Making the business case for **Packaging reuse systems**

Circular Economy Portugal
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Glossary

B2B
Business-to-Business

B2C
Business-to-Consumer

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

DRS
Deposit Return System is a system whereby consumers buying a product pay an additional amount of money (a deposit) that will be reimbursed upon the return of the packaging or product to a collection point.

HACCP
HACCP means Hazard analysis and critical control points. It is a certified process to ensure food safety and hygiene.

Life cycle assessment (LCA)
LCA is a methodology that analyses and assesses the environmental impacts of a product, process, or activity over its whole life cycle.

Plastic
A material consisting of a polymer as defined in point 5 of Article 3 of Regulation (EC) No 1907/2006, to which additives or other substances may have been added, and which can function as a main structural component of final products, with the exception of natural polymers that have not been chemically modified.

Primary packaging
Packaging which is in direct contact with the product. Its main function is to protect the product, but it also has marketing and communication functions.

Reusable packaging
Packaging which has been conceived, designed and placed on the market to accomplish within its lifecycle multiple trips or rotations by being refilled or reused for the same purpose for which it was conceived.

Return on the go
Ellen MacArthur Foundation reuse model. Users return the packaging at a store or at a drop-off point (e.g., in a deposit machine) which means this model can be implemented across sectors with a wide use of disposable packaging such as traditional retail outlets for beverages and in the HoReCa and events sector (for on-the-go products).

Return from home

Ellen MacArthur Foundation reuse model. The packaging is collected at home by a pick-up-service (e.g., a logistics company). Therefore, this model is particularly suitable for e-commerce, since the collection of the used packaging can be combined with the delivery of new products. In addition, this model is especially appropriate for urban areas where travel distances between deliveries are shorter.

Reuse

Any operation by which packaging, which has been conceived and designed to accomplish within its life cycle a minimum number of trips or rotations, is refilled or used for the same purpose for which it was conceived, with or without the support of auxiliary products present on the market enabling the packaging to be refilled; such reused packaging will become packaging waste when no longer subject to reuse.

Single-use product

Single-use products are used once, or for a short period of time, before being thrown away.

Secondary packaging

Packaging that is not in direct contact with the product, but it has a protective function towards the primary packaging.

Standard

A document, established by consensus and approved by a recognized body, that provides, for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context. There are several different types of standards. Basically, standards include requirements and/or recommendations in relation to products, systems, processes or services. Standards can also be a way to describe a measurement or test method or to establish a common terminology within a specific sector.

3PL

Third party logistics provider consists of companies that supply a wide range of services such as material/product management, transportation/distribution and warehouse space in exchange for a fee.

User

In a circular economy, the term User is used to define a person that uses or has access to a technical material (e.g., washing machines).

Executive Summary

Packaging is ubiquitous and has driven much of the modern distribution models that thrive today. B2C reusable packaging systems, though, have been in decline in Europe in recent decades, at the same time that B2B transport packaging has shown that businesses can reap environmental and economic benefits from reuse.

To be effective and realise its potential, packaging reuse systems require a systemic change, whereby all players of the value chain are involved, and all elements of the system are rethought. Straightforward processes, clear communication and reward for all actors are key to get successful systems delivering their potential benefits.

Reuse systems present opportunities for the environment, for people and for the economy. These benefits support the transition to a circular economy, are aligned with municipalities 'waste policies and decrease the costs of waste management. But reusable packaging can also make a positive effect on brands, driving loyalty, offering a better user experience, driving consumer engagement, besides the economic savings it holds.

There is clearly a lot of potential for reusable packaging but also many challenges that reuse systems face in practice as a result of the linear economy context in which they have to operate. Reuse businesses have high upfront investment (e.g., to purchase reusable packaging, set up washing facilities) and operational costs (reverse logistics, collection, inspection activities) and clear need for scale.

There are promising examples of reusable packaging businesses with different models, tackling different product groups across Europe. Records of businesses funding their own growth or receiving investment from private investors are positive signs that it is possible to break down the barriers and succeed. There are also many examples of collaborative pilots and tests being done with manufacturers and retailers across Europe.

Food and beverage containers in HoReCa, e-commerce fashion and household care in retail are amongst the most promising product groups when it comes to packaging reuse. Reuse systems for these four product groups show much less environmental impact than single-use alternatives: between 3 times and 13 times less impact depending on the product category. Therefore, the perspective of a European scale up in these product groups alone, would bring environmental benefits of great significance. A target to replace single-use packaging for reusable ones in Europe by 20% in 2027 and 50% by 2030 across all four product groups, would drive the following environmental savings: 938 and 2.660 full truck loads saved from landfill in 2027 and 2030 respectively; the equivalent to 898.705 and 1.650.585 average energy consumption of a household in a year in 2027 and 2030 respectively; 1.383.472 and 4.014.054 Olympic pools in water consumed in 2027 and 2030 respectively; 1.265.707 and 3.485.529 full truckloads of materials; and 58.836.378 and 170.073.184 in carbon dioxide sequestered by mature trees in 2027 and 2030 respectively. Driven by viable business cases, economic savings to users of the systems (retailers/manufacturers) could be significant too. In 2027, economic savings could account for over €5.868billion by 2027, to €16.261billion by 2030. Social impact is also very positive, at various levels with job creation potential driven by reverse logistics models (washing, collection, inspection) being 185 and 613 new jobs by 2027 and 2030, respectively.

As proven by DRS systems, standardisation offers opportunities to help reduce operational costs, create necessary economies of scale, and maximise the environmental benefits of reusable packaging systems. A clear definition of reusable is needed, and a label could be developed to distinguish reusable from single-use packaging, following a set of requirements regarding the overall system. Guidelines could be developed by public institutions at national level (based on best practices and expertise at national level) on aspects that are more difficult to standardise at

international level but require some adaptation to the local/regional context. There is a clear need for policy support to maximise the business case and drive the scale up in Europe. Public support (EU, national and local level) of reuse initiatives to overcome the challenges depicted, can be done not only by creating enabling conditions through policies and regulations, but also through other instruments.

At EU level, the revision of the PPWD should integrate concrete reduction and reuse targets. At national level, new legislation should be enacted to formalise these targets, and update existing EPR agreements and Plastic Pacts. Most importantly, government monitoring is needed to keep track of the level of reuse and effectiveness of measures implemented by the industry, while non-compliance should lead to effective sanctions.

In principle, unnecessary and unsustainable single-use packaging (not only plastics, but all materials) should not be allowed on the market. It should be made mandatory to offer an option of a reusable alternative for all out-of-home consumption (take-away and delivery), e-commerce and household care.

To steer the circular economy in the right direction it is essential that the EU and national governments adopt ambitious and legally binding reduction and reuse targets with which the packaging industry has to comply. To be in line with the ambitions for a circular economy, the total amount of virgin plastic packaging placed on the market should decrease by 25% by 2025 and 50% by 2030. Another option is a quantitative limit, or cap, on the amount of single-use packaging material put on the market, to force companies to avoid single-use packaging.

In addition, binding reuse targets create a safe environment for investments by SMEs and larger corporations in reuse systems and infrastructure. Different targets should be adopted for different product groups, because each of them has their own potential, market dynamics and challenges. The following targets (percentages for the share of the market covered) for reusable packaging are proposed:

- Drinking cups: at least 75% by 2030;
- Take-away and delivery meal containers: at least 50% by 2030;
- Household care products (laundry care) distributed by large retailers: at least 20% by 2030.

To address the investment obstacle for businesses, government agencies could provide soft loans or create innovative funding schemes such as convertible loans or grants for reuse businesses. At the local level, municipalities can provide local businesses financial support to develop and implement reuse pilots. Measures to improve the business case for reusables, such as more economic disincentives for SUPs are needed, as well as fiscal measures to recognise capital investments for reuse systems as eligible for tax rebates.

In addition, government support for R&D programs is needed to develop and improve reuse systems. At least 10% of EPR budget should be earmarked to be invested in the development and scaling up of reuse systems. Furthermore, EPR mechanisms can be improved to promote design for reuse. This can be achieved through ecomodulation (differentiation) of fees so that producers of reusable packaging pay less. DRS for beverage containers, increasingly being adopted in EU countries mostly for recycling, can be deployed for reuse as well.

Government agencies should provide information services to support stakeholders with the practical implementation of reuse systems, for instance through guidelines, and support set up of Communities of Practice (CoP) on reusable packaging, funded by packaging waste management contributions, are relevant for different actors (e.g. supermarkets, brand owners, service providers, start-ups, research institutes and NGOs) to collaborate and exchange information on the challenges and opportunities for reusable packaging.

It’s time to realise the environmental ambition and embrace packaging reuse and its potential across Europe!

1. The reusable packaging opportunity

In the last few decades, we have become dependent on single-use packaging as an accessory for the linear economy, being, in fact, a symbol of it. Primary and secondary packaging are used in HoReCa (Hotels, Restaurants and Cafés), E-commerce and Large retail to market products, protect goods in transit, extend product life, ensure health & safety and facilitate logistics.

In Europe, and in the world, most packaging produced is designed as single-use, or in other words, to be disposable. This translates in a rapid and continued growth of the amount of materials used for packaging and a growing consumption of goods, which led in 2018, to 40% of all plastics [1] [2] and 50% of all paper being used for packaging [3]. In addition, in 2017, packaging waste in Europe reached a record – 173 kg per inhabitant [4] - and it represented in 2019, 36% of municipal solid waste [5]. To a great extent, the acceptance of the externalisation of costs of using single-use packaging, has been the primary enabler of retail models developed strictly based on one-way packaging [6].

So far, European policies addressing the issues of single-use packaging have been more focused on recycling or in the implementation of small changes in the packaging, such as reduction of the amount of material or volume or replacement of materials for biobased ones. These changes are part of a trend observed in the past decades in which countries are moving away from reusable solutions and replacing them by single-use ones. Alongside, the EU prepared several Directives and set up targets specifically for recycling, but not for reuse. Only more recently, the EU has started (again) to pay attention to reuse, as recycling rates are low, and recycling is showing to be a limited option to tackle this massive problem [7] [8].

As we set to explore the business case and enabling conditions of packaging reuse systems and its potential in this report, it is important to note that although packaging has a generally negative environmental impact, in all covered product categories (HoReCa - food and beverage containers; E-commerce - fashion, shoes and accessories and Large retail - household care), it only represents a small portion of the full impact of selling these product categories, as typically the production phase is responsible for most of the environmental impact. Nevertheless, the great majority of studies point out reusable packaging as the most environmentally friendly option [9], even if the business models still need to be implemented and tested to overcome challenges mostly related with logistics and scale up.

Many startups and small businesses have, in recent decades, attempted to develop reusable packaging systems across all three channels, but none has yet achieved a large scale. At the same time, in B2B packaging there are many examples of reusable packaging (specially in transit packaging) in operation. Whilst there is room for scale up here too, the main difference is that there aren't any consumers involved in such systems.

Packaging sustainability has also been an important topic in the public agenda in recent years, with many international renown entities, such as the Ellen McArthur Foundation, Reloop, and initiatives like the Plastics Pact, dedicating efforts to discussing some of the environmental challenges it poses.

Taking in consideration the environmental issues mentioned before and the urgency to act, the European Union has identified as a priority to promote and facilitate the implementation of reusable packaging and reuse systems across Europe. The New Circular Economy Action Plan [4] is part of a wider European strategy - the New Green Deal - which aims to create a climate-neutral, resource-efficient and competitive economy by 2050. With regards to packaging - one of the key product value chains identified - the document sets the target of "all packaging on the EU market

being reusable or recyclable in an economically viable way by 2030". More specifically, the main actions about packaging are: reduce (over)packaging and packaging waste, promote design for reuse and recyclability of packaging and reduce the complexity of packaging materials used.

In 2018, the new Waste Framework Directive (2018/851) was adopted, amending the Directive 2008/98/EC. In this Directive, the waste hierarchy was reinforced as a principle to be applied as a priority order in waste prevention and management legislation and member states should prioritise the options with the most environmental impact: prevention and preparation for reuse and recycling. Member states are impelled to act in order to promote reuse activities through, for example: "encouraging the establishment of and support for preparing for re-use and repair networks (...) and by promoting the use of economic instruments, procurement criteria, quantitative objectives or other measures". Additionally, targets for preparing for reuse and recycling of waste were increased, and are now more demanding: by 2025, the preparing for reuse and the recycling of municipal waste shall be a minimum of 55 % by weight, by 2030 this number will have to increase 5% and by 2035 the target is to reach 65%.

In addition, the Directive 2018/852 of 30 May 2018 amending Directive 94/62/EC on Packaging and Packaging Waste (PPWD) sets out Article 5 specifically for "Reuse". The goal is to increase the share of reusable packaging available in the market and the implementation of reuse systems that produce positive environmental impacts and that don't compromise food hygiene and safety for users. Therefore, measures such as the use of deposit-return systems, the use of economic incentives or the definition of a minimum percentage of reusable packaging placed on the market, are recommended to member states to achieve this goal. Currently, the Directive is being revised and it is expected to be adopted by the end of this year.

The EU also adopted the Plastics Strategy, in 2018, building up on existing measures to specifically reduce plastic waste and it "aims to transform the way plastic products are designed, produced, used and recycled in the EU." One of the most relevant actions in this strategy is the establishment of mandatory requirements for the implementation of waste reduction measures for a set of products such as packaging.

Following this Strategy, the European Parliament and the European Council adopted the Directive 2019/904 on the reduction of the impact of certain plastic products on the environment, mostly known as the Directive on Single-Use Plastics. The document sets a a number of measures member states should follow to comply with:

- Article 4, on "Consumption reduction": member states should take measures to reduce the consumption of single-use plastic beverages cups (covers and lids included) and food containers by 2026, compared to 2022.
- Article 5, on "Restrictions on placing on the market", i.e. bans: amongst several items, cutlery (forks, knives, spoons, chopsticks), plates, straws (except for medical use), beverage stirrers, food containers made of expanded polystyrene used typically in take-away and delivery services, beverage containers made of expanded polystyrene, including their caps and lids and cups for beverages made of expanded polystyrene, including their covers and lids cannot be placed on the market from July 3rd 2021.

Primary reusable packaging systems in Europe have been in decline for the last few decades, and mostly subsides in the bottled beverages category [6], to varying degrees in different member-states. These systems exist in both HoReCa (with centralized refill by manufacturers) and retail in the form of Deposit Return Schemes (compulsory or voluntary). At the same time, reusable transport packaging has grown in adoption on the back of the economic savings and logistics efficiencies it holds.

2. Research methodology

This research aims to assess the business case behind reusable packaging. The scope of the study is B2C models as the main source of packaging waste is driven by primary packaging and there is a wider gap in reusable packaging systems in this segment, in contrast with the broad implementation on B2B of reuse pallets or crates. Hence the need and importance for more in depth research on the environmental impact of B2C reusable packaging systems and the feasibility of the business cases. Focusing on the product groups that have the biggest potential to implement such systems, this study explores the best possible implementation strategies for reusable packaging systems.

The focus of this study are models in which the packaging is owned by the brands/retailers and the user has to use this package to participate in the system. It is important to mention that "user" is the terminology used to replace "consumer" since in these systems the individuals only use or have temporary access to the packaging during the usage phase and, therefore, don´t consume or own it.

There are already a number of examples of "bring your own container" or refill models. However, although these models require less investment, they are mostly niche and they don't entail the same focus and scale necessary for the channels and product groups chosen in this study. Also, alternatives of channel replacement such as online subscription models for Large Retail were not considered the best options to drive user adoption and achieve scale. Nonetheless, grocery shopping (Large retail) and delivery services for HoReCa can be integrated in these systems in the future.

The four reuse models from the Ellen MacArthur Foundation [11] were chosen as references: Refill at home, Refill on the go, Return from home and Return on the go. These models differentiate from each other based on two main aspects: packaging "ownership" and where users refill and/or return the packaging. For the scope of this study, only the Return from home and Return on the go model were effectively covered.

The main research steps were the following:

1. Review of available studies, industry reports, and scientific papers on reusable and sustainable packaging;
2. Selection of the product groups with the biggest impact to be studied in depth by applying a multicriteria decision analysis method;
3. Interviews with experts and players along the value chain regarding packaging, logistics, business models, ecodesign;
4. In depth analysis of the four selected product groups and identification of effective strategies for systems with potential to scale up;
5. Identification of successful case studies of reuse systems in Europe for each of the product groups;
6. Estimation of potential environmental, economic and social impact of reuse systems for a scale up at a European level.

A literature review focused on existing reports and scientific papers on the definition, characteristics, and implementation of reuse business models mostly in Europe was done. Research was also performed on existing LCA studies on the comparison between traditional vs reusable packaging/business models focusing, amongst other subjects, on environmental impacts of each of the systems or the operational costs of these systems. This was complemented with the experience, work, and knowledge of the consultants on various packaging reuse systems to complement and deepen the theoretical information mostly found online.

To select the product groups with the biggest potential to implement reusable packaging systems, the research focused on three main distribution channels:

1. HoReCa: covering restaurants, hotels and cafés. In this case, the consumer goes to an outlet to purchase food/ beverages for take-away.
2. E-commerce: covering all products that are shipped from warehouses/retailers directly to users' homes. Secondary packaging is used to protect the goods being delivered.
3. Retail: covering big and small supermarkets and chains. This channel considers all the goods that are commercialised in a physical space, where the user goes to buy. Most goods are pre-packed and displayed on shelves, often in several layers of multimaterial packaging;

A multicriteria analysis was applied to the main product groups empirically identified for each channel to determine the ones with the biggest potential.

HoReCa	E-commerce	Retail
Take-away food	Fashion, shoes and accessories	Fruit and vegetables
Hot beverages	Cosmetics	Dried Food
Cold beverages	Books	Refrigerated and frozen food
Dried Food (e.g.: sandwiches, pastries, etc)	Electronic and Electric Equipment	Household care products
Beer	Food	Cosmetics
Wine	Toys and Games	Beverages

Table 1: Main product groups sold through the three distribution channels considered

The goal was to identify product groups that generate high volumes of difficult to recycle packaging waste, for which reusable packaging solutions could have the biggest impact. Criteria related to potential barriers to such systems such as less health and safety restrictions; higher acceptance from users; as well as local and vertically integrated supply chains[1] (which increases control and capacity to implement a reuse system). Consideration was also given to criteria that could increase reuse opportunities, i.e., products with higher profit margins, which could more easily accommodate more expensive packaging and/or where a deposit for the packaging could be more acceptable by users; as well as the availability of data and case studies that show evidence of the feasibility of reuse models.

The four product groups deemed to have the biggest potential to implement reusable packaging systems were:

- Food & beverage containers and cups sold in the HoReCa sector;
- Fashion, shoes and accessories that are distributed through e-commerce;
- Household care products (e.g., laundry care, surface care, dishwashing, etc) that are distributed through large retailers.

Around 20 interviews and personal contacts were also conducted in order to assess and confirm information and data found in the literature review and to gather updated and in-depth information from relevant stakeholders in the field: businesses already implementing reuse systems in different countries in Europe for all three product groups, manufacturers and retailers, testing reuse models such as reusable packaging and different reuse systems and, also, experts on logistics, packaging, and manufacturers' associations.

[1] Vertical integrated supply chains are observed when players control one or more stages in the production or distribution of a product.

An in-depth analysis of the four selected product groups was done by additionally studying the value chain and existing logistics, in order to identify effective strategies for systems with potential to scale up.

Case studies for existing reuse systems were prepared, with the objective of inspiring and informing readers on how specific barriers have been overcome, what are the environmental and socio-economic impacts of these models (specially compared to single-use ones) and to identify the potential opportunities these cases demonstrate. The following case studies were selected: HoReca channel, Uzaje (France) for food containers and CupClub (United Kingdom) as a best practice for beverage containers; for e-commerce for fashion RePack (Finland); for large retail, a combination of different pilot projects and initiatives from different companies.

The estimation of potential environmental, economic and social impact of reuse systems for each product group at a European level was done by following an LCA methodology, based on a set of 16 impact categories, from land use, to human toxicity, climate change to water use. For each of the product groups, a comparative analysis was done between a reusable system and a single-use alternative.

An economic analysis of each of the systems was also conducted, to assess whether there are viable business cases, taking into consideration the following cost categories: collection costs; inspection costs; washing costs; environmental protection costs; new packaging acquisition costs; holding costs. The potential economic savings/additional costs of the system to the users (retailers/manufacturers) were then performed comparing to the most prevalent single-use alternative.

The scale up potential was assessed by applying three different scenarios to a proportion of packaging currently used, deemed addressable for each of the product groups to determine the potential number of packaging uses to replace: the food and beverage containers used by population in urban areas; the packaging used in intra-European e-commerce orders of fashion items; and the liquid laundry detergents and fabric conditioners bought in retails stores.

3. General barriers and opportunities for packaging reuse systems

To be effective and realise its potential, packaging reuse systems require a systemic change, whereby all players of the value chain are involved, and all elements of the system are rethought. Straightforward processes, clear communication and reward for all actors are key to get successful systems delivering their potential benefits.

Reusable packaging systems are confronted by many barriers during their implementation and scale up, but there are also many opportunities.

The main barriers of reuse systems are the ones that allow and make linear systems easy and convenient for everyone. It begins with single-use packaging being, in general, cheap due to low prices in raw (virgin) materials and, also, by the fact that externalities of these types of packaging are not internalised in its price. This factor makes it more difficult for reuse systems to compete since they have a higher upfront investment and operational costs (e.g., to purchase reusable packaging, set up washing facilities). Because even though there is an increasing demand (or at least interest in) for "eco-friendly" products, some users are still not willing to pay an additional cost for reusable packaging [7]. Therefore, reuse systems to function properly also face the challenge of requiring high levels of communication and education to change user's habits and behaviours since they must perform an additional step and return the package after being used. This is an important barrier in case many non-standardized systems are implemented because users will experience difficulties dealing with multiple systems. In addition, it doesn't allow systems to be profitable once it decreases the realisation of economies of scale.

Despite all these barriers, reuse systems present more opportunities for the environment, for people and for the economy. One of the main benefits of reuse systems is the environmental long-term effects. Most LCA studies [8] [11] [12] report these systems produce less waste and less CO2 emissions when compared to traditional ones. These benefits support the transition to a circular economy, are aligned with municipalities 'waste policies and decrease the costs of waste management. This can increase municipalities' interest in waste reduction initiatives and their willingness to support local businesses in adopting such systems (e.g., through paid trials).

For companies, the use of reusable packaging also shows several opportunities. For manufactures it lowers their EPR since it reduces disposable packaging placed on the market (and for which they are held accountable for) and, consequently, lowers their financial costs with it. For businesses using reusable packaging this can not only promote cost savings but can also even be a source of profitability if the packaging goes through a high number of use cycles. In addition, companies using this type of packaging are perceived by users as being more sustainable, which improves their image and may attract more users [7]. Reusable packaging also offers a better user experience than single use, as they are of better quality and eliminate the need to dispose of the packaging. Also, businesses using harmonised packaging and sharing a centralised washing and logistics can benefit from streamlined operations and cost savings. These centralised and shared operations are already being tested by voluntary collaborations between players in the value chain, such as beer manufacturers creating DRS for reusable bottles in Netherlands; brand owners and retailers, to test and develop solutions, such as Loop with Tesco UK and Carrefour in France, Unilever and ASDA, Algramo and Unilever; and pilots such as Tchibo and Zalando's with Repack for e-commerce. Finally, registered venture capital investment levels in packaging reuse startups such as Algramo (€6.4M), Loop (€22M), The Modern Milkman (€4.4M), Good Club (€1.6M) among others show that private investors are seeing the business case in these systems.

The main elements of reuse systems are: packaging design and materials; ownership; logistics; incentives to return and users' role. Each of these aspects poses specific challenges for implementing and running these systems and it is essential that practical solutions are found. These basic elements are described in more detail below as they apply to all reuse systems for all product groups. However, at the same time, different product groups in different distribution channels (HoReCa, E-commerce and Retail) require different adaptations in order to function. These differences will be explained in the subsequent sections, based on case studies, but also considering the literature review and best practices in the market.

The choices regarding how to organise these basic elements will influence the investment and operational costs, which will ultimately determine the business model of a reuse system and its success.

Reusable packaging design and material main characteristics - durability to maximise the number of cycles, take as little space as possible in storage and transport, being stackable and lightweight, designed to be repairable, made of recycled materials and recyclable.

Ownership - following a circular economy framework, packaging-as-a-service models mean that manufacturers or retailers would lease the packaging for temporary use (selling its “function” and not transferring the ownership).

Logistics - reusable packaging logistics involve a number of new reverse logistics processes, from package recovery after use, cleaning and washing as well as redistribution to be reused.

Incentives for return - high return rates of reusable packaging can be obtained through a deposit or reward and by means of tracking technology.

Users’ role - identifies the role a user has to play in the system, such as refill the packaging or return it in drop-off points.

4. Priority product groups

4.1 HoReCa – Food & Beverage containers

Product categories

In the current traditional system, food and beverage containers in HoReCa are used in take-away and delivery services. Even though take-away and delivery deal with different types of food (soup, salads, pizza, hamburgers, etc) and beverages (hot and cold) they both present similar characteristics (materials used, legal requirements, opportunities). Therefore, for the scope of this report they were analysed together, taking in consideration, when needed, specific aspects of each one.

Sector trends

Worldwide, the take-away and delivery of food and beverages is increasing rapidly. In the European Union alone, there are more than 2,556 billion take-away containers being used per year [13], and both food containers and beverage cups are on the top 10 single-use plastic items most commonly found on Europe's beaches [14]. The COVID-19 pandemic drove a surge in demand for single-use plastic, especially packaging, a category that observed a 40% increase[2] [15]. One of the sectors affected was food take-away and delivery services. As many businesses had to close because of the lockdowns in many European countries, food delivery services saw a surge in online orders as well as users, many of which are expected to continue using these services after the pandemic is over. According to recent data, in Europe, the Online Food Delivery sector revenue is expected to grow at 7.06% CAGR[3] between 2021 and 2024.

Single-use packaging and materials

This sector uses a variety of single-use containers (mainly cups, trays, bowls) to package different food and beverage types, in order to avoid the use of tableware which needs to be washed (saving costs and effort). The environmental impacts of these items are most significant during the initial phase of (resource) extraction and production and, at the end stage (disposal) since this packaging is used for a short period of time and, afterwards, generally, sent to landfill, incineration or littered.

Different materials can be used for single-use packaging for food & beverage, but the polymers that are used the most are: polyethylene terephthalate (PET), polypropylene (PP), high (HDPE) and low (LDPE) density polyethylene, polystyrene (PS), or multilayers (combinations of different types of materials); and lastly, bio-based plastics [16]. Aluminium, combined with a paper lid, is also often used for meal containers. Coated or waxed paper is starting to be used more as a substitute for plastics. However, single-use products made of other materials besides plastics still do not present a sustainable solution because they are still disposable, requiring materials and energy for production, and often the mix of materials hinders the recycling process [17].

[2] This figure was also due to the increase of plastic use in the medical sector

[3] CAGR - Compound Annual Growth Rate

Hidden chemicals in so-called "green alternatives"

Moulded fibre products (often advertised as compostable or biodegradable) pose a danger to human health as a study found the presence of PFAS (also known as "Forever Chemicals''). PFAS are a group of more than 4.500 compounds that are used due to their ability to repel grease and water, but they also can persist for a long period of time in the environment and don't degrade easily, thus creating harmful impacts in the environment. Another recent study conducted in four countries by BEUC (Bureau Européen des Unions de Consommateurs') and other consumer organisations found in single-use tableware such as plant fibre bowls, paper straws or palm leaf plates, dangerous chemicals. Half of the sampled products contained one or more unwanted chemicals above recommended levels (53%). This study also warns about green claims and marketing messages found in this type of packaging that can mislead consumers to think these options are perfectly safe and "environmentally friendly". Therefore, BEUC and its member organisations urge the EU to ensure these alternatives are safe since there are no specific rules for these materials (unlike plastics).

Reuse system alternatives

Different packaging reuse **implementation strategies** are presented below:

Packaging design and material

The main criteria for the functional performance of reusable packaging to be used in HoRecA are: leak proof for transportability (better than single-use packaging if possible); several (not many) formats and sizes should be standardised and suitable for specific types of food (e.g. soup, pizza, hamburgers); easily washable, stackable and with enough airflow between packaging to prevent mould from forming. Packaging should also be heat resistant to allow for warming up and washing at high temperature, have a separate universal lid and be firm [18]. Packaging should be adapted for marketing purposes and differentiation, especially in the case of large chains and well-known brands. Standardised in format, branded packaging can be sorted out during washing, regrouped and distributed according to brand.

Reusable containers must also comply with national food safety legislation and/or international regulation such as HACCP, regarding food contact materials, but also the handling and storage of dirty containers, in order to be safe for food and drink consumption. It should be made of materials that are proven not to leach chemicals into food, even with very hot drinks. Where possible, the use of recycled materials should be included, although having in consideration material safety, as the use of these materials may increase possible sources of contamination, as well as enhance the levels of chemicals that can migrate from packaging into food.

Ownership

Each region or locality can have a different set-up for the structure and operation of the model, adapted to local realities.

However, the most effective model is the one where Reuse businesses are responsible for both the packaging and managing and operating services such as washing and transportation/distribution logistics. Reusable packaging (e.g. cups and food containers) is owned by an external third party (reuse-as-a-service provider) who leases the packaging to a network of HoReCa businesses. Due to the proximity element of this sector, this system offers an opportunity to small businesses to thrive in a new economy focused on local solutions for local actors and local users.

There is also another model in which the reusable packaging is owned by the HoReCa businesses, making them responsible for managing the system. However, due to limitations of space and washing capacity (reusable packaging usually takes up more space than single-use options) and, especially for take-away only businesses such as food trucks and kiosks, this model may not be suitable for all businesses.

Logistics

Reusable packaging requires the development of a new reverse logistics system which involves changing or adjusting the existing value chain and operational processes, increasing complexity and requiring HoReCa businesses to assume new functions that they may not have experience with. To tackle and solve this difficulty, there should be a local pooling coordinator (generally a 3PL) to act at scale within a region in order to reduce complexity and reach economies of scale. A standardised system increases logistics efficiency, environmental performance, and streamlines processes such as to program the packaging weight on a scale of those businesses selling food by weight.

In the case of closed spaces such as schools, campuses, offices, sports facilities, and at events such as festivals, where consumption takes place onsite, it may be easier to implement and run these types of systems as it simplifies the return logistics and minimises the impact of transportation.

An app/website owned by the service provider can also be offered to display the network of partnering businesses and drop-off points. Transportation logistics can be implemented to daily collect, in reusable boxes too, the containers/cups from all the partners in the network to be washed and re-distributed. Used packaging should be picked up for washing as soon as possible to prevent mould in dirty/used packaging, in order not to take too much valuable space inside businesses, and to keep pooling volumes low. The distance travelled to pick up and clean containers should be minimised through smart logistical systems and planning. Also, last mile logistics[4] should be the most energy efficient: either electrical vehicles or even if distances allowed, by bicycle [19].

One of the most important process steps in a reuse system is the washing of the containers. In general, food and beverage containers, but especially the ones used for oily or creamy foods, render the washing of reusable containers more difficult, thus creating possible difficulties to businesses that need to ensure a proper washing process for all types of containers used for different types of foods. Therefore, to guarantee food safety and hygiene of reusable packaging this should be done by either the HoRecA business itself (if they have the facilities, which is not always the case) or an external service provider. These operations may be located in the outskirts of the city/region where the system is in place.

Incentives to return

Most systems include a deposit or reward to ensure users return the packaging. Recircle's experience revealed that the deposit is usually not a barrier and Uzaje has even tested a system with no deposit associated. Another way to encourage users' participation is to offer discounts in future purchases if the package is returned; VYTAL, for example, offers points that can be used in the next order[5].

In the HoReCa channel, the volume of daily transactions done by users is especially high. Therefore, accounting for deposits on packaging every time a user returns it adds an additional step to the checkout processes. This can complicate accounting on revenue transactions and, it also represents a transaction charge for the business if performed electronically. An app to manage the users deposit can streamline processes (e.g., Recircle).

[4] In logistics, this is the final step of the process, when the package arrives at the user's house.

[5] Marketing strategies such as discounts, vouchers or rewards should not incentivise unnecessary (new) purchases, but rather promote a repeated and adequate use of the system.

A dense local network of accessible bring-back points should be available, so it is easier for users to return containers. Automated bring-back machines or reverse vending machines (e.g., Greenwins) can improve user friendliness of the system, allowing users to bring-back containers at their convenience, after closing hours of outlets and avoiding queues. The need for users to return the packaging increases the probability of a new purchase and can function as an opportunity to increase user loyalty to a HoReCa business participating in this network.

Traceability is a major component of these systems since stock of cleaned containers is crucial for its success. Thus, asset tracking technology such as RFID tags inside cups and containers or barcodes could be helpful to track location and most importantly to know how often a cup is being used and washed. This information is crucial to gather data on usage and to help control container lifespan and quality.

User's role

Users return the containers at a network of local drop-off points created by the reuse-as-a-service provider. This allows users to return containers at their convenience, after closing hours and avoiding queues. Besides, returning the container, depending on the system implemented, pre-washing or even washing can be required to be accepted by businesses.

In addition, reusable packaging often offers a better solution to temporarily store food than single-use ones, therefore, users can save and store the leftovers for a longer period of time before returning the container.

Hitchhiking with food delivery services

Currently, delivery services still mainly use single-use packaging in their operations. However, in Barcelona, Glovo is testing with a local reuse startup Bûmerang to use their reusable food containers with member restaurants. So far, more than 70 restaurants have this option available, and the intention is to expand the network. This is part of the pledge Glovo made in 2019 to reach carbon neutrality by the end of 2021. In the pilot phase, users must return the containers to a member restaurant, but Glovo believes that in the future, delivery partners may be able to pick-up from users' homes and drop-off at a member restaurant at their next delivery.

The following are the key success criteria to scale-up a packaging reuse system for Food and Beverage take-away:

- **Standardised packaging** - reuse systems need to have few product references (types of containers and cups used) and should be standardised (e.g., materials used, size, shape) to allow less complex logistics (transportation) and storage, and easy pooling (to be used by several local players).
- **Reuse-as-a-service model**: an external service provider should be responsible for managing and operating a reusable packaging system in a network of HoReCa businesses.
- **Washing** - ensure processes comply with health & safety food regulations such as HACCP.
- **Incentivise return** - easy to use deposit management system such as a card or an app which can store the deposit paid once joining the system. The card/app can be scanned at checkout avoiding the actual transaction of money.
- **Ease stock management for outlets** - the system needs to guarantee regular deliveries of new/washed cups and containers, in some cases even more than once a day.

Case study: Tracking CupClub's vanguard system

System: Return on the go

Operating markets: United Kingdom, United States of America

CupClub is a pioneer returnable cup subscription service for beverages based on a technological system to fully track user food packaging (cups, lids and drop point cases). Providing real-time operational data through QR code internet of things (IoT) technology, it supports brands and businesses to keep the convenience of take-away without throwaway.

Overcoming challenges

In two years, CupClub has served 530.000 drinks across numerous London offices and university cafés with a record return rate of 95%, empowered by its mobile app to easily find a nearby drop-off point without deposit (although, in the U.S there is a €4,38 per item charged to cover the costs if not returned within 5 days).

Their return on the go model consists of delivering 250 to 10.000 clean cups and lids every day in CupClub boxes to outlets, while collecting used ones to ship back to outsourced washing facilities within a 25km perimeter. There is a setup fee, depending on the technology integration requirement, and an additional €0,2 per served drink on a 24-month contract with a 3-month trial. To improve data accuracy and traceability, the company has replaced the initial RFID code by a QR code printed on the polypropylene (PP) cups and low-density polyethylene (LDPE) lids.

Thanks to the app, operations are optimised by tracking the status and quantity of cups in circulation, overcoming a challenge usually faced by non-tech reusable schemes, which require a higher volume of containers to respond to equivalent demands. The collected data is also a key strategy for customer engagement, by showing each individual's reduction of energy, plastic, paper and CO2 levels within CupClub's overall results.

Making impact

A positive environmental impact is shown in CupClub's first LCA, as the service produces 50% less CO_2e[6] than disposable and ceramic cups – including polyethylene (PE) lined, styrofoam (EPS) and compostable (PLA) – over a typical lifecycle of manufacturing, cleaning and distribution. The cups are designed to last for a minimum of 1000 uses with an optimal use of 250 cycles guaranteed. CupClub achieves environmental benefit over disposable options when used 72 times vs. PE lined single-use cups and 100 times vs. EPS cups and lids [20].

On the horizon

The company's 2021 vision is to scale up across London retailers as well as expanding to two North American cities, after a successful one-month pilot in Palo Alto, California. In this pilot, a result of a two-year project called NextGen Cup Challenge CupClub obtained a customer's rating of 8,4 out of 10 with a conversion rate of 20% (1 in 5 customers) preferring a reusable solution at street cafes and of 47% at university cafes.

[6] CO_2e stands for CO_2 equivalent

Case Study - Inspecting Uzaje's centralised cleaning

System: Return on the go
Operating markets: France

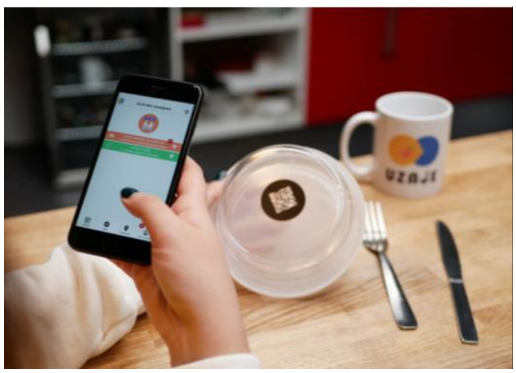
Uzaje is not only reframing the take-away reuse system by building an efficient logistic support system with a centralised network of industrial cleaning centres throughout France. It is also creating jobs in the Social and Solidarity Economy (SSE) for social inclusion.

Overcoming challenges

Uzaje resolutely embraced both food and beverage reusable containers (mostly locally sourced glass and stainless steel and a few durable plastics), collecting dirty ones within a 50km to 200km radius (restaurants and food distribution, respectively) for efficiency and carbon footprint reduction. In just 20 months, it has scaled-up to a 1300m2 industrial cleaning center serving 50 clients from restaurants, catering services, and 100 clients from food retail and non-food distribution.

The return on the go model offers its clients the option to either hire Uzaje's cleaning and logistic service while keeping container ownership and loss or damage costs, or a full 'rent per service' costing around €0.40/container, which is cheaper than buying a high volume upfront. The setup fee includes Uzaje's consultancy for technical packaging advice, collection, and cleaning logistics with HACCP inspection and a pick-up box that safeguards dirty containers. The current overall return rate is between 30-90% depending on the client's marketing strategy, as Uzaje believes a deposit scheme could prevent wider customer acceptance.

Making impact



According to the company's LCA, conducted with the financial support of Ademe & Citeo, its reusable glass container used 8.5 times and with a 90% return rate is more efficient than single-use glass, from an environmental and economic perspective (-59% GHG[7] and -30% overall costs, respectively). Reusable glass models are also environmentally competitive vs. single-use r-PET[8] (90% recycled), although the process can still be optimised in terms of logistics and standardised packaging.

For the high-end French fast-food restaurant Daily Pic, which currently recycles over 600 thousand used containers per year, Uzaje will help to reduce 100 tons of glass each year by reusing 50% containers, while saving up to 25% water and 75% of energy compared to recycling [21]. Regarding secondary packaging, reusable plastic crates will avoid the generation of 20 to 30 thousand cardboard-box waste.

The company's new industrial cleaning facility in Neuilly-sur-Marne for Île de France region has two last generation tunnel machines that wash by immersion (bottles) and spray (containers) with a capacity from 3.000 to 4.500 units/hour respectively. Powered by solar panels, the facility has the potential to wash up to 40 million containers per year, avoiding 3.300 tons of packaging waste and saving €900.000 in waste management costs.

[7] GHG - Greenhouse Emissions
[8] Recycled PET

On the horizon

Uzaje plans to open eight additional industrial cleaning centres in France by 2022 and is developing an app to improve packaging traceability and optional deposit scheme to its clients. The company is also developing a new in-house machine to remove sticky labels from reusable containers more efficiently. Their consultancy vision is to overcome the containers' standardisation barrier (by advising clients to purchase the best reusable standardized packaging available) while in the long term, incorporate its outsourced transportation (cyclo-logistics and electric vehicles).

4.2 E-commerce – Fashion and accessories

Product groups

Fashion product group is composed of various product types: apparel, footwear, sportswear, formal wear, and accessories. Some items are bulkier than others and some may be more sensitive to creasing like formal wear.

Sector trends

E-commerce has been growing in recent years, reaching 11% of total retail sales in 2019 in Europe from 4% in 2010 [22]. After growing at a 12% rate between 2018 and 2019, initial indications are that e-commerce grew by 31% from 2019 to 2020. COVID-19 accelerated the adoption of online retail across European countries, tripling the annual ecommerce growth rate and in line with long-term trends. In 2020, the 10 billion B2C parcel volume was reached [23]. E-commerce is driven by cross-border purchases, with between 67% and 99% of European shoppers stating they have bought online. Over 70% bought an item from China and just under 40% have bought from the USA [24]. The fashion industry e-commerce alone is valued at over €460 billion annually and is expected to grow at 11.4% annually to over €880 billion by 2025 [25]. Online sales of fashion and accessories represent between 10 and 30% of total retail sales of this category [22], with between 50% to 68% of European ecommerce shoppers having bought an item from this category in 2020 [26]. Spending on online fashion sales, which was declining before the pandemic, is expected to only partially recover after.

Single-use packaging and materials

The primary function of packaging in e-commerce is to protect goods in transport and prevent damage [27]. Delivery of faulty goods as a result of poor handling of the package can lead to undesired returns and even waste as products might be deemed not suitable for selling. This often leads to overpackaging and use of packaging accessories (such as bubble wrap, air pillows, polystyrene chips). The importance of packaging varies significantly by product category in this channel as some goods are more damageable in transport than others. The overpackaging of fashion items in e-commerce represents 23% of total parcel weight [22]. Securing goods in transit is also a key aspect to reduce theft, and ensure traceability, and can be ensured by using technology such as RFID or barcodes. The impact of e-commerce packaging is limited, in comparison to the total amount of packaging placed on the European market every year (in the Netherlands for example, it is estimated that e-commerce packaging represents three percent of the total packaging weight on the market [28].

The most common packaging types used in e-commerce for fashion are self-sealing plastic envelopes[9], and kraft boxes[10]. Garments are often shipped in primary packaging (used to protect during transport from the manufacturer to the brand/retailer), with fashion items typically being shipped in individual polybags [29] and shoes in kraft boxes.

Reuse system alternatives

Different packaging reuse **implementation strategies** are presented below:

Packaging design and material

To be suitable for e-commerce of fashion items, which are sensitive to handling and transport, reusable packaging should be made of a protective material; light weight; flexible; resizable; sealable; durable; and washable. Packaging

[9] Low density polyethylene (LDPE) mailers, also known as polybags

[10] Kraft paper or paperboard is more resistant than other paper types

should also allow for some sort of method to secure (closed off with secure plastic tag like Hipli or with the couriers label like Repack) and trace the goods in transit (Hipli started by using an RFID tag but has now changed it to a simple barcode to minimise environmental impact of materials). E-commerce packaging is also often used to repack and return goods and should therefore open and close easily (Hipli opted for a zipper whilst Repack uses a velcro). Also, e-commerce packaging does not require a lot of differentiation, as packaging formats are typically optimized for logistics. There is potential for reusable packaging to be standardised for the various product categories that are sold by online marketplaces (e.g., books, fashion, shoes, cosmetics). There is too high potential to use recycled materials (fabric, synthetic, plastic).

An important aspect is that this packaging is often the first physical contact online users have with a product, and therefore, serves an important function in user experience and a means for brands to execute their marketing strategies. By using reusable packaging, brands and online retailers can also enhance this experience and have a positive impact on user satisfaction while showing concern about their environmental footprint

Ownership

In this case, the system owner transfers the ownership of the packaging temporarily to the online retailer who leases the packaging to ship the goods, and potentially acquire additional services.

Logistics

E-commerce trade happens at an international level. Even European retailers will typically fulfill orders from only a few central locations. Scaling up packaging reuse solutions thus involve multiple return points in each country or international return to logistics centres which typically represent a higher operational cost.
However, in the context of online sales of fashion items there is a high return rate. Reusable packaging may provide a better user experience than reusing a torn single-use packaging to return items or paying for own packaging. Retailers can then reuse the same package for a new shipment, thus reducing overall packaging costs.

Packaging logistics is a critical operation in e-commerce fulfilment which is driven by speed and efficiency. If leading to longer lead times, reusable packaging may compromise adoption. Large online retailers ship thousands of parcels a day, making it harder for reusable packaging stock management to meet market requirements and expectations. The same happens with fulfilment from retail stores.

However, due to the high level of specialisation of these operations, these logistics can be leveraged to be used and scaled up by reuse systems. Therefore, in this system, packaging is shipped to the retailer's warehouse or fulfilment centre; after which it is used in the same ways as the single-use ones; packaging can be returned by mail (dropped at a mailbox), picked up by courier from the user or dropped at a PUDO, to be shipped to cleaning centres where they are checked, cleaned and put back in the system. Packaging returned to the retailers directly with an order return, can be cleaned and re-used to send a new order. Cleaning is relatively easy (gentle rubbing with mild soap) and can be performed centrally by the reusable packaging provider or by the retailer/fulfilment centre. However, since these are additional activities, they do require additional process steps that take time and resources. A cleaning station, storage and human resources are needed wherever the packaging is returned to.

Incentive to return

At face value, the price of a reusable packaging is generally higher than single-use, especially compared to polybags and this cost or part of it is, usually, passed to the user. However, a study concluded that users are willing to pay for a more sustainable delivery method in ecommerce, a study concluded. This varies by country between 22% (Finland) and 42% (Germany) [26].

In fact, companies presenting users with an option to use reusable packaging minimize the non-return rate. Offering it as a free option to the user maximises the acceptance (Hipli in France reports 89% acceptance rate by users when offered free and 55% when offered at 1€). Instead of a deposit scheme, a reward system can be an alternative way to stimulate users to return packaging (RePack uses a voluntary reward system from retailers to users which may consist of a voucher or a discount in a future purchase or a donation to an NGO).

Besides the options mentioned previously, reusable packaging is also suitable for subscription and rental services that require return of the item after usage and increase user loyalty to the system/brand.

Users' role

Reusable packaging for e-commerce does not differ much in use from single-use. However, users must be willing to ship back the reusable packaging. Return of the packaging can happen by post dropped in a mailbox; returned by courier (e.g., with the next delivery); returned to store or another return point from a network. For exchange/returns to the (re)sellers, users can use the packaging in the same way as they already do with single-use packaging.

What about primary packaging for fashion?

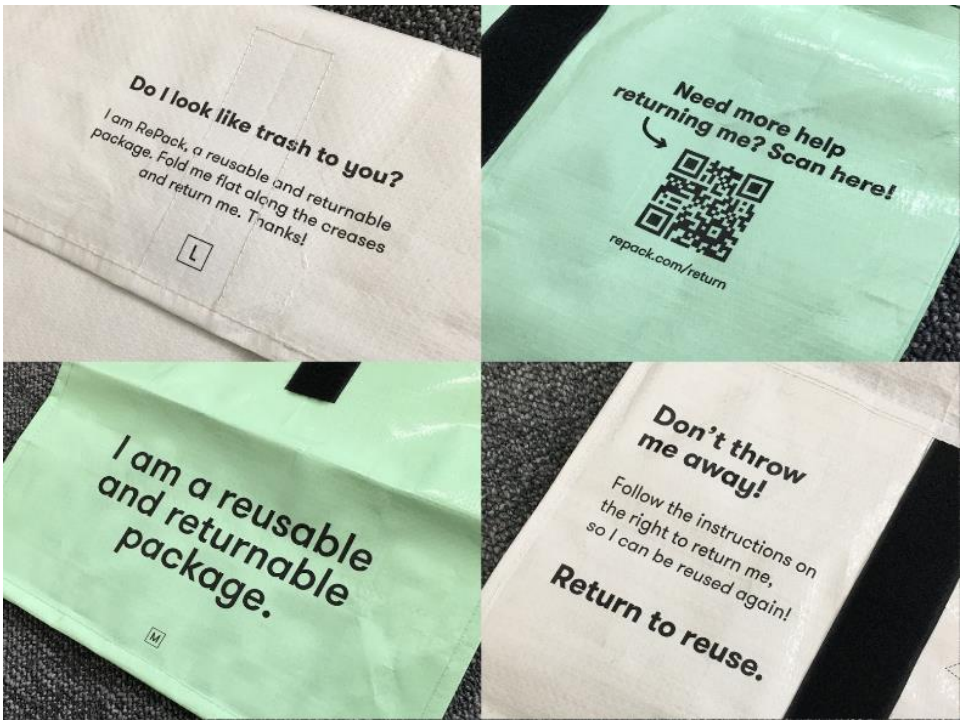
Clothes and shoes are packed in primary packaging for shipping between manufacturing locations and retails stores and consumers homes. For apparel, each item is typically covered in a clear plastic bag (polybag) to avoid moisture and condensation damage and creasing during transport. The items are then removed from the primary packaging to be hung in retail shops. For online channels, many retailers also remove the bags for a better user experience. Whilst hundreds of billions of polybags are estimated to be produced for the fashion industry every year [29], a reusable solution is not very applicable at present as the vast majority of manufacturing sites are located in Asia.

High-value shoes made of materials that can be easily damaged in transport, are typically packed in cardboard boxes. These boxes make transport and warehouse logistics more efficient and can be optimized to be made from kraft recycled and recyclable paper, thus minimising its environmental impact. Whilst some brands have managed to design and use shoe boxes that can act as transport boxes in an e-commerce channel, the majority of online fashion purchases include more than just a pair of shoes. The average number of items in an online order for the Fashion category in Europe is between 2.8 and 3.2. In fast fashion, shoes are often bought with other items, not allowing the primary packaging (shoe box) to be the transport packaging.

The following are the key success criteria for scale-up of a packaging reuse system for the fashion product category in e-commerce:

- **Protective, lightweight and flexible packaging materials** - to minimize shipments and transport space and environmental impact and costs. A few standardised sizes, to allow snug fit and protect the goods, and minimise transport costs.
- **Security** - like single-use packaging, reusable packaging must be tampering-proof and reduce shipment loss. Courrier stickers can be used to secure and close packaging to minimise additional materials to be used, but for smaller items like accessories, a zipper may be needed.
- **Ease to use** - the packaging return processes must be streamlined and available in a dense network of return points at common locations such as pick up/drop off points, supermarkets, cafés, mailboxes.

- **High return rate** - Products with high order return rate, such as fashion, make it easier to set up such a system, as the reusable packaging can be used to return the order returning the packaging to the retailer/logistics provider.
- **Reverse logistics** - for this distance to be minimised, it is key that packaging is returned to multiple locations across Europe, ideally within each country. For it to be economically viable, it's important that existing logistics channels are leveraged (postal systems, couriers, PUDOs) and that packaging fits existing reverse logistics (e.g. letterbox size). When empty, both Repack's and Hipli's packages are foldable to envelope-size so that they can easily be returned via the postal system.
- **Clear system instructions** - until the system is mainstream and everyone knows how to use it, instruction must be clear and visible on the packaging. Repack recently implemented a new packaging design with clearer instructions on how to return packaging. Additionally, systems can supply retailers with communication and integration kits for websites (Hipli and Repack).



Credits: Repack

Omni-channel packaging return

CTT Correios de Portugal (mail operator offering a national delivery service), is piloting a reusable packaging system with a few merchants whereby users can return the packaging to the courier when receiving the delivery, at a Postal shop, and mailboxes. The mail operator is running the reusable packaging system, thus controlling the return operations of the packaging [30].

Case study - Unfolding Repack's Success

System: Return on the go and Return from home
Operating markets:Europe and USA

RePack is much more than a reusable packaging to reduce waste in e-commerce. It is a pioneering solution to close the loop in three steps: standardised delivery packaging, return through a reward system, and effective cleaning to put it back in circulation.

Overcoming challenges

RePack's reusable postal velcro-sealed bags made with recycled (polypropylene) plastic were inspired by the Finnish bottle deposit return system (DRS). Since 2011, the innovative solution has scaled up across Europe and North America and is adopted by over 150 apparel brands and retailers.

The challenge was to find the best material, size and format to fit all e-commerce clients' requirements. RePack's waterproof packaging is made in China in three different colours and sizes (up to 6, 21 and 45 litres), designed to fold and close into letter size when empty, so it can be returned by simply posting it into a mailbox, anywhere in the world, for free. It's made to last at least 20 cycles and is currently working with up to 80% return.

The return on the go system is a voluntary scheme for brands (costing around €3,50 per cycle to retailers) for the packaging's delivery and return to the cleaning and resupply hub in Estonia, that can be reverted into vouchers (even on returned purchases) or charity donations. RePack's partner stores have two business models for its return: either sending the package back to a centralised facility or closing the loop through a rental based scheme by which they ensure its in-house cleaning and reuse.

Making impact

In the company's LCA, RePack states it can reduce the carbon footprint by up to 80% compared to disposable packaging and 96% on e-commerce packaging waste, achieving breakeven in carbon and waste footprint after its second use. Moreover, manufacturing a small plastic bag has a 50% higher footprint than returning a RePack: 36 gr of CO2 emission per shipment is roughly equivalent to an email with a large attachment [31].

RePack's Net Impact Report also shows that this (small) startup creates many new jobs compared to its revenue, while the reusable package makes use of postal services, a key-element of societal infrastructure.

On the horizon

RePack is planning to decentralize its cleaning facilities (currently in Estonia) across Europe to improve its CO2 efficiency. In fact, they have partnered with La Poste, the largest postal service company in France, for a 9-month project called 'French Loop', which aims at reducing the distance travelled by each RePack, ensuring the local reconditioning of used packages within French borders.
The company has also started working with e-commerce logistics providers which now distribute the packaging directly to the online retailers.

4.3 Large Retail – Household care

Product groups

Household care product category is composed of different product types: laundry care, surface care, dishwashing, maintenance products and bleaches [32]. Distribution of product category sales by value is as follows: laundry care 47.5%, surface care 21.7%, dishwashing 15.2%, maintenance products 13.5% and bleaches 2.1% of the market value in 2019 [33]. Many of these products mainly consist of water, with only a small volume of so-called "active ingredients" [34]. In 2019, over 19,5 billion units of household care products were sold. The 15,6 billion units registered under the Charter for Sustainable Cleaning accounted for 71.8kg of packaging per thousand user units.

Sector trends

In 2019, the household care market was €30.2 billion and grew by 2%, in particular laundry (2.3%), and surface care (2.1%). Products are sold mostly through grocery retailers (85%), pharmacies and drug stores (9%).

Single-use packaging

The products above are sold mostly in plastic bottles of varying sizes. The most common types are HDPE and PET [35]. Packaging quality is key to avoid product leakage, ensure safe and correct dosage, and it has been optimized for different applications and to meet different requirements in terms of regulation.

The industry has been exploring different ways to reduce the environmental impact of their packaging. From incorporating more recycled material to improving material efficiency in the packaging to piloting refill in store (Ecover). Compaction of the product (e.g. higher concentration), tablets and parent packaging all contribute to the reduction of material use, but are not sufficient to move towards a circular economy without waste.

Reuse system alternatives

Different packaging reuse **implementation strategies** are presented below:

Packaging design and materials

Key characteristics of the packaging are durability to endure a number of cycles of use, transport and cleaning; stackable or collapsible to avoid transportation costs and environmental impact in reverse logistics. The package should also disclose ingredients, especially hazardous ones. Product classification may also trigger special rules on packaging, covering the use of child-resistant fastenings and tactile warnings of danger [36].

When filled, the packaging must allow for a label to be stuck. Following a standardisation approach, packaging should still accommodate a removable element of differentiation between brands because in this category, like any other FMCG[11] packaging plays an important role in getting the user to buy the product at the retailer since brand recognition and loyalty are key elements for these companies [7]. Packaging materials can play a role in the durability, experience and engagement with the user. Some cases are using steel packaging for a premium feel (e.g Loop), but Polypropylene or HDPE may be good alternatives.

[11] FMCG: Fast-Moving Consumer Goods are products that sell quickly at relatively low cost. These goods are also called consumer packaged goods (CPG).

Ownership

Refill in store models leave the packaging responsibility to users which hold on to the packaging for their use. In this case, cleaning is the users' responsibility and manufacturers do not control the conditions to ensure the product use guidelines are ensured. In centralised refill models, ownership of the packaging is left with the manufacturer.

Logistics

Refill in store models require dispensing stations/walls in store (investment levels vary depending on the dispensing technology); storage space for wholesale refill containers, empty packaging and increasing restocking times. This presents a challenge since physical retail is driven by floor profitability per square metre of shop floor, which in some European countries, especially in cities, is limited. Retailers are therefore reluctant to dedicate space to storing empty refillable containers or refill dispensers.

However, by setting up a centralised refill system where manufacturers can recover, clean, refill and label the same packaging - used for a variety of household product references - , selling it prefilled in retail shops, means business as usual for retailers on the shop floor and where it comes to restocking. Also, since retail logistics are the same for many product groups (household care, beverages, personal care, etc), with retailers focusing on restocking self-service liners and check-outs, with human resources being minimised in store.

Packaging can be shipped directly to manufacturers' factories, but given the location of these in Europe, this might not be efficient for all countries. Alternatively, decentralised filing and cleaning units (in large containers/jerry cans) located in shorter distance from consumption, can act as a capillary network reducing transport.

Incentives to return

Deposit or reward systems may apply to get users to bring the package back. Given, it's a recurring buy product, to build loyalty, a reward on a next purchase or offering more sustainable products can be effective. Incentives for retailers should also be applicable to support the recovery processes. Also, these systems allow users to take only the quantity they need, preventing waste and, often paying the same price or lower (e.g Algramo in Chile) per litre. In addition, brands and retailers can use more technology driven solutions such as the ones with RFID tags (e.g. Algramo), to identify consumption habits and to continuously improve the system´s operations and features.

Users' role

Adoption of refill in store systems has been shown to stagnate over time [37] as the systems require users to change their habits and take back the packaging at the time of purchase, and to perform an extra operation in store. Convenient and user-friendly return operations, with pre-packaged products being readily available in a simple shop front and advanced dispensing technology (automated and with sensors) may ease the complexity of these systems.

Success criteria

The following are the key success criteria for scale-up of a packaging reuse system for the Household care product category in Large Retail:

- **Durable, stackable, and standardised packaging** - durable packaging to maximise life cycle and number of uses, stackable to minimise transport volume, standardised to allow for quicker return cycles, and smaller pooling volumes.
- **Safety & Hygiene** - inspection and cleaning logistics are important to comply with product specific legislation and avoid leakage and cross-contamination.

- **Incentive for return** - in general, the system works best with a deposit on the packaging. The packaging return processes must be simple, streamlined and available at or close by familiar locations such as supermarkets, municipal collection points. Deposits or rewards can promote user loyalty when the successful return of a package or associated with a discount on the next purchase.
- **Minimise reverse logistics distance** - for the impact of the reverse logistics transport to be minimised, it is key that packaging is returned to multiple locations across Europe, ideally within each country.
- **User education** - until the system is mainstream and everyone knows how to use it, instructions must be clear and visible on the label and in store so that reusable packaging is not confused with (single-use) recyclable ones.

Case study - Levering refill & reuse for mainstream markets

System: Return on the go
Operating markets: Europe (and worldwide)

Reuse models in retail for household care will not have a one-size-fits-all solution: given the multiple different products, alternative offers are needed to encourage 'bottle for life' usage, either by refilling at home (concentrated version in reduced packaging to be diluted with water) or refilling on the go (dispensing systems in stores). Refill and Return from home models are also in full expansion, allowing brands to create refillable versions of their current single-use products, to reduce waste in a circular ecosystem.

Since 2019, a few UK-based retailers have started trials of gravity-based dispensers and automatic machines offering Ecover detergents in 100% post-user recycled plastic bottles and Unilever's Persil in QR-coded reusable aluminium or stainless-steel bottles in touch-free refill stations.

Overcoming challenges

Retail's slow up-take of centralised cleaning systems seems to have been broken by Loop, an online and physical store facility developed by TerraCycle, that has engaged with major retail players in France and the UK to offer delivery and pick-up of both products and empty reusable packaging, while taking care of reverse logistics, cleaning, sanitation, and redistribution. Loop's return from home and on the go models charge companies a membership fee according to packaging durability, washability, and LCA (only allowing packaging that can be reused or recycled into the same product). Customers pay a deposit to incentivise the return of empty packages, which they can drop in a collection area at the store through a QR-code-based app, and collect a refund within 7 days [10].

Making an impact

Algramo is tackling the 'poverty tax', the extra fee included in smaller packages that should be more affordable for lower-income users, but in fact costs up to 30-40% more compared to larger packaging. Operating internationally, this Chile-based startup sells 'by the gram' as a refill from home model using mobile electric tricycles and reusable packaging equipped with a hidden RFID tag, offering a 'sustainable consumption credit' on the next purchase (10% discount on average) upon packaging reuse.

In 2020, Algramo partnered with Unilever for the South American market to scale up to 8 tricycles, and has also created an app for a touchless refill system, in which the settings are controlled by customers through their own mobile devices – a significant advantage in the context of COVID-19. Algramo is expanding to Europe where it is looking for implementation (retail) partners.

Making it small

Unilever has also launched a refill at home model for its brand product CIF, as a concentrated formula to be diluted in water: CIF Ecorefill (75% less plastic, 97% less water is transported and 87% fewer trucks are needed on the road vs 700ml).

On the horizon

Subscription and pick-up services are a must to create brand loyalty and provide information about customer needs while tracking reusable packaging and pick-up boxes in circulation for efficiency in logistics and scale up. These brands are also planning to expand within Europe's market as a result of an increased demand from customers for more conscious solutions.

5. Potential to scale up reuse for key product groups

5.1 Environmental and economic assessment

The environmental impact and economic savings for the potential scale-up of packaging reuse systems across Europe was estimated for each of the product categories. The tables below show the system characteristics that were compared between a reusable system and a single-use alternative, for each of the product groups to perform the LCA.

Reusable system	Single-use system
Polypropylene; 79g; end of life in Europe 16% recycled, end of life in Europe	Polypropylene; 43g; 16% recycled, end of life in Europe
Extrusion thermoforming manufacturing in China	Extrusion thermoforming manufacturing in China
90% return rate; 100 use cycles	-
Washing centre 20 km from user	-
Packaging cost 1,80€/ unit	0,39€/unit

Table 2: HoReCa food containers reusable and single-use system characterisation summary

Reusable system	Single-use system
Polypropylene cup, 49.3 grams; low-density polyethylene lid, 22.03grams 90% recycled, end of life in Europe	Paperboard cup, 10.2g; corrugated sleeve 3.7g; polystyrene lid 3.4 g Polyethylene liner 1g not recycled, end of life in Europe
Injection moulded cups and lids Manufacturing in Europe	Calendering for the cup and injection moulding for the lid Manufacturing in Europe
90% return rate; 132 use cycles	
Washing centre 20 km from user	
Packaging cost 1,59€/ unit	0,25€/unit

Table 3: HoReCa beverage containers reusable and single-use system characterisation summary

Reusable system	Single-use system
Polypropylene packaging, 55 g; zip: nylon 1g, polyester 3g and POM 6g; thread 0.4g End of life in Europe, not recycled	LDPE, 15g 16% recycled, end of life in Europe
Plastic film extrusion manufacturing in China Assembly in China	Plastic film extrusion manufacturing in China
90% return rate; 30 use cycles	
e-commerce warehouse 500km from user; washing centre 275km from e-commerce warehouse	
Packaging cost 2,10€/ unit Package return by mail 1,30€/unit	0,28€/unit

Table 4: E-commerce fashion packaging reusable and single-use system characterisation summary

Reusable system	Single-use system
HDPE, 102 g 16% recycled, end of life in Europe	HDPE, 48g 16% recycled, end of life in Europe
Blow moulding manufacturing in Europe	Blow moulding manufacturing in Europe
90% return rate; 100 use cycles	
Bulk supply from brand manufacturer 581 km to central warehouse Average distance from retailers to a washing centre 20km one way	
Packaging cost 4,79€/ unit	0,15€/unit

Table 5: Large retail household care packaging reusable and single-use system characterisation summary

Three scenarios for scale up of packaging reuse systems across Europe, for the four product groups analysed as per Table 6, based on reuse targets for 2027 and 2030:

	2027	2030
Scenario 1	10%	20%
Scenario 2	20%	50%
Scenario 3	50%	75%

Table 6: Scenarios for reusable packaging system targets

Having this into account, in the subsequent sections, the potential environmental and economic impacts across all product groups are presented.

HoReCA: Food containers

A reuse system has nearly 13 times less impact than a single-use. If scaled, a packaging reuse system could save:

		Scenario 1		Scenario 2		Scenario 3	
Criteria	Equivalence	2027	2030	2027	2030	2027	2030
Waste to landfill	Full truck load 8T	240	537	479	1,343	1,198	2,014
Energy	Average energy consumption per household per year	21,937	42,251	43,873	105,628	109,683	158,441
Water consumed	Olympic pools	567,364	1,034,209	1,134,728	2,585,522	2,836,820	3,878,284
Materials	Full truck load 8T	40,480	87,586	80,960	218,964	202,400	328,446
Climate change	Carbon dioxide absorbed per year by a mature tree	13,289,956	28,316,423	26,579,912	70,791,056	66,449,779	106,186,585

Table 7: Environmental impact for main criteria equivalence for scale up scenarios for food containers

Reusable packaging systems for food containers can be quite profitable and still deliver economic savings for its users (HoReCa). Even with savings of just 0.01€ (between the total cost of single-use vs. reuse packaging), would represent significant economic savings for retailers across all three scale up scenarios.

	Scenario 1		Scenario 2		Scenario 3	
	2027	2030	2027	2030	2027	2030
Savings (€)	€926,495,444	€2,111,967,476	€1,852,990,887	€5,279,918,691	€4,632,477,218	€7,919,878,036

Table 8: Economic savings for retailers using a reusable system for scale up scenarios for food containers

HoReCA: Beverage containers

A reuse system has around 4 times less impact than a single-use. If scaled, a packaging reuse system could save:

		Scenario 1		Scenario 2		Scenario 3	
Criteria	Equivalence	2027	2030	2027	2030	2027	2030
Waste to landfill	Full truck load 8T	200	439	401	1,098	1,002	1,647
Energy	Average energy consumption per household per year	262,484	575,271	524,969	1,438,177	1,312,422	2,157,265
Water consumed	Olympic pools	69,779	152,930	139,557	382,324	348,894	573,486
Materials	Full truck load 8T	578,165	1,267,129	1,156,330	3,167,822	2,890,826	4,751,733
Climate change	Carbon dioxide absorbed per year by a mature tree	9,153,634	20,061,454	18,307,268	50,153,634	45,768,169	75,230,452

Table 9: Environmental impact for main criteria equivalence for scale up scenarios for beverage containers

Reusable packaging systems for food containers can be quite profitable and still deliver economic savings for its users (HoReCa). With savings of 0.12€/unit (between the total cost of single-use vs. reuse packaging) it would represent significant economic savings for retailers across all three scale up scenarios.

The economic savings derived for the retailers is also significant across all three scenarios:

	Scenario 1		Scenario 2		Scenario 3	
	2027	2030	2027	2030	2027	2030
Savings (€)	€928,746,402	€2,035,476,116	€1,857,492,804	€5,088,690,290	€4,643,732,011	€7,633,035,434

Table 10: Economic savings for retailers for scale up scenarios for beverage containers

E-commerce: Fashion

A reuse system has nearly 3 times less impact than a single-use system in the e-commerce fashion category. If scaled in Europe, a packaging reuse system could save:

		Scenario 1		Scenario 2		Scenario 3	
Criteria	**Equivalence**	**2027**	**2030**	**2027**	**2030**	**2027**	**2030**
Waste to landfill	Full truck load 8T	14	47	28	116	69	175
Energy	Average energy consumption per household per year	2,828	9,513	5,657	23,783	14,141	35,674
Water consumed	Olympic pools	47,612	160,147	95,224	400,369	238,061	600,553
Materials	Full truck load 8T	3,732	12,552	7,463	31,380	18,659	47,070
Climate change	Carbon dioxide absorbed per year by a mature tree	2,338,956	7,867,279	4,677,912	19,668,197	11,694,780	29,502,295

Table 11: Environmental impact for main criteria equivalence for scale up scenarios for e-commerce packaging

Although reusable packaging systems for e-commerce fashion can be profitable, they cannot yet compete with the prices of the most used single-use packaging in the fashion category (polybags). This is mainly due to the costs of returning one unit of packaging individually to the washing centre, which can account to more than the cost of acquiring a new reusable packaging unit. From the online retailer point of view, at face value, using a reusable packaging would account for 2,43€ of additional cost. The model may be more dependent on users contributing, to prevent merchants from having to take the cost alone. In a recent study on e-commerce in Europe, between 22 and 42% of European shoppers indicated they were willing to pay extra for a sustainable delivery method. Also, in the project Praxpack, a pilot study from Tchibo in Germany concluded that 63% of users would be willing to contribute to costs of the reusable packaging. A study by RePack, concluded that a merchant shipping 250.000 orders a year, could reduce their packaging costs by 40% a year if users were to have an option to choose RePack and pay for its use[12].

Large retail: household care

A reuse system has around 12 times less impact than a single-use. If scaled, a packaging reuse system could save:

		Scenario 1		Scenario 2		Scenario 3	
Criteria	**Equivalence**	**2027**	**2030**	**2027**	**2030**	**2027**	**2030**
Waste to landfill	Full truck load 8T	19	41	38	103	96	154
Energy	Average energy consumption per household per year	15,505	33,199	31,010	82,998	77,525	124,497
Water consumed	Olympic pools	120,650	258,335	241,300	645,838	603,250	968,758
Materials	Full truck load 8T	12,534	26,837	25,067	67,092	62,668	100,639
Climate change	Carbon dioxide absorbed per year by a mature tree	5,503,516	11,784,118	11,007,031	29,460,296	27,517,578	44,190,444

Table 12: Environmental impact for main criteria equivalence for scale up scenarios for household care packaging

With a healthy gross margin (estimated), at a selling price to the manufacturer of 0,15€, the reusable packaging system for household care can still realise economic savings of 0,10€/unit, which result in significant savings across all three scenarios.

[12] "The Business case for reuse", Repack. Based on a retailer shipping 250.000 orders annually, with a 25% user return rate and a 100.000 annual cost of single-use packaging. Introducing reuse as an option, and assuming 15% of users choose it and pay €3,95, it would reduce the packaging cost by 40%.

	Scenario 1		Scenario 2		Scenario 3	
	2027	2030	2027	2030	2027	2030
Savings (€)	€150,160,100	€321,522,556	€300,320,200	€803,806,390	€750,800,500	€1,205,709,585

Table 13: Economic savings for retailers for scale up scenarios for household care

5.2 Social assessment and job creation

Reuse systems pose opportunities to single-use packaging manufacturers to focus on reuse-as-a-service model and/or for the emergence of new businesses such as centralised cleaning and logistics which by operating at scale, can decrease the cost and guarantee hygiene standards. In turn, this drives the creation of new jobs.

Based on available data, reuse systems studied can promote the creation of 50 FTE[13] jobs in warehouse and transportation services (for dealing with 120.000 units/day). These new jobs will also require the acquisition of new skills and knowledge, increasing the level of professional competences and the development of new careers of the local community.

Taking in consideration the estimation of possible new employment opportunities, the job creation potential was also assessed for the three scale up scenarios across all product categories.

	Scenario 1		Scenario 2		Scenario 3	
	2027	2030	2027	2030	2027	2030
Job creation	93	245	185	613	462	12,332

Table 14: Estimation of job creation potential for scale up scenarios for all product groups

[13] Full Time Equivalent Jobs

6. Main business and environmental drivers of reuse

The main drivers of the environmental and business case are aligned and are the following:

- **Number of reuse cycles** - the benefits of a reuse packaging system can only be realised if the reusable packaging is maintained in the system for as long as possible. The higher the number of uses the lower the costs and the lower the environmental impact of the production of the packaging. Therefore, materials used in the packaging should be durable and ensure the quality of reuse so that number of uses can be maximized.
- **Return rate and losses** - when the return rate is low, or the number of damaged recipients is high, the environmental impact of the reuse system increases. Systems must ensure that packaging is correctly returned, and users have incentives to do it.
- **Transportation distances** - from the point of supply to the point of consumption. The longer the transport distances to return packaging in the reusable system, the higher the environmental impact associated with the reuse system. Shorter distances tend to favour reusable packaging. Environmental impact can be lowered when using clean energy in vehicles.
- **Scale** - the more units are processed through a system, the higher the efficiencies and the lower the unit cost across all phases (production, transportation, cleaning). More efficient processes generally offer higher environmental benefits.
- **Standardisation** - can also play a big role in achieving scale and driving efficiencies by improving interoperability, reducing investment costs in design of systems, and fostering quicker penetration of reusable packaging systems resulting in less risk for businesses.

Investment needs

Initial investment to set up a reuse packaging system is a hurdle [7] and may undermine initiatives from small and large players to come into this space. Main investment categories include warehousing space (for storing, cleaning, inspection, maintenance); packaging recovery infrastructure (such as reverse vending machines in supermarkets or drop-off boxes in restaurants); transport vehicles for collecting, delivering or pooling the reusable packaging in the system; reusable packaging washing/cleaning equipment (washing, cleaning, drying machines); software/app to manage user engagement and manage deposits.

The role of technology

Technology can have a facilitating role in the implementation of reuse systems, driving adoption and facilitate monitoring it: asset tracking technology such as barcoding and RFID tags (Radio Frequency Identification) helps track packaging containers in real time, allow monitoring of cycles and help prove the business case (e.g. CupClub); digital apps can support engagement with the user, facilitate deposit and reward systems (e.g. Recircle) and enable contactless operations (e.g. Algramo's); dispensing technology, such as automated dispensers with sensors, can ease processes and drive safety. Standardisation can support automation in logistics that can drive further efficiencies. Nonetheless, if used in retail, technology can hinder the business case for both owner of the system and retailers, when it represents an additional investment per retail unit, and some brands (e.g., Ecover) have reverted to more simple manual technology (e.g pressure and gravity assisted dispensing units [38].

In addition, the reusable packaging pool is also considered a capital investment. This is the number of packaging units required to support a reusable packaging system needed to keep the system running. As the pool needs to allow for the time taken for the return logistics, cleaning, seasonal peaks in volumes, damages and losses in the system [39], it must be significantly higher than the number of packaging units required for the immediate and current product supply at any point in time. Its size varies depending on the distance the containers have to travel, the speed at which the products are consumed, and the packaging returned by users and the turn-around time (time required to prepare the packaging for a new cycle) [7]. Shared pools of reusable packaging reduce the **potential** pool of reusables. As an example, the Dutch beer bottle used in DRS needs 7 times more bottles to operate than the average weekly consumption [18].

Investment in communication with actors along the value chain is also needed, to ensure the system runs smoothly and that the environmental and economic benefits are realised.In Table 16, some estimates for levels of investment needed to certain key aspects of the system are illustrated. Although the requirements are not exactly the same for all product categories, some infrastructures, such as cleaning/washing facilities, can be shared amongst some categories, thus facilitating the circular business case around infrastructure and other technology to advance the recovery and reuse [40]. Previous investments in reuse infrastructure are likely to promote reuse systems [41]. Leveraging B2B reuse models, such as recovery, reposition and wash centers, can facilitate implementation and reduce investment needed for B2C models [18].

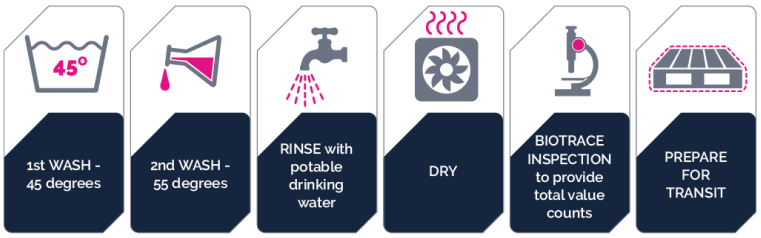
Category	Investment estimates
Cleaning	Industrial washing equipment: between €125.000 and €300.000 Small bottle washing: €25.000
Recovery	Reverse vending machine €3.000
Technology	Technology development and maintenance €200.000
Transport	Electric truck: €100.000
Warehousing	Storage space/ hall for the washing line: between €125.000 and € 400.000

Table 15: Estimation of level of investment per category[14]

[14] Source: Anonymised data from various reusable packaging businesses in Europe

It's a lot about the cleaning

From a simple rubbing with a mild soap (RePack) to a two-stage washing with clean rooms (Packaging Services Europe), there is a lot to be said about cleaning and washing processes. Its optimization is a crucial element to make a compelling business case. According to Packaging Services Europe, a great deal of optimization can be achieved with standardisation of packaging formats and processes that can enable scale up of operations, cost savings and positive contributions to environmental impact. Whilst in some channels, washing processes and equipment exist (e.g., dine-in Horeca outlets generally have washing for plates and cutlery) these may not be adapted to containers.



Credits: Packaging Services Europe

Washing process of reusable containers[15]

Of course a single company may decide to set up its own reuse system, and in some circumstances this may be the only option, but generally the cost-efficiency and sustainability of a reuse system is improved when more companies collaborate. At a small scale, this could be a cooperative of several restaurants at neighbourhood level that decide to collectively purchase reusable packaging, accept returns at different locations and manage the system together. In principle, the more actors join a common reuse system, the more efficient use is made of assets and infrastructure (e.g., washing facilities) and the higher the environmental benefits of reuse.

Reuse systems (at least for cleaning of food and beverage containers) are generally best implemented at regional level to shorten the supply chain and minimise transport distance, but the overall management of reuse-as-a-service systems may span the (inter)national level, thus creating a collective approach to tools (e.g., apps), protocols and communication strategies. The benefit of this is that there is no need to reinvent the wheel at each location, and scaling can more easily be achieved through replication.

At this stage it is inevitable that various different initiatives are created and start experimenting at local level and at some point, even competing at national level. This creates a dynamic ecosystem where eventually the most successful thrive. At the same time, it may not be efficient if there are dozens of reuse initiatives in the same sector using a different packaging format, as well as different logistics and cleaning processes, and it would bring additional complexity for users. Standardisation of certain basic aspects of reuse systems (particularly packaging format), at national and even European level, would facilitate processes.

[15] Packaging Services Europe: https://packagingserviceseurope.co.uk/pallet-washing/

7. Scaling up reuse systems through standardisation

One of the main challenges in the market nowadays is the high level of differentiation in product design of packaging in terms of format, material type and additives (e.g., colouring). This is not only because of the large diversity of products on the market, and varying levels of performance requirements, but also marketing purposes as each brand wants to distinguish itself from others. However, different packaging formats make it more difficult to scale up a reuse system.

In a reuse system, most of the operational costs are due to the reverse logistics, handling, washing and distribution, which have a higher complexity than single-use packaging. In order to minimise these costs, efficiency is essential, which can be achieved through automated processes and standardised packaging and systems. This means packaging has to comply with specific dimensions, which facilitates stacking and easy transport, processing and washing by industrial equipment. At the same time, there is still an opportunity for differentiation between brands, by using different colours, labels or other details of design.

The German Perlenflasche is an iconic example of standardised reusable design for water and soft drinks, which can be reused around 50 times. Another example of standardised sizing for refill are the beer bottles in the Netherlands (see text box below).

The Dutch Brown Retour Bottle (Bruine Nederlandse Retourfles)

In the Netherlands, the refillable brown beer bottle has existed since the eighties. The standardised bottle was regarded as a solution to the high cost of the beer packaging and is a voluntary scheme collectively managed by the beer producers, now representing a large share of the market[16]. A reuse cycle is as follows: brewery, retailer, user, DRS machine, back to the brewer, removal of old labels, cleaning, quality control, refill, redistribution etc. The DRS glass bottles are of high quality and can be refilled around 20-40 times which minimises the CO2 footprint of the bottle to a minimum. To ensure the continuity and quality of the whole BNR pool of bottles, there are a number of rules for the production, sale and reuse of the BNR. The bottle size and shape is standardised at national level: content (30 cl or 50 cl); thick glass (1.4 mm); UV resistant brown colour; 207 mm high. The advantage of the BNR is that the user can return the bottle in any supermarket, even when it does not sell the specific brand. The bottles are simply returned in the crates of another brand.

Here, it is important to understand the difference between standardisation through an official standardisation committee and simply having a common format or following commonly agreed guidelines. In the first case, technical standards are developed for products, services or systems, by CEN or national standardisation bodies. These are developed by various stakeholders through consensus and are usually not publicly available (they need to be purchased). In the second case, formats or dimensions are specified by certain market actors, but without an official status. This means that not everybody might agree with them. In both cases, common characteristics can be defined such as the packaging's dimensions to facilitate processing and operations, thus lowering implementation and operational costs.

[16] Lindeboom Bierbrouwerij, Budelse Brouwerij, Bierbrouwerij AB InBev, Gulpener Bierbrouwerij, Heineken Nederland, Grolsche Bierbrouwerij and Royal Swinkels Family Brewers.

A clear set of technical rules eases the collaboration between actors in the value chain (also across sectors). However, in the case of "official" standardisation, it would be easier to scale at (inter)national level, although at international level standards in the EU would need to be harmonised as well (because standards can be different in each country).

Therefore, the question is: to what extent can packaging format be standardised to scale up reuse systems? Beverage and meal containers, e-commerce packaging and detergent bottles do not have to be available in all sorts of shapes and sizes. They simply have to be functional, which can be accomplished through a standardised format that is optimised to fit a reuse system.

Standardisation for reusable food packaging (July 2020, KIDV [43])

The KIDV in the Netherlands has explored the potential of standardisation in primary reusable food packaging to enable the transition to reusable packaging systems in the food industry. A number of requirements were formulated for the most efficient and effective cleaning and reverse logistics: PolyPropylene as preferred material, heat resistance for cleaning (85°C), separable and universal lid, nestable and the use of light colours. A more square or rectangular shape is preferred for stacking and transportation. Reusable packaging design should avoid deep edges, grooves or narrow holes as these can become blind spots for cleaning machines and will be difficult to dry.

Also, many packaging and logistics companies offer secondary packaging which conform to European standards (EN) but comply to Gastronorm* sizing on the inside. It could be useful to produce reusable primary food packaging according to Gastronorm sizes that fit in EN crates.

*The standard is derived from the Europallet. Gastronorm is a common standard used in the preparation, storage and transport of food.

For food packaging, the National Institute on Sustainable Packaging in the Netherlands (KIDV) has performed a study to identify design elements that could be standardised for reuse. Such an in-depth study about standardisation of reusable packaging for e-commerce and household products would also be useful to identify functional and non-functional requirements. However, even if such blueprints existed, not all producers would automatically follow them. That's where EU legislation comes into play.

Besides packaging format, also other aspects of a reuse system could be "standardised", or at least facilitated by common norms and guidelines. These could apply for instance to the deposit system, to make it reliable; to the washing process, to limit the environmental impact related to the water, energy and material consumption; to raise operators and customers' confidence about practices fulfilling minimum standard practice to ensure high levels of hygiene and durability. Moreover, a guideline on the chemical composition of materials of reusable packaging could ensure the use of safe materials (specially for food contact).

EU legislation and standards

The European Packaging and packaging waste directive 94/62/EC (amended in 2018) obligates member states to meet targets for the recovery and recycling of packaging waste, but also requires packaging to comply with 'essential requirements' which include the minimisation of packaging volume and weight, and the design of packaging to permit its reuse or recovery. It requires the implementation of measures to prevent packaging waste in addition to preventative measures under the 'essential requirements', which may include measures to encourage the reuse of packaging.

The EU standard EN 13429 on packaging reuse specifies these essential requirements. According to the standard EN 13429, a packaging is classified as a reusable packaging on the basis of its principal suitability for the purpose.

However, it would be insufficient to speak of reusable packaging without referring to the system in which it is embedded. Therefore, as this position paper by ECOS and ANEC explains, the EU standard presents several shortcomings:

- It does not require the need for reuse or refill logistics and infrastructure;
- It does not specify minimum durability requirements to achieve a minimum number of trips or rotations;
- It does not contain a test method for the verification of durability requirements;
- It allows the use of hybrid systems, where both the refill and the reusable packages may be used as single-use packaging.

Consequently, the standard does not provide a clear-cut technical specification, but relies on the judgement of the user whether a certain package is deemed reusable and for how long, which is clearly not sufficient.

Catalysing systemic change: from B2B to B2C

Reuse systems in B2B packaging are already tackling logistics inefficiencies and economic benefits. The wider the adoption of standardised reusable transport packaging, the more benefits it can reap (individual adoption; single-industry pooling as service; multi-industry pooling as service; and the paradigm shift “Physical internet”). Shared logistics packaging could help reduce the cost barrier attached to reverse logistics models by creating an open infrastructure for new business models to utilise. The modular dimensions that define B2B shipments (e.g. pallet dimensions) could set the boundary conditions for standardisation of primary product packaging [34].

Conclusions

Harmonisation in packaging types and dimensions, or 'universal' packaging formats, can help a wide acceptance of such packaging formats as they can be used by different companies along the value chain. Thus, standardisation offers opportunities to help reduce operational costs, create necessary economies of scale, and maximise the environmental benefits of reusable packaging systems. Optimised and universal dimensions of packaging facilitates logistics, handling, cleaning and refill. At the same time, standardisation can also allow for a varying degree of some customisation of packaging (e.g. through labelling) to enable brand differentiation and thus acceptance by companies. While dimensions would be standardised, the packaging's label, colour, transparency, texture, and other details of its design which affect its general 'feel' and look could still differ. Although the most specific designs could not be exchanged for reuse between brands, they could be washed and transported using the same washing and logistics systems thanks to standardised dimensions and overall shape.

Nationwide deposit return systems for beverage packaging have proven to benefit greatly from standardisation (e.g. standardised formats of beer bottles). For specific niche products, EU standards on reuse systems may not always be feasible and national standards and guidelines could be better suited. However, for fast-moving consumer goods that are mass-produced and found across the EU (particularly soft drinks but also others analysed in this report), CEN standards at EU level could be developed and harmonised. National standardisation bodies could already create standards that are less prescriptive and do not stifle innovation, but still provide useful guidance to operators.

However, the most basic need of all is a clear definition of reusable. There could even be a label to distinguish reusable from single-use packaging[17]. By definition, packaging should only be labelled as reusable if it is reused multiple times for the same purpose within a reuse or refill system. In any case, it is important to revise the existing standard EN 13429 to incorporate requirements regarding the overall system (reuse/refill logistics and infrastructure; min. durability requirements to achieve a maximum number of trips/rotations; test methods; exclusion of hybrid systems).

At the same time it is important to realise that many reuse systems are still in an experimental phase and there are many different ways to organise the various building blocks (e.g. deposit system, logistics and communication), depending on the means and context of the initiative. Guidelines could be developed by public institutions at national level (based on best practices and expertise at national level) on aspects that are more difficult to standardise at international level, but require some adaptation to the local/regional context.

[17] In France, Reseau Consigne' members use a pictogram to mark the reusable items: http://www.reseauconsigne.com/pictogramme-national-rapportez-moi-pour-reemploi/

8. Conclusions and Policy recommendations

This study presented insights regarding the basic elements of a reuse system for packaging for different product groups in different channels. There is clearly a lot of potential for reusable packaging but also many challenges that reuse systems face in practice as a result of the linear economy context in which they have to operate. This chapter outlines policy measures through which governments can support reuse initiatives to overcome these challenges. Not only by creating enabling conditions through policies and regulations but also through other instruments. Most of these measures would have to be implemented at national or local level, but also the EU has an important role to lead the reuse transition through for instance target-setting, the PPWD (as discussed in the previous chapter) and guidance for EPR schemes.

Packaging and Packaging Waste Directive (PPWD)

To achieve the objective that all plastic packaging and single-use plastic products placed on the market should be reusable "where possible" and in any case recyclable by 2025, the essential requirements have to be formulated more specific in order to provide sufficient technical guidance to producers. Most importantly, control and enforcement on the ground should be improved in order for the PPWD to be more than just a list of intentions. It is essential that Member States enact accountability mechanisms and penalties that are sufficiently dissuasive to prevent non-compliance.

Bans on Single-Use Packaging

In principle, unnecessary and unsustainable single-use packaging (not only plastics, but all materials) should not be allowed on the market. This would force businesses to invest in reusable packaging systems.

This can be achieved through a phased approach that first focuses on the sectors where single-use packaging can easily be substituted by reusables. As a first step, the use of single-use packaging for onsite consumption should be banned in the HoReCa sector, but also for government buildings and public institutions (e.g., schools). Secondly, single-use packaging can be banned at public events and festivals like in the region of Flanders, Belgium. In some cases, frontrunner municipalities can lead the way by imposing a ban at local level (e.g. Geneva in Switzerland banned most single-use plastics, including cups and food containers).

As for out-of-home consumption (take-away and delivery), it should be made mandatory to offer users a reusable option. In Germany, operators of a restaurant or café that offers food or drinks to-go will be obliged from 2023 to offer reusable packaging in addition to environmentally friendly disposable packaging. There will be an exemption for small businesses with 5 employees or less and a shop area of no more than 80m2. The reusable version may not be smaller or more expensive than the disposable packaging, only a deposit may be added. In addition, the reusable containers must be taken back by the respective company after use. Besides reusable containers, in the CAEP, the EU committed to propose an initiative to replace single-use tableware and cutlery by reusable options in food services.

A ban on single-use packaging for e-commerce and household care is less likely in the short term, but also for these product groups it can be made mandatory to offer a reusable alternative. Furthermore, reuse targets will help to establish reuse systems.

Waste reduction and reuse targets (both national and EU level)

At the moment, there are only binding recycling targets for packaging at end-of-life, rather than reduction and reuse targets. Although the European Plastic Pact aims to reduce virgin plastic products and packaging by at least 20% (by weight) by 2025, with half of this reduction coming from an absolute reduction in plastics[18], the signatories do not cover the entire market and there are no enforcement mechanisms to ensure the target is reached.

Most efforts, including EPR schemes[19] and Plastic Pacts at national level, mostly focus on recycling and quick wins. However, to steer the circular economy in the right direction it is essential that the EU and national governments adopt ambitious and legally binding reduction and reuse targets with which the packaging industry has to comply. To be in line with the ambitions for a circular economy[20], the total amount of virgin plastic packaging placed on the market should decrease by 25% by 2025 and 50% by 2030. Another option is a quantitative limit, or cap, on the amount of single-use packaging material put on the market, to force companies to avoid single-use packaging.

In addition, binding reuse targets create a safe environment for investments by SMEs and larger corporations in reuse systems and infrastructure [43]. It also prevents them from simply replacing SUPs with disposable products made from other materials. Different targets should be adopted for different product groups, because each of them has their own potential, market dynamics and challenges. We propose the following percentages for the share of the market covered by reusable packaging:

- Drinking cups: at least 75% by 2030;
- Take-away and delivery meal containers: at least 50% by 2030;
- Household care products (laundry care) distributed by large retailers: at least 20% by 2030.

For e-commerce packaging, users should be given the option at checkout. Although, based on our research, the business models seem to be viable, the cost of the reusable alternative is much higher to the retailers, thus making it difficult to scale up without users' contribution to the packaging cost. Research is needed to establish a feasible target, as currently the business model is not yet economically viable without users' contribution to the packaging cost.

At EU level, the revision of the PPWD should integrate concrete reduction and reuse targets. At national level, new legislation should be enacted to formalise these targets, like in the French law on circular economy, but also existing EPR agreements and Plastic Pacts should be updated. Most importantly, government monitoring is needed to keep track of the level of reuse and effectiveness of measures implemented by the industry, while non-compliance should lead to effective sanctions. In addition, large retailers should be obliged to devote a share of their shelves to refill stations selling unpackaged goods.

[18] This refers to reduction of 'unnecessary' plastic, without increasing use of other materials and/or generating unintended consequences. Absolute reduction can be achieved in a number of ways including reuse/refill systems.

[19] At national level there are often formal Packaging Agreements between the national government and producer's responsibility organisations describing binding requirements for packaging producers.

[20] Based on EU plastic pact, "aiming to reduce virgin plastic products and packaging by at least 20% (by weight) by 2025, with half of this reduction coming from an absolute reduction in plastics": https://europeanplasticspact.org/targets/

Setting enabling conditions for reuse at national level

As from 1 January 2020 in Romania [43], market operators who place packaged products on the market are required to sell a minimum of 5% of their goods in reusable packaging. Furthermore, the percentage may not be less than the average percentage achieved between 2018 and 2019, and there should be an annual increase by 5% until 2025. As a result, at least 30% of user packaging on the Romanian market should be reusable by 2025. Retailers will be required to give users the opportunity to choose reusable packaging and return it to the point of sale (with the exclusion of retailers with a small sales area).

In France, a new law is under debate which should make it easier for shoppers to refill their own reusable containers in supermarkets when buying dry products like rice, pasta, cereals and beans. The new law would mean large supermarkets in France must dedicate 20% of their surface space to food refill stations by 2030. After being passed by parliament it still has to be passed by the senate. If passed, it will apply to shops that are 400m2. It will not apply to off-licences, wine shops, cosmetics stores or perfume shops in which it is more difficult to sell products as refills.

Financial support

Given the challenging business case for reuse and the time it takes to reach a break-even point, it is often difficult for entrepreneurs to access financing to cover the initial (upfront) investments in, for instance, a stock of reusable containers or industrial washing systems. In order to address this obstacle for businesses, government agencies could provide soft loans[21] or create innovative funding schemes such as convertible loans or grants for reuse businesses. At the local level, municipalities can provide local businesses financial support to develop and implement reuse pilots. These financial support measures should of course set clear requirements for the environmental and economic performance, while stimulating the scaling-up and harmonisation of systems.

In addition, government support for R&D programs is also still needed to develop and improve reuse systems. The UK Research and Innovation competition developed a grant programme to support collaborative projects for Refill Infrastructure projects, as part of the UK Circular Plastics Flagship Projects grants. The German Federal Ministry of Research has funded a PraxPack long-term research collaborative program to develop and test business models for reusable packaging solutions in online retailing. And a pilot test showing that the reuse of bottles in the wine sector is technically feasible and more environmentally friendly, was funded by Life Program. The outcomes and insights of these national and European programs should be combined and shared across the EU.

Fiscal measures

In order to remove the economic advantage that single-use packaging currently have vis-a-vis reusables, environmental costs should be internalised in the price of single-use packaging, in line with the polluter pays principle. It is simply too cheap to produce and waste single-use packaging, which means reusables can seldom outcompete single-use packaging. To improve the business case for reusables, more economic disincentives for single-use packaging are needed. This can be achieved through a tax or levy on single-use packaging, like the latte levy. Such a levy should be at least €0,20 per packaging and visible for the user in order to have effect. The generated revenue could be used to support innovative reuse systems. Another way to encourage reusables through fiscal measures is to recognise capital investments for reuse systems as environmental measures that are eligible for tax rebates.

[21] A soft loan is a loan with no interest or a below-market rate of interest. Also known as "soft financing" or "concessional funding," soft loans have lenient terms, such as extended grace periods (Investopedia, 2021).

Extended producer responsibility (EPR)

EPR schemes are an important instrument to make producers pay for environmental costs, firstly by obliging them to cover the cost for waste collection and treatment. With the implementation of Article 8 of the SUPD, producers will also be obliged to cover the clean-up costs of certain packaging litter as well as awareness-raising measures. It is essential that these costs are determined based on an objective methodology that takes into account all costs related to the end-of-life disposal of (single-use) packaging, from collection infrastructure and transport to recycling.

Currently, there are many EPR schemes across Europe that are all organised in a different way. EU guidelines for EPR schemes should include requirements for EPR schemes to also take into account reduction and reuse targets. At least 10% of the EPR budget should be earmarked to be invested in the development and scaling up of reuse systems.

Furthermore, EPR mechanisms can be improved to promote design for reuse. This can be achieved through ecomodulation (differentiation) of fees so that producers of reusable packaging pay less.

The Ellen MacArthur Foundation has also recently released a position paper, signed by over 100 businesses across the packaging value chain, including brands, retailers and packaging manufacturers, calling out for EPR schemes for packaging, as a means to fund scale up of circular activities with packaging.

DRS systems for reuse

Deposit return systems for beverage containers are increasingly being adopted in EU countries, which is a positive trend [44]. Although these are mostly geared towards recycling at the moment, they can be deployed for reuse as well. The logistical systems for DRS can be used for different packaging types, such as glass, plastic and aluminium and shared between recycled and reusable packaging (two-way). Member states should incentivise the efficient use of infrastructure implementation for both systems and the European Commission can formulate guidelines building on best practices.

Information dissemination and collaboration

Government agencies should provide information services to support stakeholders with the practical implementation of reuse systems, for instance through guidelines as described in the previous chapter. A good example is the public agency OVAM in Belgium which offers useful information and reports on reusable catering material for event organizers and municipalities.

Also, Communities of Practice (CoP) on reusable packaging, such as those established by the KIDV in Netherlands, and funded by packaging waste management contributions, are relevant for different actors (e.g. supermarkets, brand owners, service providers, start-ups, research institutes and NGOs) to collaborate and exchange information on the challenges and opportunities for reusable packaging. Such a CoP could launch pilots on reusable packaging, organize events, publish reports and tools on key aspects, which can be of great value in the transition phase.

9. Study limitations

The authors of this study tried to elaborate the most complete and informative document taking in consideration the scope and objectives set out. However, the study presents different limitations which are described below for transparency purposes.

Due to the lack of data at the time of performing the prioritisation of product groups for the different criteria used distributed for each product group within each channel, the classification was performed taking mostly into consideration the knowledge of the consultants. Although this is a limitation of the study, the application of a multicriteria decision analysis made the process systematic and therefore more reliable.
A simplified quantitative study was used to estimate the potential of improvement of the reusable systems at environmental, economic and social level. Where possible, data used was based on published LCAs from reusable packaging systems currently in operation and done by known organizations and following equivalent methods (i.e. Cup Club and Hipli). Although precision and consistency were pursued as much as possible, several assumptions were made because data was either confidential, inconsistent or unavailable.

The study focused on analysing the worst-case scenario for the reuse system and the best case for the single-use system, in order to ensure that where positive results arose, it meant that with a higher level of certainty it could be affirmed that reuse systems are a promising solution.

Data on packaging units consumed in each product group is not readily available (a European level), so assumptions had to be made based on the best data proxy.

Economic data was harder to assess and modulate as i) some systems have very small, non-scaled operations, or are wary of sharing data on business-critical processes such as reverse logistics and cleaning costs; ii) there were no examples to base data on (i.e. household care). This may impact the results and make less positive business cases in some product groups.

Investment was not taken into consideration in the assessment of the business case for reuse as neither was the investment in single-use packaging (such as moulding and blowing equipment).

The economic impact for incentives for return (deposit or reward) were not considered in the design of the systems as there are different alternatives available, and who incurs the cost (retailer/ manufacturer, reusable system provider). Although deposits are mainly used to ensure the packaging is returned to the system by the user, retailers/manufacturers may incur costs in the processing of electronic transactions, which may be avoided with a digital wallet system. Moreover, reward is often implemented as a discount on a subsequent purchase, driving loyalty and additional sales which would have to be accounted for. Nonetheless, there is a need for incentives for all actors of the value chain to design successful systems.

Needless to say, although European averages were used, there are sometimes significant differences in terms of population density, warehousing space cost, or even wages that have an impact in the business and environmental case of reuse systems in certain settings or member states. A sensitivity analysis of the LCAs was not conducted in this study. When implementing reusable packaging systems, undertaking sensitivity analysis can support decision-making in terms of determining thresholds that should be met to ensure reusable systems are made environmentally friendly.

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