaging EPR scheme led to a 50% reduction in average packaging weight, although such reduction could be attributed to the use of plastic laminate which, despite being lighter, is difficult to recycle (Chow, 2013; Hage, 2004).

Recycling targets are a common performance indicator for EPR policies. However, recycling targets alone might not represent the best way to determine the internalisation of costs. Separate collection targets should also be considered as EPR schemes cover separate collection and treatment costs, but not mixed waste collection (Zero Waste Europe, 2015). Even though increasing recyclability is one of the main objectives of EPR, it is difficult to measure (Eduljee, 2017) and other indicators could be introduced such as the extent of littering (Zero Waste Europe, 2015). Moreover, an increase in recycling rates obtained through the implementation of an EPR scheme does not guarantee success on other important indicators. This was the case for Fost Plus, the Belgian PRO addressing packaging waste which has achieved high packaging recycling rates whilst reducing re-use and eroding the market for refillable containers (Green Alliance, 2008).

Among the diversity of EPR schemes currently in place, **producers tend to favour collective over individual schemes**. However, although the former offer economies of scale for waste collection and recycling, there are also a number of concerns associated with them which threaten their compliance and enforcement (OECD, 2014). Collective schemes are less likely to lead to eco-design than individual schemes, since the responsibility is shared and therefore the impact and incentive effect on individual producers is limited (Eduljee, 2017). In fact, contrary to individual schemes where producers pay the full cost of the waste management for their products, in collective schemes it is difficult to implement fees based on the varying waste management costs and therefore the actual recycling costs of each producer (OECD, 2014). This leads to an 'averaging' effect on fees (Zero Waste Europe, 2015) which generally results in lower incentives for eco-design and more frequent free-riding (OECD, 2014) (where some producers do not pay their full share).

EPR policies are considered relevant tools to improve product design. However, evidence shows that their **design impacts have been limited** and in many cases improvements in eco-design have been observed as a response to the ecological requirement of the Eco-design Directive rather than EPR schemes themselves. This suggests it is important to incorporate incentive mechanisms to strengthen the impact of EPR schemes (Zero Waste Europe, 2015). Fee modulation is possibly the strongest incentive to encourage eco-design, so the lack of eco-modulation in the majority of schemes means that there are currently rather **weak incentives for the design of new products** (Bonnet, 2017). Under the new CONAI fee structure, it is arguable that the differentiation of rates is still not large enough to incentivise a shift in packaging practices (although the fees may be further differentiated over time).

Fee modulation does not always translate into better product design. For instance, the Belgian Fost Plus scheme has led to exceptional results in collection and recycling despite the lack of eco-modulation of fees, but is also seen to have contributed to a decline in the market for refillable beverage containers between 2003 and 2011 (Green Alliance, 2008). As fee modulation is generally based on weight or material type, the other aspects of eco-design, such as recycled content or recyclability, are often neglected (OECD, 2016). To date, only a few true fee modulation mechanisms have been applied and EPR schemes so far have tended to **focus on achieving collection and simple recovery** of the waste streams concerned (Bonnet, 2017), rather than truly pushing for eco-design.

The nature of EPR policies, which affect different steps of the value chain, can lead to wider **unintended impacts in related markets** (Kaffine and O'Reilly, 2015; OECD, 2014). For instance, an additional challenge concerning EPR policies revolves around their potential influence on international trade markets. By changing costs for domestic firms, distortions might be created in relation to foreign firms and have implications on world markets (Kaffine and O'Reilly, 2015).

4 Opportunities and needs for more ambitious EPR

Developing more ambitious EPR measures for plastic packaging in Europe presents a range of needs and opportunities. Article 8a of proposed amendments to the Waste Framework Directive (Directive 2008/98/EC) provides general requirements for extended producer responsibility schemes (see section 4.2 below). As well as supporting the implementation of existing policy objectives, including those linked to the circular economy strategy, enhanced EPR measures can help to improve the operation and market performance of European PROs. Measures also have the potential to improve the design of plastic products placed on the European market, leading to a reduction in the use of raw materials, and facilitating their re-use and recyclability. Effective EPR will support full cost recovery of the collection and treatment of packaging waste. Finally a core objective of improving EPR should be to support the prevention of leakage of packaging into the terrestrial and marine environments, as well as limiting other externalities such as GHG emissions.

Development of EPR schemes can be broadly summarised in the following ways:

- Improving the implementation of existing legislation and integration of EPR into environmental and circular economy objectives;
- Enhancing the market performance of existing EPR schemes; and
- Deepening the scope of EPR within regulated waste streams, and strengthening the financial incentives for eco-design.

4.1 Improved implementation and integration of EPR into circular economy objectives

Improving the functioning of EPR for packaging can help support the implementation of existing and proposed legislative commitments for packaging waste. Relevant targets are shown in Table 4.

Table 4 Selected targets in EU waste legislation

Directive	Current targets	Targets proposed in 2015 EU Circular Economy Package
Waste Framework Directive (2008/98/EC)	Recycle 50% of municipal waste by 2020	Recycle 65% of municipal waste by 2030
Landfill Directive (1999/31/EC)	Reduce biodegradable municipal waste sent to landfill to 35% of 1995 levels	Reduce landfilling to 10% by 2030
Packaging and Packaging Waste Directive (1994/62/EC)	Recycle between 55 and 80% of all packaging waste by 2008 Recycle 22.5% of plastic packaging waste by 2008	Reuse/recycle 65% of all packaging waste by 2025, and 75% by 2030 Reuse/recycle 55% of plastic packaging waste by 2025

In addition to measurable targets, EPR measures are broadly in support of the EU Circular Economy Action Plan and existing resource efficiency objectives of the EU and its Member States (EUROPEN, 2013). For example the Dutch Framework on Packaging (Raamovereenkomst Verpakkingen II 2013-2022) aims to increase the portion of collected and recycled plastic packaging (The Ministry of Infrastructure and the Environment, 2016).

Coverage of EPR schemes remains relatively low. One study of 14 European cities showed that whilst packaging waste was covered in all of the cities, PROs currently only cover 45% of the total products (by mass) that become waste, and less than one third of total municipal waste (Zero Waste Europe, 2015). Nevertheless, not all Member States have implemented EPR schemes for packaging and not all

packaging products are covered by existing schemes within countries (see Table 3). Opportunities therefore exist to **extend the coverage of existing EPR measures to all packaging applications**.

Box 3 Creating incentives to reduce uncollected packaging

Since 2009, the Belgian EPR organisation FOST Plus pays a compensation to the Belgian Regions (Flanders, Wallonia and Brussels) to cover the management of waste which is not covered by the scheme. The fee of EUR 0.5 per inhabitant is fixed for the current accreditation period, i.e. 2014-2018 (Fost Plus, 2014a). As the rate is fixed to the population size rather than the amount of uncollected packaging put on the market, arguably this fee does not create incentives to reduce uncollected waste. One study has concluded that a product tax on uncollected waste would create better incentives to increase the volume of waste covered by the EPR collection (EY, 2016).

The **existing EU proposals to increase recycling and landfill reduction targets will provide a further incentive** for better implementation of EPR measures across the EU if the proposals are accepted, as they will require producers covered by EPR measures to improve their collection infrastructure and reporting (EY, 2016).

Finally, a core opportunity for EPR exists in its **potential to reduce environmental externalities of packaging waste** – notably natural resource depletion, GHG emissions throughout the value chain, and leakage of waste material into the terrestrial and marine environment from poor waste management. The plastics industry is anticipated to account for 15% of the global carbon budget by 2050 (Ellen MacArthur Foundation, 2017). It is estimated that 700 tonnes of mismanaged plastic waste enter the Mediterranean daily (Jambeck et al, 2015; UNEP/MAP, 2015). The EU Circular Economy Package sets a target for reducing beach litter by 30% by 2020, and the EU is also committed to support the reduction of plastic leakage into oceans across the globe.

4.2 Enhancing the performance of existing EPR schemes

A further window of opportunity exists to improve the functionality of EPR schemes for plastic packaging in the EU. A number of limitations of existing EPR schemes were previously outlined in Chapter 2, including the need to:

- **Clarify definitions** of, and related to, EPR to support harmonisation across the Member States (EUROPEN, 2013);
- Clearly **allocate responsibilities between stakeholders** to support dialogue between producers and public authorities (European Commission, 2014);
- **Cover costs** to ensure that costs are effectively passed to producers and provide adequate financing for separate collection and waste management (European Commission, 2014) (Bonnet, 2017);
- **Facilitate fair competition** between PROs and actors in the waste management sector, including between Member States where appropriate/necessary. In Member States with competing PROs, an independent third-party 'clearinghouse' body should be set up to act as a regulator for a competitive market (European Commission, 2014); and
- **Ensure transparency** both on the performance and costs of EPR schemes, to allow for monitoring and reporting, as well as the replication of best practice.

Article 8a in the proposed amendments[6] **to the Waste Framework Directive (P8_TA(2017)0070, 2017) includes provisions for general requirements for European EPR schemes**. These relate to defining the roles and responsibilities of stakeholders in product value chains, providing measurable

[6] Institutional trilogue negotiations on the amendments began on 30 May 2017.

targets on waste management, and improving reporting on waste flows. Financial contributions are to be based on cost recovery and modulated according to the 'real end-of-life cost of individual products'. Noting the diversity between schemes in Europe in terms of effectiveness and performance, the amended waste legislation also includes a provision for an initiative to support an information exchange on EPR schemes in Europe (P8_TA(2017)0070, 2017).

4.3 Deepening the scope of EPR and strengthening financial incentives for eco-design

EPR measures in the EU have demonstrated successes in increasing rates of recycling, but have been less effective at meeting circular economy objectives beyond recycling, such as re-use and eco-design (Zero Waste Europe, 2015). Some of the challenges faced by existing EPR schemes in stimulating producers to change the design of their products include:

- Low cost of compliance with EPR, including end-of-life phase, relative to other business costs (Zero Waste Europe, 2015);
- Fees are unavoidable so are viewed as a tax, and therefore do not incentivise innovation (Zero Waste Europe, 2015);
- Collective PRO schemes average the fees across producers, dis-incentivising individuals to be innovative (Zero Waste Europe, 2015) (OECD, 2014);
- Consumers are often willing to absorb the costs of EPR within the products they buy (Zero Waste Europe, 2015);
- Fees were designed to cover the costs of waste management and not to change the behaviour of producers (Zero Waste Europe, 2015), for example by promoting eco-design;
- Fees encourage waste management which minimises the costs of recycling and treatment rather than following circular economy objectives (Zero Waste Europe, 2015); and
- A focus on weight favours some products which are less compatible with circular economy objectives (Zero Waste Europe, 2017).

Box 4 Opaque PET

Opaque PET is a problematic material for recyclers as it is difficult to distinguish from other materials such as (transparent) PET and HDPE, yet unlike those materials it is poorly recyclable due to its opacifier coating. Previously, opaque PET was used in small volumes, allowing it to be absorbed within standard PET waste streams. However, rapid growth in its use (up 45% since 2014 in France), notably for cosmetics and dairy products, has led it to become a disruptive material that degrades the quality of recyclates (Zero Waste France, 2017). Nevertheless, plastic producers continue to favour opaque PET because of the benefits it offers, including being up to 20 to 30% cheaper than HDPE, and up to 20% lighter for specific applications.

Producers of opaque PET also benefit within typical weight-based EPR schemes, since it is lighter than alternatives. Consequently, producers of opaque PET pay less weight-based fees even though the material is not recyclable – contrasting to slightly heavier but recyclable HDPE. Additionally, some retailers have promoted their switch to opaque PET, noting the benefits of lightweighting and creating less waste compared to their previous product (Zero Waste France, 2017).

The challenges presented by opaque PET exemplify market signals, including those within many EPR schemes, that fail to incentivise producers to take into account the end-of-life stage of packaging. Under the French EPR scheme, producers who add opacifiers to plastics are now charged a 100% penalty – see Table 5. This represents a practical example of eco-modulation to better account for the recyclability of packaging placed on the market (Eco-Emballages, 2017).

Beyond existing measures there is a need for policies to support EPR schemes which facilitate systemic change in our approach to plastic packaging. A core opportunity for improving EPR measures is to **develop economic incentives which favour circular products and business models**. Doing so requires making more ambitious commitments in EPR legislation on packaging, and can be done in the following ways:

- **Harmonising criteria** including minimum requirements on products' design in order to reduce their environmental impact and support the waste hierarchy; and
- Development of EPR fees, including **modulated fees**, which reflect the intention of the waste hierarchy and incentivise more environmentally sustainable products to be placed on the market.

With regards to the **harmonisation of criteria**, within the context of the common market, EPR criteria should ideally be designed to reduce the variation of scopes, calculation methods and fees between Member States. The circularity (including re-usability and/or recyclability) of a packaging product should be factored in to the calculation of fees. Minimum requirements on recycled content have the potential to increase the market for secondary raw materials – with the ambition for them to compete with virgin materials (OECD, 2001). Legislation (e.g. the REACH Directive, EC 1907/2006) could be used to ensure the quality and safety of recycled packaging materials (Ecopreneur.eu, 2016). Specific EPR criteria could be put in place to address material design, such as small format or multi-layer packaging, as well as additives which are problematic for waste management.

Box 5 Carbon black and recyclability of packaging

Carbon black is a common pigment used to colour plastic packaging black. The pigment is problematic for recycling plants because it does not reflect light well and therefore cannot be easily detected by optical sorting machines. The French PRO Eco-Emballages (now CITEO) charges a 'penalty' fee to producers who put 'disruptive' packaging on the market, including packaging containing carbon black. Meanwhile, an 8% bonus (i.e. reduction) is available to packaging producers who remove black carbon dye from their products (Eco-Emballages, 2015c).

Fees should be modulated to support the waste hierarchy. Fees and the calculation methods behind them have significant potential to influence product design. The vast majority of current methods for EPR fee calculation are based on weight (arguably to minimise material use and carbon emissions of product transit). However, weight does not always reflect the full environmental impact of a product. In the right context (often heavier) reusable packaging will become ecologically superior after a sufficient number of uses (WRAP, 2010). A focus on weight has arguably led to an increase in the use of lightweight but poorly recyclable packaging (Zero Waste Europe, 2017). Modulating fees based on environmental assessment (e.g. based on recyclability or other aspects of environmental performance) therefore has potential to better inform how fees are charged.

Fees could be differentiated to incentivise specific products or producers. Existing EPR fees are often unavoidable and collective PRO schemes average charges across producers, which effectively dis-incentivises individual producers to innovate (Zero Waste Europe, 2015). Under current practices, there is a risk that innovative packaging producers, i.e. those who attempt to bring to market products compatible with the circular economy, will be penalised for waste created by laggards (Ecopreneur.eu, 2016). A significant level of differentiation or exemptions therefore presents an opportunity to reward pioneers – this could usefully be carried out in the context of CPR, but also IPR, schemes.

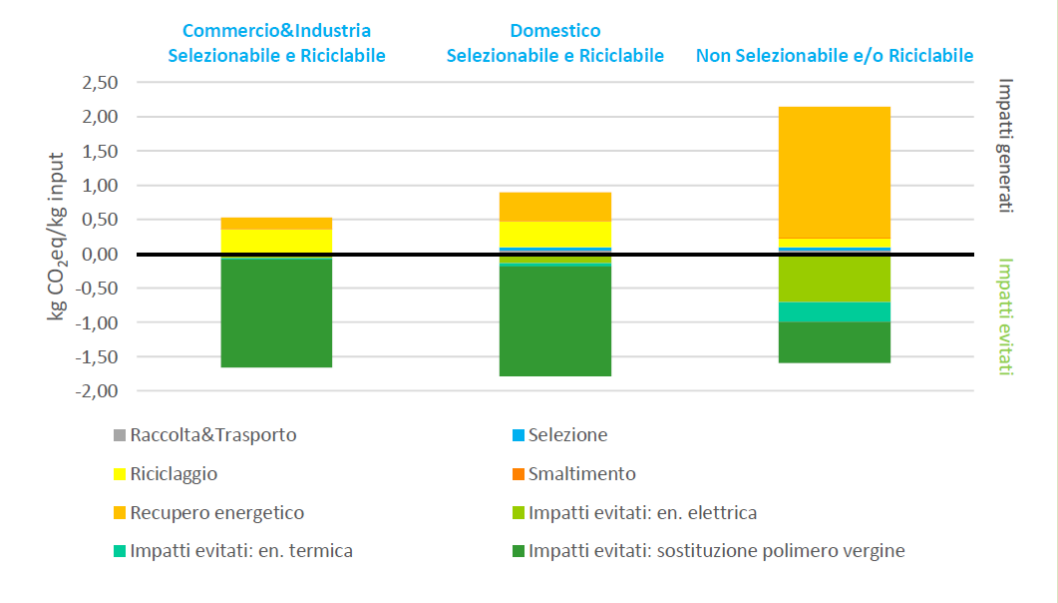
Challenges in creating the right incentives for producers. The difference in rates and the categorisation of products placed on the market requires careful consideration when developing EPR measures. For example under a system of modulated fees, there is uncertainty over what constitutes a sufficiently differentiated rate to incentivise a change in design amongst producers. Having said this,

in other areas of environmental fiscal reform relatively small changes in rates can provide a sufficient price signal to nudge behaviour, as demonstrated by the plastic bag levy in Ireland (Anastasio and Nix, 2016). From the perspective of a product value chain, there are also challenges in connecting different stakeholders; product design in practice is not undertaken by the actors responsible for paying producer fees. Initiatives should better integrate waste management objectives with design principles. In Italy CONAI have an award for packaging design (CONAI, 2017b), but the extent to which this is linked explicitly to environmental objectives is unclear.

Box 6 Providing an evidence base for eco-modulation

As part of the development of their system of 'contribution diversification', Italian PRO CONAI commissioned a life cycle assessment study of different waste streams to assess their relative environmental impacts (CONAI, 2017e). The study was based on four indicators: carbon footprint, ecological footprint, energy consumption and raw material use. Other indicators such as water footprint, land use and ozone depletion were omitted from the study. Arguably the application of several environmental impact indicators in this way can illustrate the benefits of re-use and recycling over the use of virgin materials in non-recyclable products.

Figure 3 Carbon footprint of waste categories, results from LCA study (Life Cycle Engineering (LCE), 2017)



Typical products in three categories of waste (left to right in Figure 3: industrial, domestic and unrecyclable) are assessed to give a range of life-cycle impacts in those categories. The study demonstrated that the impacts of unrecyclable waste are larger than the other two categories (Life Cycle Engineering (LCE), 2017). Differentiated rates based on the findings of this study will be introduced in January 2018 (CONAI, 2017c).

In this case, LCA provides one methodology which can be implemented by PROs to develop an evidence base for fee modulation. Having said this, the expert roundtable during this study acknowledged that the narrow system boundaries and impact criteria of LCA studies might not effectively represent the complexity of waste management systems. Also, the heterogeneity of products and waste collection, sorting and recycling infrastructure suggest that it may not be possible to generalise results across different geographical areas (Circular Plastics Platform, 2017).

5 Roadmap and policy options

This chapter outlines a series of policy options for future consideration by stakeholders and policy-makers, to help achieve the potential of plastics-related EPR schemes to support the transition towards a circular economy in Europe. Whilst several of the general options may also be of relevance to a wide range of EPR schemes dealing with different materials, we maintain a focus on EPR schemes dealing with plastic (and in particular plastic packaging). In addition to the general options for improvements to EPR, we present a series of options related to the potential for greater modulation of fees based on environmental criteria, with a view to encouraging greater eco-design.

The options below are intended to form a useful contribution to both the forthcoming EU Plastics Strategy and the ongoing process of finalising the adoption of the EU Circular Economy Package. It should be noted that they are not intended as a 'one-size-fits-all' approach; specific conditions in the Member States (e.g. particularly prevalent types of packaging, or existing waste collection, sorting and recycling infrastructures/technologies) may make some options more suitable than others in some cases. However, where feasible, greater harmonisation should still be sought.

5.1 Windows of opportunity to push for greater ambition on EPR for plastics

There are currently two key windows of opportunity at the EU level to increase the ambition of EPR schemes regarding plastics.

The first is the publication of the **EU Plastics Strategy**[7]. The Strategy will present an overarching plan to move towards a circular economy for plastic materials in the EU. To achieve this goal, the Strategy will provide a vision to rethink how we produce, use and reprocess plastics, to improve the design of plastics and increase their reuse and recycling, amongst other solutions. It is also likely to propose actions related to improving collection, sorting and recycling infrastructures, encouraging the establishment of markets for recycled plastics, developing innovative materials and feedstocks, encouraging smarter design, and reducing pollution caused by plastics.

EPR schemes have a role to play in achieving several of these objectives. As discussed in this report, EPR has been demonstrated to help with the financing and improvement of infrastructure for the separate collection of plastics. The higher quality, less contaminated plastic material collected with the support of EPR offers greater opportunities for recycling, which in turn can help to provide a more reliable supply of secondary raw material and support the development of markets for their use. EPR schemes, through their promotion of separate collection, also contribute to capturing a greater proportion of plastic material through waste management channels, helping to reduce the amount of plastic which is landfilled and/or lost to the terrestrial or ocean environment.

However, as previously discussed, **there remains significant potential for greater ambition of EPR**, in particular in terms of encouraging smarter and more sustainable design of plastic products, and greater recyclability of plastics. **Wider application of the eco-modulation of EPR fees** is likely to offer considerable potential to assist with these objectives (see below).

[7] At the time of writing, the EU Plastics Strategy was due to be published on 6 December 2017.

The second window of opportunity is the final adoption of the **EU Circular Economy Package**[8], including the proposed revisions to waste-related Directives. The proposed revisions include:

- A target to recycle 65% of municipal waste by 2030;
- A target to recycle 75% of packaging waste by 2030;
- The use of economic incentives for producers to produce greener products and support recovery and recycling schemes;
- Measures to promote re-use and stimulate industrial symbiosis;
- A binding target to reduce landfill to a maximum of 10% of municipal waste by 2030;
- A ban on the landfilling of separately collected waste;
- The promotion of economic instruments to discourage landfilling; and
- Simplified and improved definitions and harmonised methods to calculate recycling rates throughout the EU.

EPR can contribute to all of these targets and objectives. Its role in promoting the separate collection of waste should assist in meeting the municipal waste and packaging recycling targets, and the avoidance of separately collected waste being sent to landfill. EPR is one of the key economic instruments (along with waste disposal taxes/charges, and material and product taxes/charges) that can discourage landfill and incineration, and encourage producers to create more sustainable products. If incentives provide the right signals, EPR could also help to drive reuse, prevention and eco-design, moving plastic waste management up the waste hierarchy. It also has the potential to contribute to encouraging industrial symbiosis (by ensuring separate collection and the provision of high quality secondary raw materials). Finally, the definitions currently used in some EPR schemes to identify which products are recyclable, and the way in which their recycling rates are calculated, may provide some inspiration to policy-makers for future EU-wide definitions and calculation methods (assuming that EPR schemes are willing to share their methodologies).

In addition to these two EU level initiatives, the planned **Chinese ban on imports of plastic waste** (due to be in place as early as January 2018) may provide extra motivation for improved plastic waste management in the EU. The EU currently exports almost half of the plastics collected for recycling (European Commission, 2017), mainly to China (Bourguignon, 2017b).

The **subsequent implementation** of both the Plastics Strategy and the legislative measures in the Circular Economy Package will provide an ongoing opportunity, over the coming months and years, to continue to highlight the potential role for EPR in encouraging a more sustainable use of plastics.

5.2 Policy options of relevance to the EU Plastics Strategy: eco-modulation of EPR fees

It is expected that the EU Plastics Strategy will recognise the crucial role that EPR schemes can play in contributing towards its objectives. It is therefore likely that the Strategy will suggest not only wider use of EPR for plastics, but also adaptations to how EPR is designed and implemented. It may suggest ways to address issues such as how to achieve EPR's potential to encourage producers to create more sustainable products (including through eco-design), and how to encourage greater harmonisation of EPR to address the current divergent approaches used in the Member States. This section focuses on the former issue, by suggesting a series of options for the eco-modulation of fees.

[8] At the time of writing, the legislative proposals within the Circular Economy Package were with the Council following the first reading opinion of the European Parliament in March 2017 (COM(2015)595 to amend Directive 2008/98/EC on waste; COM(2015)596 to amend Directive 94/62/EC on packaging and packaging waste; COM(2015)594 to amend Directive 1999/31/EC on the landfill of waste; and COM(2015)593 to amend Directives 2000/53/EC on end-of-life vehicles, 2006/66/EC on batteries and accumulators and waste batteries and accumulators, and 2012/19/EU on waste electrical and electronic equipment).

As demonstrated by the examples of the packaging EPR schemes CITEO (France) and CONAI (Italy), it is feasible to **modulate fees based on criteria related to a product's environmental impact**. Taking this approach enables fee modulation to be designed to ensure that producers who place on the market more sustainable plastic packaging are duly rewarded through the fee structures. If fees are differentiated enough such that there is a discernible impact on producers' costs, producers are more likely to move towards the cheaper, more sustainable options (where alternatives are feasible).

Based on the research undertaken for this study, and discussions with a group of stakeholders during an expert roundtable[9], the options for eco-modulation of fees outlined below are presented in order of the potential they appear to offer to encourage eco-design of plastic packaging, as well as their feasibility and acceptability amongst stakeholders.

5.2.1 Fee modulation based on the level of recyclability of plastic packaging

Modulation of fees based on the **recyclability of plastic** would provide a significant driver for eco-design, and should have the knock-on effect of increasing recycling rates, generating more secondary raw material, and facilitating the use of recycled content. In addition, ensuring greater recyclability would lead to economic benefits by simplifying, and therefore reducing the costs of, recycling; it has been estimated that non-recyclable items that enter the recycling stream increase costs by up to USD 300-350 per tonne compared with easily recyclable items (Ellen MacArthur Foundation, 2017).

However, it must be noted that recyclability can be defined in many different ways. An agreed definition of recyclability, or different aspects that contribute to recyclability, would therefore be essential in order to provide a sound basis for eco-modulation. **A common EU definition of recyclability, or specific aspects of recyclability, should be explored**.

Aspects related to recyclability that could be considered as the basis for fee modulation include:

1. **Existence of technology to sort and/or recycle** the packaging: Both the French CITEO and Italian CONAI schemes (from 2018 onwards) take this into account in their fee structures. To ensure that there is no technology lock-in and improved technologies are taken into account in future, best available technologies should be periodically reviewed and used as the basis for defining this aspect of recyclability. It is also important to ensure that the recycling technologies used as the basis for fee calculation are accessible in the (broader) region where packaging items are placed on the market, which implies the need for some harmonisation between EPR schemes in the EU if this criterion is to be used. This is necessary to avoid theoretical options, unfeasible in practical (economic) terms, from being used to define which packaging is recyclable (e.g. in the case of rarely-used polymers that result in very low volumes of packaging of a certain type).
2. **Composite packaging** (i.e. packaging with different layers/components): Modulated fees for composite packaging are already applied in several packaging EPR schemes around the EU, but could be introduced to those where it is not already present. The fee structure could be based on how possible it is to separate and then recycle the different parts/layers of the packaging, with lower fees applied to those that are both easier to separate and where a high percentage of the separated material can be recycled (as in some cases the level of contamination of separated layers may be prohibitive to recycling).

[9] A roundtable of invited experts was held in Brussels on 18 October 2017. Stakeholders who attended represented the recycling industry, PROs, municipalities/waste collectors, materials/research institutes and NGOs.

3. **Non-hazardous but disruptive additives:** Some additives that are introduced to plastic packaging, such as opacifiers, can be classified as disruptive. This is because they make items difficult to separate at the sorting stage, and/or contaminate the material stream making recycling and the production of high quality secondary material either difficult or impossible. Fees could therefore be made higher for such materials, as is the case for carbon black pigment in the French CITEO scheme. Again, best available technologies should be periodically reviewed and taken into account.
4. **Packaging format design:** It has been estimated that up to 15% of mixed plastic packaging collected cannot be properly sorted and recycled due to its format design (Ellen MacArthur Foundation, 2017). Improvements in this area that help to improve recyclability therefore have the potential to significantly improve the economics of recycling specific types of packaging (Ellen MacArthur Foundation, 2017). Aspects of format design that could be taken into account include: labels, glues and sleeves; inks; lids and closures; valves, pumps and triggers; and the overall packaging form or shape.
5. **Hazardous additives:** Although the essential requirements for packaging state that hazardous substances in packaging must be minimised to reduce impacts at the waste management phase, there is some evidence that some packaging placed on the EU market still contains such additives. To address this, it would firstly be necessary to develop a way to identify which packaging contains the additives concerned; then additional fees or fines could be place on the responsible producers.
6. **Existence of markets** to use the secondary raw material: One of the aspects taken into account in the new Italian CONAI fees is whether there are one or more companies that use the secondary raw material created from a product. Consideration could be given to applying higher fees for materials with no current end use market, but again this should be linked to best available technologies to account for progress over time.

5.2.2 Fee modulation based on the recycled content of plastic packaging

Modulation of fees could be considered based on the **amount of recycled content in packaging** that is placed on the market. The new German Packaging Law (VerpackG) which will come into effect on 1 January 2019 will encourage EPR schemes to promote recycled content. Although it is not currently clear quite how this will be implemented, an interim minimum standard will be developed during 2018 (Landbell, 2017). Appropriate fee modulation based on the proportion of recycled content would provide a driver for producers to incorporate secondary raw material in their products, thereby helping to develop demand and markets for the use of recycled content. Care should be taken, however, to ensure that recycled plastic is not diverted away from beneficial non-packaging applications.

It should be noted that in order to provide a sound basis for this type of eco-modulation, there would need to be a definition of recycled content, quality standards, and a system of traceability for recycled material. These are needed both to ensure that the material is actually recycled, and to ensure that the use of post-production recyclate, i.e. recyclable material arising from packaging production, does not count towards the recycled content target (Circular Plastics Platform, 2017). Additionally, fee modulation on the basis of recycled content may not offer any direct benefit to PROs and recyclers more specifically, as their operating costs are likely to remain unchanged. For this reason care should be taken to design fee modulation for recycled content in a way that still permits cost recovery, for example through an additional charge placed on plastic packaging with virgin only content, rather than a reduced fee for packaging with recycled content. Having said this, as the objective of this measure would be to increase the demand for recyclates and improve the economics for secondary markets, there is likely to be an indirect benefit for recyclers.

5.2.3 Fee modulation based on bio-based materials, biodegradability and/or compostability

Bio-plastics (comprising both bio-based and biodegradable material) currently represent around one per cent of the roughly 300 million tonnes of plastic produced globally each year. The global production capacity for bio-based non-degradable plastics in 2016 was around 3.2 million tonnes, and the figure for biodegradable plastics was just under 1 million tonnes (European Bioplastics, 2017b).

Many **bio-based non-degradable plastics** can be recycled through the same channels as fossil-based plastics, meaning that they are not disruptive to recycling processes. For example, one study has found that mixing up to 10% each of starch based film and PLA film in a sorted plastic film mixture has no significant negative effect (van den Oever et al, 2017). Packaging is one of the applications where bio-plastics are most used, accounting for almost 40% of the market share of bio-plastics[10], and expected to reach 42% in 2021 (European Bioplastics, 2017a). The use of bio-plastics for beverage bottles has increased significantly since 2012, following the introduction of bio-derived PET (Smithers Pira, 2017). Nevertheless, bio-plastics currently represent less than 1% of global plastic packaging sales. However, the market share is expected to grow to 2.4% by 2023, and Europe accounts for almost one third of global bio-plastic consumption in 2017 (Smithers Pira, 2017). Some existing packaging EPR schemes do apply lower fees for bio-plastics, including ARA in Austria and Latvijas Zalais Punkts in Latvia. For these reasons, modulation of fees for bio-based plastics appears feasible, and wider application could help to encourage a further shift away from fossil-based feedstocks.

The use of **biodegradability or compostability** as a criteria for fee modulation appears more problematic. Challenges for fee modulation for biodegradable or compostable packaging include lack of clarity on the actual properties of materials and their intended after-use pathway (e.g. home or industrial composting), potential cross-contamination with recycling streams, and the related benefits and costs. However, some packaging EPR schemes (e.g. ARA in Austria and Afvalfonds Verpakkingen in the Netherlands) do have some fee modulation based on biodegradability. Since innovation into new materials with these properties is continuing, it may therefore be worth investigating in more detail in future how fee modulation could work for biodegradable and compostable packaging.

5.2.4 Other options considered but not currently preferred

A series of other potential options for eco-modulation of fees were also considered during the preparation of this report. However, for various reasons, they are not recommended for the first wave of wider application of eco-modulation. These options were:

1. **Lifecycle assessment or Product Environmental Footprint (PEF)** of a product: The expert roundtable deemed that this would be problematic due to the need to define specific, measurable criteria upon which to base the modulation. A common definition/approach would be needed, and PEF is currently neither developed enough nor simple enough in its methodology to provide that. In addition, the lifecycle cost of a product depends at least in part on the waste management systems and infrastructures available in the country where it reaches the end of its life, meaning that it may differ between Member States (Circular Plastics Platform, 2017).
2. **Reusability** of plastic packaging: Whilst some existing schemes, such as EKO-KOM in the Czech Republic, apply no fee for reusable packaging, in many cases reusable packaging is dealt with through well-functioning, closed-loop systems outside of PRO-based EPR, such as deposit refund systems (for reusable/refillable packaging) and reverse logistics (for transport

[10] NB This figure includes both bio-based and biodegradable plastics.

packaging) (Circular Plastics Platform, 2017). EPR fee structures should therefore be designed in such a way that they do not discourage the use of reusable packaging.

3. **Size of packaging/number of units:** Under the new CONAI regime, packaging smaller than 5cm x 5cm is deemed unrecyclable, since they often cannot be detected by sorting machines. It is evident that small format packaging such as single-portion packs, disposable condiment packs and coffee machine pods use more material per amount of product than larger format packaging. However, it is not always the case that these items are genuinely unrecyclable. For example, bottle lids are often made of recyclable material, and it is not impossible to sort them since their small size means they are often removed at an early stage of the sorting process (e.g. through the smallest holes in trommel screens). In addition, demographic trends (i.e. more people living in smaller or single-person households) means that there is increased demand for such packaging. The expert roundtable therefore felt that it may not be right to increase fees for such items at the current time, although this could be reassessed in future.
4. **Eco-design criteria:** Many characteristics that would potentially be included in eco-design criteria for plastic packaging (e.g. on recyclability or recycled content) can be dealt with through modulated fees that address them specifically. The expert roundtable therefore concluded that separate eco-design criteria for packaging are not required.

5.3 Policy options of relevance to the EU Plastics Strategy: general recommendations on EPR

In addition to the options for eco-modulation of fees outlined above, several general options for the reform of EPR schemes can be drawn from existing literature.

1. **(Greater) harmonisation of EPR approaches**: As outlined in this report, there is significant variation in the approaches taken to EPR within the EU Member States. It would be beneficial if these approaches were harmonised to a greater extent. This could be achieved for example through EU level legislation or guidance. The general requirements for EPR schemes included in Article 8a of the proposal to amend the Waste Framework Directive, if implemented, should help to make some progress on this.
2. **Common definitions/standards**: The lack of common definitions and standards of relevance to EPR (including the term EPR itself, the calculation of how much product is placed on the market, recycling rates, recyclability, biodegradability, compostability etc.) is often cited as a problem for the functioning and assessment of EPR schemes (see e.g. (Netherlands Institute for Sustainable Packaging, 2017a)). This makes it difficult to compare schemes like for like, and creates issues for producers who are subject to EPR schemes in more than one EU Member State and the recyclers who process the materials collected through EPR. A series of common definitions related to EPR should therefore be sought at the EU level.
3. **Extend EPR to additional types/applications of plastics** (including more types of plastic packaging): Since it can be demonstrated that EPR helps to achieve greater rates of separate collection and recycling, and higher quality recycled material, consideration should be given to increasing its scope, to maximise its potential impact. Other plastic products to which it could be applied more widely may include: plastic used in construction, agricultural plastics, medical and pharmaceutical packaging, plastic foils, bulky plastics, disposable plastic kitchenware, furniture, printer cartridges, packaging associated with e-commerce/distance selling, and carpets. Some Member States currently have EPR for one of more of these plastic products, but it could be considered by more Member States.
4. **Ensure full cost coverage of EPR schemes**: Full cost recovery should be pursued to ensure that the EPR fees paid by producers cover all collection, sorting and processing costs of the waste concerned. This would provide producers with the maximum possible incentive to reduce the

amount of packaging they place on the market, ensure the application of the polluter pays principle, and contribute to reducing the cost of waste management within municipal budgets. Consideration should also be given to whether producers should provide some financing to deal with the residual (i.e. unsorted) fraction of municipal waste, as in the Austrian and Belgian FOST Plus schemes, since it may also contain some of their product if it is not correctly sorted by households.

5. **Increase EPR collection and recycling targets:** The majority of existing EPR schemes are designed to achieve the collection and recycling targets set in EU waste legislation, but not to go further than that. This limits the ambition of EPR. It is therefore crucial to ensure that targets, whilst achievable, are adapted to progress to maintain an adequate level of ambition. Higher collection targets may be a good starting point; once materials are collected, it becomes more likely that methods will be developed to recycle the collected waste.
6. **Increase transparency of information** on PROs: In many cases, information on the fees, operating costs, functioning and performance of PROs is not currently readily available. This makes it difficult to carry out a full evidence-based assessment or comparison of different EPR schemes. Greater transparency of information would enable better monitoring, benchmarking and comparison, and the sharing of best practice to ensure that EPR schemes across the EU function to their full potential, in both environmental and economic terms.

As mentioned earlier in this report, EPR does not function in a vacuum. Policy instruments that interact with EPR include regulatory targets, bans, pay-as-you-throw schemes, waste taxes, product and material taxes, product standards, labelling, voluntary agreements, procurement policies, and information and awareness campaigns. Responsible choices by consumers are also crucial. Each of these can support the good functioning of EPR, and it is therefore important that there is **coherence between these instruments and their objectives, and those of EPR**, and that each instrument is fully and properly implemented in order to maximise the positive outcomes from EPR.

It should also be noted that EPR functions largely around the recycling element of the waste hierarchy. As such, it is preferable to final disposal and incineration (with or without energy recovery) of waste. However, it should be noted that prevention and reuse are preferred options according to the waste hierarchy. For this reason, **EPR schemes should be designed in such a way that they do not hamper, but rather encourage, actions related to prevention or reuse**.

EPR is therefore a vital part of the picture to **ensure that plastic and its value stay in the economy and out of the environment**, and to **support the transition to a sustainable circular economy**.

Annex 1 Case study: CITEO (previously Eco-Emballages), France

Author: Susanna Gionfra (IEEP)

1. Description of the EPR scheme

Eco-Emballages (now CITEO) is a collective EPR scheme for household packaging waste in France. It was the first French eco-organisation (Didier and Sittler, 2014) and was founded in 1992 as a response to a packaging decree issued in France in the same year (Bio Intelligence Service, 2009). Its aim is to encourage selective waste collection and reduce packaging waste (Didier and Sittler, 2014), creating an interface between business and other stakeholders (Bio Intelligence Service, 2009). The scheme applies to all packaging consumed by households as end-users (European Commission, 2001) and affects all companies, producers and importers responsible for placing packaged products on the French market which then become household packaging waste (Eco-Emballages, 2015b). If the producers or importers of the packaged products cannot be identified, the scheme affects the person first responsible for placing the products on the market (European Commission, 2001).

Producers are required to ensure the end-of-life of the products they place on the French market (initially by financing the extra costs of selective collection; if the 75% packaging recycling target is met, producer fees will cover 80% of the net costs of collection and sorting). Local authorities are responsible for managing waste, which can be done by developing a separate collection system for household packaging waste (Bio Intelligence Service, 2015). In addition to applying to a state-approved body for collective systems, the producer can proceed with the management of packaging waste by organising a specific take-back system or by establishing a deposit-refund scheme (Bio Intelligence Service, 2015; European Commission, 2001). Governance over the scheme is achieved through an Administrative Advisory Commission ('Commission Consultative d'Agrément', CCA) set up in 1992, which aims to advise the State so as to ensure effective functioning of the household packaging sector and monitoring of packaging recycling objectives (Bio Intelligence Service, 2015).

Each year, producers are charged fees, calculated based on the number of sales of packaging units placed on the market (before 2016) and their weight per material. The former are fixed, progressive fees and have decreased by 10% in 2016 from the previous year. Fees based on weight depend on the packaging material. Until the end of 2017, they may also vary within each category depending on the type of packaging item (e.g. PET bottles, other plastic bottles, other plastic packages).

Since 2012, the fees charged to producers have been modulated according to environmental criteria, rewarding good sorting practices and eco-design, and penalising packaging which hampers recycling (Eco-Emballages, 2015c). The criteria are defined by the obligated producers, after discussion with recyclers (Lange, 2017). An additional 'Green Dot' financial contribution was also implemented, together with a scheme based on a bonus/malus system which encourages eco-design and sorting guidelines while preventing disruptive packaging (Eco-Emballages, 2015a). For instance, a 50% penalty (malus) is applied to specific packaging which cannot be recycled or which presents features that hamper the recycling process. A 100% penalty applies to packaging which cannot be recovered. Meanwhile currently a bonus of maximum 24% is applied to packaging with eco-design features and which is associated with awareness initiatives (Bio Intelligence Service, 2015).

In September 2017, Eco-Emballages merged with Ecofolio, forming a new joint body CITEO. Through the merger, the two PROs aim to improve collection, sorting and recycling as well as eco-design. New eco-modulation tariffs are introduced for the period 2018-2022 and are shown in Table 5 below. Fees per packaging unit will be replaced by fees per consumer sales unit (CSU) in 2018.

Table 5 Eco-modulation of 2018-2022 tariffs of the CITEO scheme

BONUS		
Awareness bonus	**On-Pack bonus[1]**	
	8%	Sorting instruction on packaging
	5%	Triman logo on packaging
	4%	QR code that links to a validated sorting instruction
	Off-Pack bonus[2]	
	4%	Off-pack awareness actions (e.g. TV/radio, advertisement, press)
Reduction bonus	**Reduction and recyclability Bonus[3]**	
	8%	≥ 1 action(s) for reduction of packaging or improvement of recyclability
	+ 4%	Additional bonus if the action is documented and published in the catalogue of good practices of CITEO
	Bonus for sortable plastic packaging	
	12%	Bottles in PET, HDPE or PP
	Bonus for hard plastic packaging that can join existing recycling channels	
	8%	Hard packaging that is made out of PET, HDPE or PP (besides bottles)
Total Bonus = awareness bonus + reduction bonus = min. 0% - max. 24%		

MALUS[4]	
Malus for packaging included in sorting instructions, but without a recycling channel	100%
Malus for packaging with mineral opacifiers	100%
Malus for disruptive packaging (damage to recyclability)	50%
Malus for paper and cardboard with mineral oil-based ink	10%

[1] *On-pack bonuses cannot be cumulated.*
[2] *Off-Pack bonus can be cumulated with On-Pack bonus; the maximum awareness bonus is thus 12%.*
[3] *This bonus can only be applied the first year the packaging is brought on the market.*
[4] *Packaging that is subject to a malus cannot benefit from a bonus.*
Source: (Citeo, 2017a)

The PRO has a link to consumers through several awareness campaigns and publications on packaging information organised by the PRO and the local authorities involved (Bio Intelligence Service, 2015). In 2015, Eco-Emballages organised the first 'Journée du tri' (Waste sorting day), an event which promoted public education on circular economy and packaging waste recycling (Eco-Emballages, 2015a). CITEO is currently the only household packaging scheme in France. In May 2017, a new eco-organisation, LÉKO, was approved and was initially expected to enter the packaging compliance scheme market in January 2018. However, LÉKO has not yet started operations, leaving CITEO as the monopoly PRO. In response to the new potential competitor, CITEO implemented changes in its operation. The State also implemented changes; for instance the Green Dot is no longer mandatory in France. Removing the Green Dot obligations implies that companies that wish to use the Green Dot voluntarily are required to obtain a licence from CITEO to place their products on the market without being subject to penalties (Ecosurety, 2017).

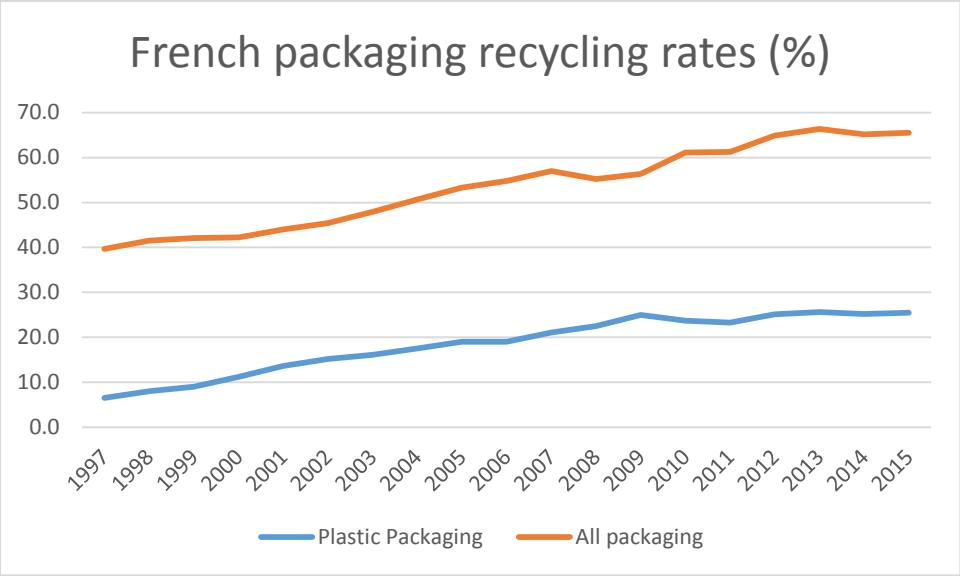
CITEO was formed building on the former mission of both and Eco-Emballages (for household packaging) and Ecofolio (for graphic papers), with the ambition of delivering solutions to its 50,000

client enterprises to develop economic and environmental efficiency of all the household packaging and printed and graphic paper sectors (Citeo, 2017b; Ecofolio, 2017).

2. Targets and performance of the EPR scheme

CITEO contributes to a national packaging recycling target of 75% (Bio Intelligence Service, 2015). The quantity of packaging put on the market by CITEO's clients, and by its affiliate Adelphe, was estimated to be 4,479,000 tonnes in 2016, 0.3% more than the previous year (Eco-Emballages and Adelphe, 2016). In 2016, the packaging waste recycling rate achieved was 68% or 3,344,000 tonnes (Eco-Emballages and Adelphe, 2016) compared to an estimated 18%, or 816,000 tonnes, in 1993, accounting for all packaging materials (Eco-Emballages, 2015a). This represents a 2.7% increase, or 88,000 tonnes, in packaging waste recycling from 2015 levels, when the recycling rate was estimated at 67% (Eco-Emballages and Adelphe, 2016). Nevertheless, around 1 million tonnes of packaging were landfilled in 2016 (Lange, 2017).

Figure 4 Recycling rates for packaging and plastic packaging in France (Eurostat, 2017b)



In addition, the implementation of the CITEO scheme aims to move towards a future where 100% of packaging waste is sorted. In France, 99.8% of the population can sort their packaging waste and in 2015 45.6 kg of packaging waste per capita was sorted (Eco-Emballages, 2015a). The increase in packaging recycling rates observed in 2016 was due to improvements in all packaging materials and associated initiatives. In particular, plastic packaging performance evolved thanks to improvements in sorting, and to the extension of sorting instructions to all plastic packaging which allowed 15 million inhabitants to sort plastic packaging items in 2016 (Eco-Emballages and Adelphe, 2016). In addition to the 75% packaging recycling target, CITEO aims to contribute to achieving 65% of paper recycling by 2022 (Citeo, 2017a).

The set targets are to be achieved by 2022, meaning an additional 444,000 tonnes of packaging should be recycled compared to 2016 (Eco-Emballages, 2017).

Today, 50,000 companies take part in the recycling and sorting initiatives implemented by local authorities and since the creation of Eco-Emballages in 1992 they have paid a total of EUR 8 billion in fees. New items are manufactured from recycled packaging waste and resold materials have generated EUR 193 million of revenue for local authorities (Eco-Emballages, 2015a).

Market trends in the packaging sector indicate that efforts have been made to reduce the weight of packaging. In 2015, packaging weight was reduced by 4,500 tonnes. This trend has allowed Eco-Emballages to contribute to reducing the amount of packaging entering the market by 106,000 tonnes between 2007 and 2012 (Eco-Emballages, 2015a).

In 2016, the contribution of the EPR scheme was EUR 654 million for 4.9 million tonnes collected (Eco-Emballages and Adelphe, 2016). The average contribution per tonne collected is thus EUR 133 per tonne collected or EUR 9.8 per inhabitant[11]. These numbers show that the average contribution has somewhat decreased over time, from EUR 140 per tonne collected or EUR 10 per inhabitant in 2012 (Bio Intelligence Service, 2015).

3. Assessment of the EPR scheme

CITEO encourages good packaging recycling practices and incentivises waste prevention by offering financial support to local authorities and producers which successfully collect, recycle and recover packaging waste.

In addition, the Green Dot fee modulation scheme, based on eco-criteria, promotes recycling and eco-design in packaging by financially rewarding recycling-friendly packaging whilst also penalising packaging that cannot be recycled, or alters recycling in very specific cases. The optimisation of packaging design and recyclability is further encouraged through the provision of a number of tools such as provision of training and guidelines to producers and companies (Bio Intelligence Service, 2015; Eco-Emballages, 2015a), with all costs being covered by the PRO. For instance, CITEO provides an online software tool which enables the calculation of the impacts of packaging on the environment and helps producers in reducing them.

In order to support good sorting practices, CITEO promotes the development of sorting instructions to be placed on all packaging (Bio Intelligence Service, 2015). In 2015, 40 billion packages carried sorting guidelines (Eco-Emballages, 2015a).

Monitoring of producers' activities is ensured through annual reports and activity reports, which include information on collection and recycling rates, and tonnages put on the market. Producers' declarations are then regularly compared to those of local authorities to check for coherence (Bio Intelligence Service, 2015). This monitoring system provides a useful tool to predict future trends and quantities of waste that will need sorting in the future, as well as their characteristics (Eco-Emballages, 2015a).

Despite the number of advantages associated with CITEO, the system presents some disadvantages linked to the large number of sorting centres (251 in France) and the lack of transparency over costs actually borne by the municipalities. For instance, there is a risk of overestimating the overall costs due to the system's reliance on reference rather than actual costs. These are not a good representation of the heterogeneity of the services offered by local authorities, and more transparent information on such costs is needed (Bio Intelligence Service, 2015). However, CITEO is currently working to reduce the number of sorting centres and modernise them. Lastly, although the scheme modulates fees based on several criteria, modulated fees within Eco-Emballages in 2013 amounted to only 0.27% of the total fees paid by the packaging industry.

[11] Based on quantities reported by Eco-Emballages and Adelphe, 2015 and number of inhabitants (Eurostat, 2016, 1st January): 66,759,950

Annex 2 Case study: CONAI, Italy

Author: Jean-Pierre Schweitzer (IEEP)

1. Description of the EPR scheme

The Italian National Packaging Consortium (Consorzio Nazionale Imballaggi - CONAI) was established with the Legislative Decree 22/1997 (Decreto Legislativo 5 febbraio 1997, n. 22) in order to support compliance with the EU Directive on Packaging and Packaging Waste (*94/62/EC*). A framework, the ANCI-CONAI Agreement, was set up in 1999 between the national association of Italian municipalities (Associazione Nazionale Comuni Italiani) allowing CONAI to fund the separate collection of packaging waste in municipalities and providing conditions for extended producer responsibility measures, for which CONAI is the Producer Responsibility Organisation (PRO). The agreement is voluntary and municipalities can opt to go to market selling collected waste directly to recyclers. The agreement was revised in 2004 in order to align it with the amendments to the Packaging and Packaging Waste Directive (*2004/12/EC*). Within CONAI, specific consortia have responsibility for the materials covered by the scheme (steel, aluminium, paper, wood, glass and plastic) – the consortium responsible for plastic is called *Corepla*.

The model implemented by CONAI covers all types of packaging and "is based on compliance with the principle of shared responsibility between companies, municipalities and citizens, whereby separately collected packaging waste is recycled" (Facciotto, 2017). A range of stakeholders in the packaging value chain are involved, including the companies which place packaging on the market or make use of it, public administration and citizens (Pro Europe, 2016). CONAI's self-financing system is based on "contributo ambientale" or environmental contribution charged to all packaging material and imposed on producers or importers of packaging products. CONAI transfers collected environmental contributions and distributes them to the material consortia that then remunerate municipalities for separate waste collection.

The rate of contributions charged to producers and importers depend on the weight and material of the packaging introduced on the market (CONAI, 2015). Table 6 summarises current rates across packaging materials. CONAI has a network of 450 waste centres for the take-back of packaging waste streams from industrial and commercial activities not covered by municipal collection. CONAI offers the service to process this waste at no additional cost to commercial actors, except for collection and transport.

Table 6 Existing environmental contributions in the CONAI system (CONAI, 2017c)

Material	Environmental contribution (EUR/tonne)		
	1998	2016	2017
Steel	15.49	13.00	13.00
Aluminium	51.64	45.00	45.00
Paper/card	15.49	4.00	4.00
Wood	2.58	7.00	7.00
Plastic	72.30	188.00	188.00
Glass	2.58	17.30	16.30

In 2016, a Plastic Packaging Contribution Diversification project was approved – this provides the basis for the modulation of fees for plastic packaging according to environmental criteria (CONAI, 2017e). Given the complexity of plastics as a packaging material, the launch of the project aimed at promoting

sortable and recyclable plastic packaging. Contribution levels are based on the environmental impact of products end-of-life. The proposed reductions depend on the recyclability and sortability of plastic packaging, as well as on the destination of packaging and packaging waste. The new approach introduced three new contribution diversifications on plastic packaging:

- Level A: sortable and recyclable packaging from the Commerce & Industry circuit
- Level B: sortable and recyclable packaging from the Household circuit
- Level C: packaging not sortable/recyclable with current technologies

Table 7 provides an illustrative list of the types of packaging which can be considered in each packaging category and the rates which will be introduced in 2018. A list of products in the three contribution levels is maintained on the CONAI website, which is based on available technology for recycling (CONAI, 2017e). As well as the product groups, specific considerations are given based on the criteria of sortability and recyclability.

Table 7 Modulation according to CONAI product groups from January 2018 (CONAI, 2017e)

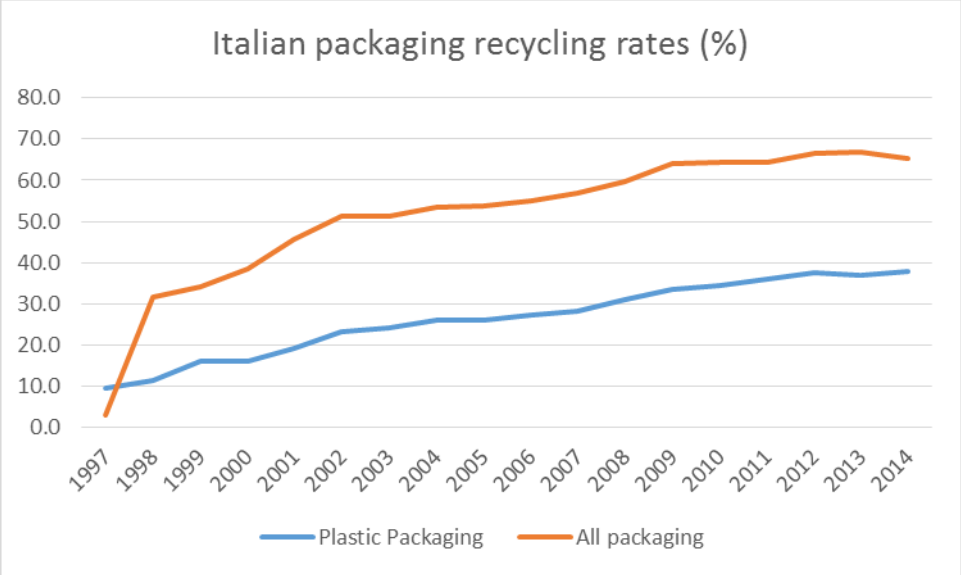
Product group	**Fees from 01/01/2018 (EUR/tonne)**	**Example products - see full updated list** (CONAI, 2017a)
A (sortable/recyclable industrial waste)	179.00	- Liners, Big Bags and similar fabric Bags for industrial use - Water dispenser bottles - Caps to cover pallets/Big Bags - Crates and industrial/agricultural Boxes/Large Boxes - Bottle baskets
B (sortable/recyclable household waste)	208.00	- Compliant reusable bags - Mechanical dispensers (e.g. spray pumps, triggers, etc.) - Compliant Disposable carrier bags - Cans - up to 5 litre capacity - Caps, closures, lids
C (not sortable/recyclable)	228.00	- Cases, boxes and other presentation containers - Emptied beverage system capsules - Labels - Protective film (e.g. removable film) - Adhesive tapes - Film for garments (e.g. film used by laundries) - Net and string bags (e.g. for fruit and vegetables
Additional product criteria		
Sortability	- Packaging is large enough to be sortable (min. 5 cm x 5 cm) - Packaging is identifiable on the sorting line by optical readers - Minimum sorting quantities are met (homogenous quantities of at least 2% of total volume must be met)	
Recyclability	- There are one or more recyclers that sort the material to produce a secondary raw material - There are one or more companies that use the secondary raw material - Any minimum quantity of material to supply a recycling line is met - Packaging is compatible with existing technology	

CONAI recognises that sortability and recyclability are dynamic and dependent on available technology and stakeholders. Consequently, the criteria for modulation are based on the decision of an advisory committee - the "*Permanent Technical Assessment Committee (PTAC)"*. CONAI states that fees in the new system have been designed to maintain equivalence in the total level of contribution from producers, and to gradually increase the difference in fees (CONAI, 2017e). This suggests that difference in rates between recyclable and non-recyclable packaging is likely to increase in the future.

2. Targets and performance of the EPR scheme

CONAI is a not-for-profit consortium, with a membership of around 900,000 producers, sellers and users (CONAI, 2017c). In 2013, 6,800 municipalities had set up contracts with CONAI to manage the take-back of packaging waste – representing 95% of the Italian population. In 2011, a cost benefit analysis of CONAI's activities was carried out. It showed that between 1999 and 2010 recycling and re-use of materials, alongside environmental contributions, generated revenues of EUR 12.6 billion, while the cost of the CONAI system amounted to EUR 3.3 billion (Althesys, 2011).

Figure 5 Recycling rates for packaging and plastic packaging in Italy (Eurostat, 2017b)



Eurostat data confirm that Italian recycling rates have increased from 9.6 and 3.0% in 1997 to 38.0% and 65.4% in 2014 for plastic packaging and all packaging respectively – see Figure 5. In 2015, the rate of recycling for packaging waste in Italy increased to 66.9%, of 8.2 million tonnes of material put on the market. Of this, 48% was handled by CONAI and the remainder was processed by independent operators (Facciotto, 2017). Across all packaging materials CONAI has successfully increased rates of recovery and recycling. Recycling rates for all packaging and plastic packaging are shown in Figure 5. CONAI has met the targets which it set itself in 2008 – see Table 8. These targets are anticipated to be revised based on the outcomes of ongoing revisions to European waste legislation.

Table 8 CONAI waste handling, targets and environmental contribution

	1998	2016	2008 Target
Total packaging on market (k Tonnes)	10,700	12,593	-
Total collected (k Tonnes)	3,500 (33%)	9,854 (78.2%)	60%
Recycling (k Tonnes)	3,300 (31%)	8,448 (67.1%)	55-80%
Energy recovery (k Tonnes)	253 (2%)	1,406 (11.1%)	-
Total Environmental contribution (EUR)	217 mn	492 mn	-

Modulated fees within the Italian EPR scheme have not yet been introduced and will come into force in January 2018. For this reason, it is difficult to forecast the extent to which the measure will improve collection and recycling rates for plastic packaging in Italy.

In addition to EPR measures, CONAI is in the process of developing design guidelines to facilitate the recycling of products. The organisation states that influencing design is part of their prevention

activities to reduce waste. They have published the first edition of "Guidelines for Facilitating Plastic Recycling Activities" on a dedicated website. This project has been carried out in conjunction with the Design faculty of the Università Iuav di Venezia, as well as representatives from the Italian recycling industry (COREPLA - Consorzio Nazionale per la Raccolta) (CONAI, 2017d).

CONAI also organises an award for sustainable packaging. This aims to promote the design and development of innovative packaging solutions. CONAI reviews products put on the market in the previous 2 years and rewards packaging options which support reuse, reducing material use, optimization of logistics, facilitation of recycling, simplification of the packaging system and optimisation of the production process. However, 2016's winner in the plastic packaging category, Smilesys, is a single use packaging solution which won on the basis of its resealability, rather than for re-use or recyclability (CONAI, 2017b). CONAI reviews products using a simplified Life Cycle Assessment (LCA) based on energy savings, water use and GHG emissions. For 2017, CONAI has a prize pool of EUR 400,000 to award to worthy packaging designs (CONAI, 2017b).

3. Assessment of the EPR scheme

In the existing system, there is a flat rate for all plastic packaging put on the market. This means that within CONAI's EPR scheme there are no incentives for packaging producers to change between different plastic packaging designs on the basis of environmental considerations, with reference to circular economy objectives. Similarly to many packaging EPR schemes in Europe, CONAI's system charges a higher rate for plastics than other packaging materials – arguably favouring other materials.

When modulation to the environmental contributions from plastic packaging producers and importers according to the recyclability and sortability of products are introduced in 2018, Italy will be one of the few EU Member States to introduce such measures. The design of the modulation system is interesting from the perspective of other PROs and policy makers, as it provides a precedent for basing EPR measures on the recyclability and sortability of packaging products, with the potential to influence packaging design up the value chain.

Features of interest include:

- The application of LCA study to determine the fees charged to specific packaging formats;
- Criteria on the minimum size of packaging, recognising the difficulty of recycling small format packaging;
- Criteria on existence/potential for a market for secondary materials;
- The formulation of fee modulation that can be revised on the basis of available technology; and
- Product lists which favour re-usable over single use products (e.g. charging a lower rate to refillable dispensers).

The French system Eco-Emballages is the only existing system in Europe which has a level of modulation according to the recyclability of plastic packaging. The introduction of CONAI's new system is possibly more comprehensive than the French system on the basis of the level of analysis of products, and an explicit focus on recyclability.

Arguably, the small difference in rates to be introduced in 2018, between EUR 179.00 and EUR 228.00, is not sufficient to lead to a significant shift in packaging practices. This is particularly true for household packaging where "not sortable" packaging will be charged a premium of EUR 20.00 per tonne. Having said this, correspondence with CONAI confirms that increasing rates is already forecast to be on the agenda for 2019.

Annex 3 Case study: FOST Plus, Belgium

Author: Charlotte Janssens (IEEP)

1. Description of the EPR scheme

Fost Plus is a Belgian producer responsibility organisation that was founded in 1994 as an initiative of the private sector in response to the ecotax law (Fost Plus, 2017c; Green Alliance, 2008). Initially a cooperative, it became a not-for-profit company run for its members in 1996 (Green Alliance, 2008). Fost Plus is accredited in Belgium for the collection and recycling of household packaging waste. It has financial and partial organisational responsibility (Fost Plus, 2017a). Companies that place packaging material on the Belgian market can join Fost Plus and pay an annual contribution, the Green Dot Tariff, which is based on the quantity and type of their packaging (De Jaeger and Rogge, 2014; Fost Plus, 2017a). In return, Fost Plus fulfils their information and take-back obligations (Deloitte, 2017), finances the collection and recycling of a number of packaging materials and coordinates the activities of municipalities, inter-municipal waste companies, collection companies and sorting centres (De Jaeger and Rogge, 2014; Fost Plus, 2017a).

Fost Plus collects household packaging materials including glass, paper and cardboard and the PMD-fraction, i.e. plastic bottles and flasks, metal packaging and drink cartons (De Jaeger and Rogge, 2014). Most collection is curb-side, with only the glass fraction collected via glass recycling bins located in residential areas (Fost Plus, 2017a).

Fost Plus has carried out initiatives to collect and recycle more packaging (Fost Plus, 2015a, 2016). At the start of 2016, Fost Plus initiated projects to test the feasibility of an extended collection of plastics, P^{+}MD, to include hard and soft plastics, such as films and bags, alongside normal PMD. The results were promising and are currently being analysed to develop a plan for general roll-out by the end of 2017 (Fost Plus, 2015a, 2016).

The Green Dot tariffs applied by Fost Plus are differentiated by packaging material such as 'drink carton' or 'PET bottle'. As a result packaging is seen as a whole and tariffs account for the sorting cost (Arnaud, 2017). The Green Dot tariffs are presented in table 1, they are the lowest for paper-cardboard and highest for non-recoverable materials (Fost plus, 2017e). The fees are not modulated based on environmental criteria (Arnaud, 2017).

Table 9 Green Dot Tariffs in the Fost Plus scheme (Fost Plus, 2015b, 2017e).

Materials	Green Dot Tariffs (EUR/tonne)		
	2015	2016	2017
Glass	24.1	23.9	21.4
Paper-cardboard	13.9	18.5	16.9
Steel	52.4	84.8	124.4
Aluminium	31.7	35.3	32.6
PET/HDPE	111.1	147.1	210.7
Drink cartons	232.7	249.8	245.5
Other recoverable materials	267.7	287.3	282.3
Other non-recoverable materials	294.4	316.1	310.6

Despite not having an eco-modulated fee, the Belgian EPR system is also linked to the 'Packaging Charge', a variable environmental tax applied to beverage containers since 1993. Initially having a flat fee (EUR 0.37) for all types of beverage containers, following several reforms a charge of EUR 9.86/hectolitre has been charged for single use and EUR 1.81/hectolitre for reusable containers since 2014, with the aim to encourage reuse (Card, 2017).

The packaging EPR scheme is also supported by awareness raising measures (Fost Plus, 2017a). Through communication campaigns and tools (social media, TV, radio, posters), Fost Plus encourages citizens to correctly sort waste (Fost Plus, 2016, 2017a). However, the impact of such awareness raising initiatives is unclear, as there is still confusion amongst citizens on which types of packaging can be accepted by the system[12]. Since 2016, the online 'Sort Store' allows companies to download and order posters, stickers and other communication materials and discover tips on how to motivate their staff and prevent sorting mistakes (Fost Plus, 2016).

In 2015, a heated debate began on whether to introduce a deposit system in Belgium (Fost Plus, 2015a). This debate is still ongoing today. Proponents, led by the recently established alliance *Statiegeld Alliantie* which promotes deposit schemes in Belgium and the Netherlands, see it as a good solution for the litter problem, while opponents, such as Fost Plus, point out that cans and bottles comprise only a part of the litter problem. Three of the five scenarios investigated in a study by the Public Waste Agency of Flanders (OVAM) estimated that the benefits associated with introducing a deposit refund system for single-use beverage containers in Flanders would outweigh the costs (OVAM, 2015a). Much depends on the underlying assumptions: a follow-up study by OVAM estimated the costs at EUR 77 million per year and the benefits at EUR 82 million per year, while another study by Guissard and Van Cauter (2015) commissioned by Fost Plus, Comeos and Fevia estimated the costs at EUR 105 million per year. The OVAM study shows that the scheme could reduce the weight of litter in Flanders by up to 20-33% and the volume by 40% (OVAM, 2015b). Survey results on consumers' acceptance of deposit refund systems are mixed, with various surveys finding that 22%, 66% or 80% of consumers would support a deposit refund system (Fost Plus, 2015a; Het Belang Van Limburg, 2015; Test-Ankoop, 2017). The decision regarding the introduction of a deposit refund system has been postponed by the authorities until 2018 (Test-Ankoop, 2017).

2. Targets and performance of the EPR scheme

There are general targets for recycling (80%) and recovery (90%) of household packaging waste, set by Belgian legislation in the so-called Cooperation Agreement (Adams, 2011), exceeding those set by the EU Packaging and Packaging Waste Directive (Marques et al, 2014). Every company that places more than 300 kg of packaging material on the Belgian market must meet these targets (De Jaeger and Rogge, 2014). As an accredited organisation Fost Plus acts on behalf of its members to achieve these targets (Fost Plus, 2017d).

Aside from its core activity of collecting and recycling household packaging, Fost Plus is making additional commitments. Firstly, Fost Plus has been active in the fight against litter for several years (Fost Plus, 2017b). In early 2016 they concluded cooperation agreements with the Flemish, Walloon and Brussels authorities to tackle littering (Fost Plus, 2017b). The concrete goal is to reduce litter by 20% by 2022 compared to 2014 levels (Clean Europe Network, 2016). Fost Plus has set aside EUR 17 million per year for the next seven years to do this (Fost Plus, 2017b).

Lastly, Fost Plus claims to be making efforts to encourage more sustainable packaging design (Fost Plus, 2015a, 2016). They share knowledge and experience with their members, e.g. on the recyclability

[12] Personal communication with Luc De Rooms, City of Antwerp, 22 November 2017

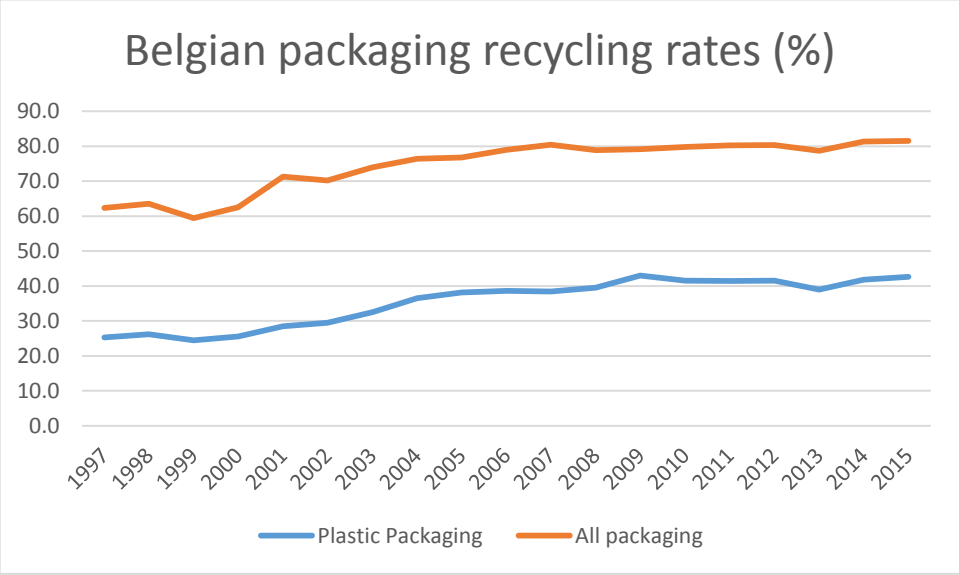
of different packaging materials. The Greener Packaging Awards, co-organised with sister organisation VAL-I-PAC, recognise companies that invest in sustainable and innovative packaging, helping to put eco-design on the agenda. More than 50 companies participated in the third edition of the Awards in 2015 (Fost Plus, 2015a), and there are 40 candidates for the 2017 edition (Fost Plus and VAL-I-PAC, 2017). Fost Plus also provides specific advice to companies on how to develop sustainable packaging. For example, they advised Colruyt (a major Belgian retailer) on the recyclability and sorting needs for a new paper-carton packaging for meat products, to replace the previous plastic packaging (Fost Plus, 2017f). Finally, they offer a variety of tools to help companies test the recyclability and analyse the environmental impact of their packaging design (Fost Plus, 2015a, 2016, 2017f).

In the first two decades of operation (by 2014) Fost Plus recycled 11 million tonnes of materials (Fost Plus, 2014b). Of the estimated 843,503 tonnes of packaging materials put on the market in 2016, almost 680,000 tonnes were recycled via Fost Plus (Fost Plus, 2016), a recycling rate of 80.6%. Adding materials recovered (20,864 tonnes), Fost Plus valorised 90.1% of all household packaging in Belgium (Fost Plus, 2016), thereby achieving the legal recycling and recovery targets.

3. Assessment of the EPR scheme

Internationally, Fost Plus is seen as a model example due to its exceptional collection and recycling results (Fost Plus, 2014b; Green Alliance, 2008). Belgium's recycling rate in 2015 for all packaging waste (81.5%) and for plastic packaging waste (42.6%) individually were above the EU average (65.5% and 39.8% respectively) – see Figure 6.

Figure 6 Recycling rates for packaging and plastic packaging in Belgium (Eurostat, 2017b)

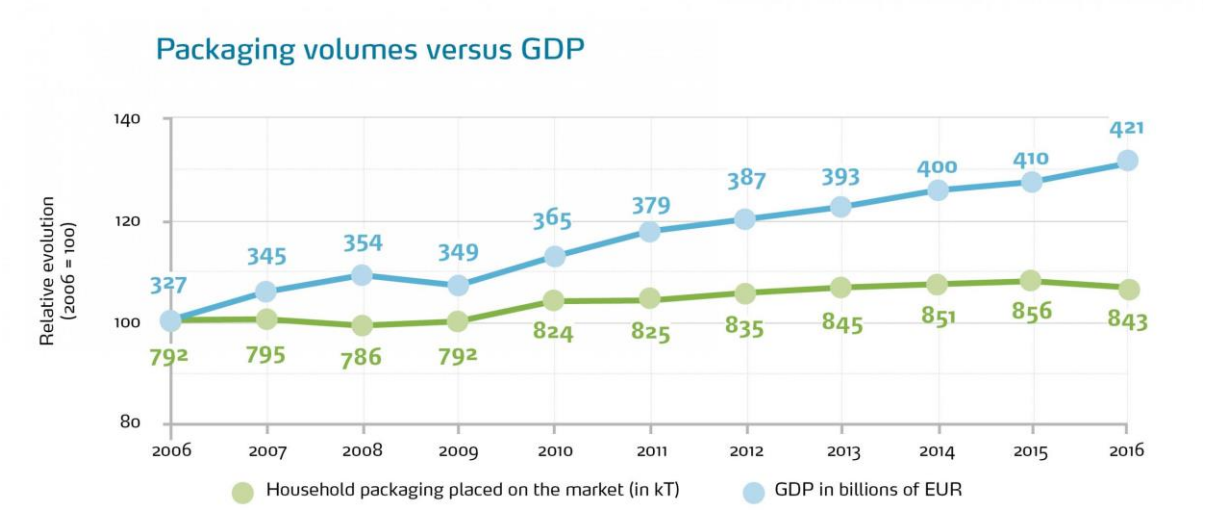


While Belgian GDP continues to rise, the volume of packaging placed on the market is relatively stable (Fost plus, 2017e). This relative decoupling of GDP growth and packaging waste production can be interpreted as an indicator of waste management success (Tencati A., 2016), although it should be noted that the lightweighting of plastic bottles (and in some cases replacing heavier reusable plastic bottles with lighter single-use ones) is likely to have contributed to this[13]. Various factors contribute to this. Fost Plus is a not-for-profit organisation with a public service mission (Regions for Recycling, 2014). Having a single collection scheme for household packaging for the whole Belgian territory

[13] Personal communication with Luc De Rooms, City of Antwerp, 22 November 2017

(Adams, 2011) and actively involving public and local authorities are also key strengths of the system (Regions for Recycling, 2014).

Figure 7 Packaging consumption (kT) and GDP (bn EUR) for Belgium (Fost Plus, 2015b, 2017e)



However, the Fost Plus scheme also has some weaknesses. One is the fact that continuous awareness campaigns are needed to remind citizens of the correct sorting rules (Regions for Recycling, 2014), particularly for plastic bottles and flasks. Some people dispose of other plastic materials in the PMD-bag, either accidently or to deliberately reduce the quantity placed in the expensive residual waste bag. In addition, the boost in economic value of collected packaging materials has led to scavenging (Regions for Recycling, 2014).

In the context of the transition to a circular economy, another possible weakness is that the main successes have been focused on recycling rates, with less evidence of success on packaging re-use. For example, one study showed that the market share for refillable beverage containers fell from 11.3% to 8% between 2003 and 2011 (Green Alliance, 2008).

Nevertheless, some best practices and lessons learned could be transferred to other EPR schemes. In particular, the separate collection of the PMD-fraction by Fost Plus is considered a best practice (Regions for Recycling, 2014). The scheme also demonstrates that good cooperation at all levels is crucial for success, with the collection of household packaging waste requiring cooperation between the national, regional and local governments on the one hand and the PRO on the other (Regions for Recycling, 2014).

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