Reusable Packaging Study

An insight into transitioning from single to multi-use packaging for fast moving consumer goods (FMCG)

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Background & objectives

There is growing interest in reuse/return/refill/prefill for fast moving consumer goods (FMCG) predominantly in the food chain but also for white goods and other consumer products to reduce the reliance on single-use packaging (SUP) and therefore reduce our growing waste plastics issue.

In addition, there may also be significant gains for sustainability from a life cycle perspective on new delivery systems and thus enabling a transition to Net Zero.

In 2018, UK Circular Plastics Network supported by Innovate UK in conjunction with WRAP held the first company and stakeholder event for the growing cohort of companies in the UK interested in this sector.

The Ellen MacArthur foundation looked at systems and models in their 2019 report ellenmacarthurfoundation.org/reuse-rethinking-packaging and the 2022 Rethink Plastic Alliance policy paper[1] suggested how policy could affect the growing sector.

There is little information regarding the hands-on use and customer trends towards the uptake of refill, the demographics and geographies that are the early adopters and how it may be scaled up and more widely adopted.

This report for the UK Circular Plastics Network aims to assist the acceleration of how our highly honed single-use FMCG value chain can transition to multiple/repeat use packaging systems. It aims to show the nascent supply chain has begun to change business models to facilitate the transition and understand where the greatest challenges lie.

1 https://rethinkplasticalliance.eu/wp-content/uploads/2022/02/1702-RPA-European-Grocery-Retail-Plastic-Policy-Briefing-V7.pdf

Approach/methodology

Anna Pitt, of Pitt Layfield Associates, conducted a series of interviews in 2022 with key players within the developing refill FMCG sector. In addition a survey was compiled and data collection was undertaken through a number of channels. Through interviews and desk-based research this state-of-the-art report aims to clarify current trends, highlight consideration of protected characteristic groups, showcase success stories and analyse the less successful projects which form an equally important part of the learning process. This has enabled an overview of the scale up requirements such as cleaning and logistics, hygiene standards and behaviour change which should inform future strategies.

This resultant report may be used by refill/ reuse practitioners to create impact for their new system developments. The results will allow companies and individuals to focus on building more relationships within the supply chain that are required to speed transition to what is a potentially lower carbon footprint alternative to SUP and also discuss the materials most appropriate for refill systems/formats required to do the job most effectively.

About the author

Anna Pitt has thirty years experience as a systems analyst, project manager and circular economy campaigner. In her early career she developed a system prototype to manage reusable pallet sleeves for CHEP pallets, as well as a contracts management system for the first UK climate controlled containers for fresh fruit and vegetables that enabled shipping to compete with airfreight.

She has been a content writer and editor for the annual Zero Waste Week campaign for the last ten years, worked as a Love Food Hate Waste Campaigner for local government, and written two books to help people reduce waste.

She volunteered with Oxford based social enterprise, SESI Food and Household Refills, for several years and recently spent 18 months part time as a SESI employee looking at ways to lower carbon footprint and accelerate support for independent zero waste businesses and small producers working with regenerative farming practices.

Anna has a BA Hons in Education, a Further and Adult Education Teaching Certificate and an MA in Creative Writing and New Media where she studied the ways people consume information and how that can evolve into behaviour change.

She continues to work helping businesses, schools and households reduce their waste and make better use of resources and is employed at WRAP.

Definition

Where the term **reuse** is used in this report it is defined here as reusing an item or component repeatedly for the same purpose it was originally designed for. Where **refill** is used it means use of the same container/ packaging vessel to acquire consumable product two or more times.

Prefill refers to a container that is designed to be refilled multiple times, but is filled either the first time or every time by the supplier, with the containers having a mechanism for return. The term **refill** is used throughout this report to refer to reuse of a packaging vessel in any model including prefill.

Scope

This report collates information on the following areas to determine what is required to enable FMCG supply chains to transition to refill/reuse whilst adopting Net Zero practices. Scope includes:

1. Research models (academic studies and active groups).
2. Review of refill, prefill, multiple use packaging systems in UK (food and non food).
3. Examples of other systems working internationally such as ‘Mehrweg’ and Pfand in Germany.
4. Primary, secondary and tertiary packing where relevant to refill systems.
5. Data on comparative LCA versus incumbent system for that product.
6. Material sustainability for reuse (glass, aluminium, steel, paper/card pros and cons).
7. Consideration of EoL of multiple use supply chain.
8. Examples of collaboration up and down the supply chain.
9. Consideration of the logistics and cleaning required for transition.
10. Behaviour change – what’s happening and what’s required.
11. Companies active in supply chain.

02

Research models

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For a list of academic studies, reports and active groups see datasheet A and for companies active in the supply chain see datasheet B.

There's a general acceptance that our current FMCG packaging model is problematic, due to a number of reasons, including:

- Overuse of the planet's resources
- Leakage of packaging into the environment
- A diversity of formats and materials that makes 100% recycling unlikely to be achieved
- Over packaging or unnecessary packaging
- Increasing per capita waste

A report by The Ellen MacArthur Foundation (EMF) in 2019 looked at reuse systems and models and considers that "***Reusable packaging is a critical part of the solution to eliminate plastic pollution***."[2] The report calls for a 20% transition to reusable packaging across the business to consumer (B2C) supply chain. The Rethink Plastic Alliance 2022 policy paper calls for an absolute minimum of 25% of consumer packaging to be reusable by 2025, increasing to 50% by 2030.[3] The report also identifies specific product category targets of 75% for household cleaning products, 75% for beverages and 50% for cosmetics by 2030. The report also called for "***harmonised format and system standards, legalised durability requirements, as well as inclusion of criteria on rotation levels and efficient and safe reverse logistics and storage***".

2 https://ellenmacarthurfoundation.org/reuse-rethinking-packaging
3 https://rethinkplasticalliance.eu/wp-content/uploads/2022/02/1702-RPA-European-Grocery-Retail-Plastic-Policy-Briefing-V7.pdf

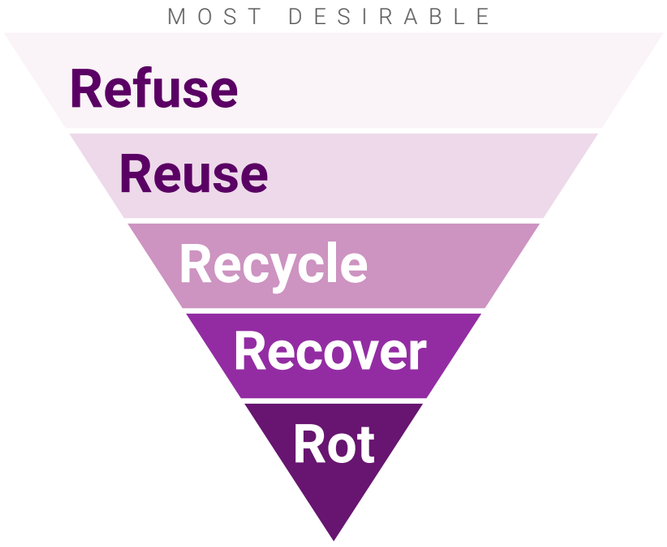

Fig 1. Common interpretation of Defra's waste hierarchy, as a 5 Rs model.

The 2019 EMF report describes refillable packaging as a 10+ billion dollar global investment opportunity. Systemiq's Breaking the Plastic Wave report[4] identifies an annual risk to businesses of over 100 billion dollars to cover the additional waste management costs if we stick to our current trajectory of plastics use and they suggest a global saving of 70 billion dollars if governments follow all viable routes for an 80% plastic reduction identified in their report, of which elimination and refill represents 30%.

This would bring a 25% reduction in Greenhouse Gas Emissions. Statistics published by the UK government[5] estimate 2.5 million tonnes of plastic is used for packaging every year. A 25% transition to refill represents a potential saving of 6.5 megatonnes annually.

Refill models are situated above recycling in the waste hierarchy[6] and have been found to show potential for reduction of greenhouse gas (GHG) emissions, when reused enough times and in conjunction with EoL recycling. (Muranko 2021, Coehlo 2020)

Hamlin (2020) discusses the high level of fragmentation within the study of closed loop systems for FMCG packaging, noting that the majority of research focuses on single products or single companies.[7]

There's greater progress around secondary and tertiary packaging than with primary packaging (Hamlin 2020, EMF 2019, Coehlo 2020) and significant cost savings have been reported.

EMF identified a quadrant model of refill centred around consumer behaviour.[8]

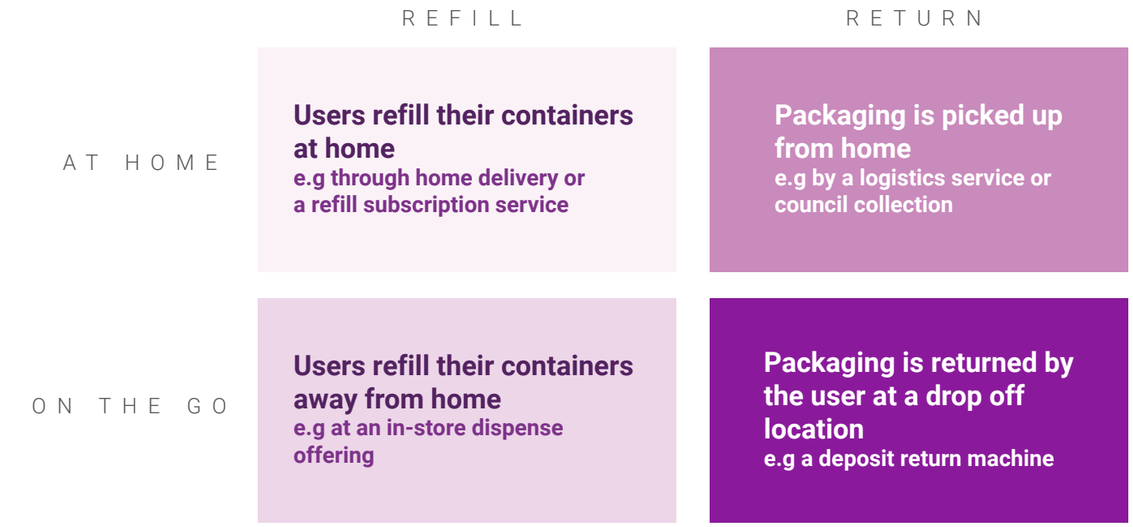

Fig 2. Quadrant model of Refill centred around consumer behaviour

4 https://www.systemiq.earth/wp-content/uploads/2020/07/Breaking-the-Plastic-Wave-One-Pager.pdf
5 https://commonslibrary.parliament.uk/research-briefings/cbp-8515/
6 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69403/pb13530-waste-hierarchy-guidance.pdf

7 Hamlin, R., 2020, From Open to Closed-Cycle Fast Moving Consumer Goods (FMCG) Packaging Systems: An Overview of Potential Avenues for Progress. RESPONSIBLE CONSUMPTION AND PRODUCTION, p.99.
8 EMF 2019 ibid

Muranko et al. (2021) have identified 5 models of refill/prefill/multi-use packaging systems within the UK currently. They classify the models into **Exclusive Use**, of which there are three models, and **Sequential Use** of which there are two. The models are made up of a number of steps that are repeated: utilisation, recovery, preparation for reuse. The models also encompass three reuse system elements: 1) core reuse behaviour; 2) reusable product/packaging provision and 3) the reuse-enabling infrastructure. The core reuse behaviours are defined as follows:

Exclusive reuse

"Exclusive reuse is a behaviour by which a reusable product is recurrently used by a single user throughout the product lifetime for the same purpose for which it was conceived, and with the support of reuse-enabling infrastructure.

In exclusive reuse models, the user owns the reusable products. The user keeps the product and is responsible for its recovery for reuse and subsequent reintroduction in the consumption phase. The pattern of "utilisation–recovery–preparation" repeats up until the reusable product is no longer fit for use, or the reuser decides to stop using the product." (Muranko et al, 2021)[9]

Fig 3. Exclusive Reuse

9 Muranko,Z.;Tassell,C.; Zeeuw van der Laan, A.; Aurisicchio, M. Characterisation and Environmental Value Proposition of Reuse Models for Fast-Moving Consumer Goods: Reusable Packaging and Products. Sustainability 2021, 13, 2609. https://doi.org/10.3390/su13052609 - page 13

Sequential reuse

"Sequential reuse is a behaviour by which a reusable product is used consecutively by multiple users throughout the product lifetime for the same purpose for which it was conceived, and with the support of reuse-enabling infrastructure.

"In sequential reuse models, the user has access to a reusable product. The user is responsible for returning the reusable product to the provider, who is then responsible for its recovery for reuse and subsequent reintroduction in the consumption phase for another user. The pattern of "utilisation– recovery– preparation" repeats up until the consumer does not return the product, the reusable product is no longer fit for use, or the provider decides to stop offering the product." [10]

Fig 4. Sequential Reuse

10 Muranko et al. (ibid) page 16

The reusable product/packaging provision is defined as either **provided** or **not provided**. For the purposes of this report we're looking at reusable packaging such as containers, vessels or bags rather than Reusable products such as nappies or make-up wipes as the product itself (e.g. the food, personal care or cleaning product is consumed i.e. used up rather than simply used.)

Provided

The product retailer, supplier or manufacturer provides a packaging item to the consumer to enable purchase, transport and consumption of the product.

Not provided

The consumer sources and uses a packaging item to enable purchase, transport and consumption.

The reuse-enabling infrastructure categorises the system that surrounds the packaging in order for it to be reused. There are two phases: recovery phase and preparation for reuse phase. Each of these phases is either consumer-operated or provider-operated. The preparation phase involves an assistive product or an assistive appliance.

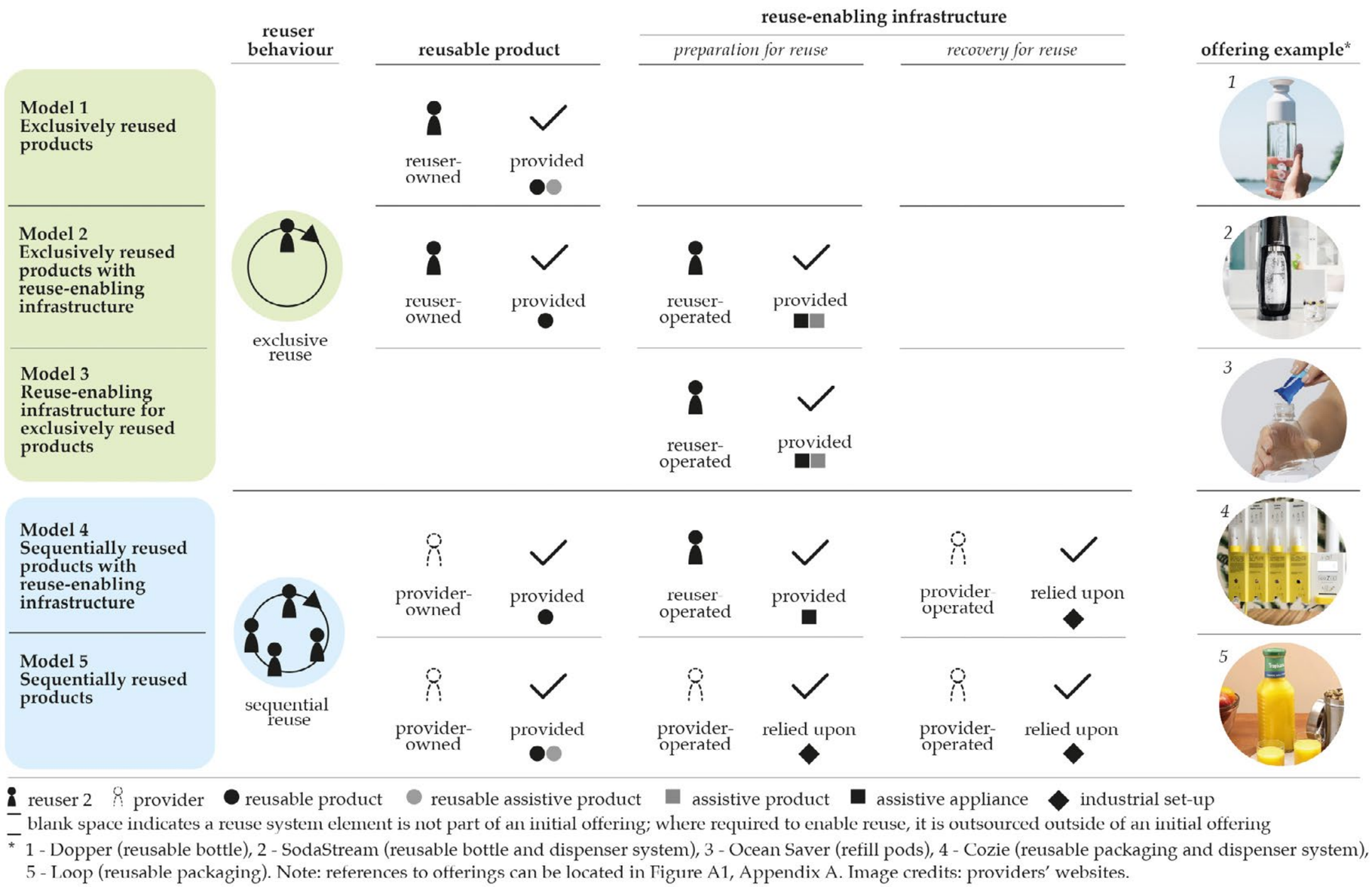

Image credit: Muranko et al (2021) included with permission.

03

Review of refill, prefill & multiple use packaging systems in the UK

(food and non food)

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There's a long history of refill and reuse in the UK, but a significant decline in reuse models in the last 50 years.

It is now starting to enjoy a return to popularity and there are multiple trials, innovations and successfully established models that utilise refill/prefill/multi-use packaging systems. However, we are yet to establish a good nationwide, accessible and low carbon infrastructure for refill in the UK.

The independent sector, often in high street and heart of community locations, has provided for our early adopters of FMCG refill. These independents provide a very different shopping experience to supermarkets: one that's based on human interaction. They are largely sprung from the current **eco-anxiety** and a need to share that feeling that we need to change our ways to protect our planet. There is a sufficiently large, though niche, sector of society who want to talk about how they shop, want to shop mindfully, and therefore will appreciate a conversation about the provenance of products with the person who has carefully selected them, while they refill or wait for their containers to be refilled.

A survey respondent said they shop in refill: "To reduce packaging waste (particularly plastic but other packaging too) and to shop somewhere I know products are sourced more ethically and sustainably."[11]

A further sector of society catered for by these independent traders are those people who find the supermarket environment unsuitable, for instance due to immunocompromisation, agoraphobia or feelings of overwhelm, over-stimulation or anxiety due to the size and complexity of choices that have to be made in the supermarket setting. Many independent businesses also say they support lonely and vulnerable citizens.

In addition to bricks and mortar independents, the sector includes numerous pop-up stalls e.g. at markets and many services offer home delivery. It is not uncommon for businesses to offer a combination of bricks and mortar, pop-up and home delivery.

Throughout 2019 to 2021, more and more stores and services have popped up in High Streets and neighbourhoods around the UK. With an initial knock back at the start of the Covid pandemic, they were soon bouncing back and gaining trade. Steph Van der Pett, an independent refill shop owner said: "I had a lot of new customers coming in to buy flour, when there was a shortage in the supermarkets, as it was actually the bags that were in short supply, not the actual flour."

The hard part for the independent refill trade as a business model is the customers buy less (see behaviour change section for more on this), yet the businesses are often in more expensive locations compared to the out-of-town supermarket and can also be restricted to a narrower window of opening hours, or alternatively a huge workload.

SESI, an Oxford-based social enterprise, was initially one such independent refill trader, operating as a buyers club from a shed in a school playground in 2006, then later expanding into a neighbourhood delivery service and then moving onto market stalls and a small shop within a community building. In 2013, Rina Melendez, SESI founder, was frustrated at the amount of plastic bulk vessels that were not reused so she developed an "own brand" washing-up liquid and hand soap with a fully circular supply chain. All tubs are returned within the backhaul and cleaned and refilled. In 2019, SESI incorporated as a Limited Liability Partnership (LLP) and has seen a surge of independent traders stocking their products because of the fully circular business model. Alongside growing customer numbers, SESI has expanded into stocking more products, operating a fully-circular supply chain not just for their own personal care, and cleaning products, but for other small producers, including crisps and snacks, food oils, coffee, chocolate, flour and salt.

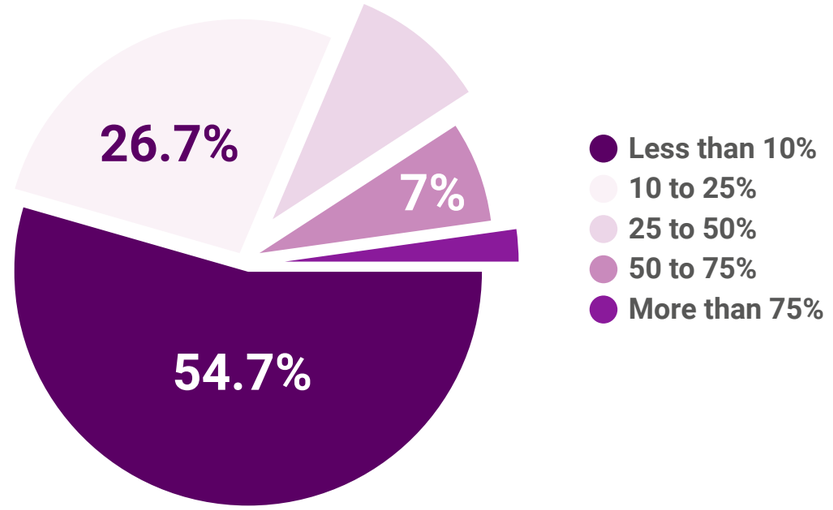
11 Respondent to the "Shopping Habits" trial survey by Anna Pitt, March 2022.

SESI's aim is to provide a route to market for small producers wanting a fully circular supply chain that would otherwise be unaffordable and unsustainable. They offer a better profit margin than the normal wholesale options in order to support the independent and community run sector, which in turn is often a form of support for the local community.

Other companies have also entered the market in the last two years with similar fully circular reusable packaging models. The more products on offer in fully circular refill, the more traders have to offer and this will help to grow customer numbers. A refill survey trial for this report shows that almost 55% of respondents who shop in refill, buy less than 10% of the shop in this way.

2021 was a key year for refill with a good deal of interest being shown in the media and business area. This included a focus on refill by Ethical Consumer Magazine, a spotlight on refill at GRIPS2021 and a number of universities studying refill and how best to turn it from a niche business model to a widely adopted habit. Many environmental organisations were involved in championing refill as a key solution to getting our plastic problem under control, and several of these were also making the link that refill has the potential to lower overall consumption as well as reducing waste and litter.

What percentage of your regular shop do you do with refill?
86 responses



A year ago the picture looked rosy for the independent trader. However, government financial support for refill R&D has been firmly placed in the hands of large coalitions and supermarkets. The independent sector has benefitted from the increase in new stores giving improved coverage as it is the visibility and normalisation of refill that has encouraged people to start such businesses. However, it remains to be seen whether the independent sector will survive as supermarkets start to offer refill more widely. Many of the independent businesses that provided for the early adopters are already closing, as a reaction to various large businesses getting involved in refill, as they feel this will make their businesses even harder to sustain.

Government investment of £60 million has been allocated through the Smart Sustainable Plastic Packaging (SSPP) challenge, a five-year programme with the following aims:

- driving research and innovation to develop more sustainable plastic packaging materials and designs, enable new recycling processes and infrastructure, and support meaningful reductions in plastics packaging by tackling barriers to reuse and refill supply models
- encouraging collaboration and innovation in integrated circular supply chains, addressing key barriers to change, and using insights into consumer behaviour to reduce the environmental impacts of plastic packaging
- sharing knowledge and the learning from funded projects to inform and underpin the development of a more sustainable plastic packaging supply chain.[12]

12 https://www.ukri.org/what-we-offer/our-main-funds/industrial-strategy-challenge-fund/clean-growth/smart-sustainable-plastic-packaging-challenge/

Of this, a significant portion of the funding has been allocated to projects that aim to accelerate the transition to refill. The Projects include:

The Refill Coalition: Unpackaged is leading a collaborative, cross-sector refillable packaging project including in-store and home delivery, The project involves real world trials of a circular supply chain solution to scale up refill for in-store and online retail. It brings together not only major supermarkets Morrisons and Waitrose but also home delivery retailer Ocado and logistics experts CHEP, part of Brambles Ltd. This highly ambitious and groundbreaking multi-retailer, multi-site demonstrator trial aims to tackle the challenge of single-use plastic packaging, by creating an innovative system for dispensing and refilling both liquid and dry products into consumers' own reusable containers either in-store or at home.

Return refill, repeat project: Beauty Kitchen's return, refill, repeat project will deliver a major trial of a pre-filled and returnable packaging scheme for liquid products in partnership with RBC Group, experts in logistics and automated retail and environmental charity City to Sea. Building on learning from previous smaller trials, the aim is to create behavioural change among brands, retailers, and consumers by empowering consumers to consider packaging as part of a service. Elements of the project will include:

- new concepts for refill stations
- packaging leasing and pre-filled reusable containers
- advanced return points and local bottle washing
- tracking and analytics
- a smart consumer app.

Again: CleanCell-V2 is a turnkey plastic packaging cleaning hub solution, which integrates into existing supply-chains and redefines what is reusable at scale.

Jo Chidley of RE pointed out that this allocation of government funding is the required demand signal necessary to convince stakeholders that the time has come for transition to refill.[13]

Defra confirms that: "It remains our intention therefore to consider appropriate measures either in the form of targets or obligations on producers to encourage the use of reusable/ refillable packaging."[14]

13 Anna Pitt's interview with Jo Chidley, March 2022
14 DEFRA, March 2022, Packaging and packaging waste: introducing Extended Producer Responsibility, https://www.gov.uk/government/consultations/packaging-and-packaging-waste-introducing-extended-producer-responsibility

The present landscape

There are already numerous offerings at least in trials in reusable packaging in the hospitality /food-on-the-go sector as well as in retail, with **refill** schemes as well as **prefill and return** and **prefill with a lightweight packaged refill** offer which consumers transfer to the reusable package at home.

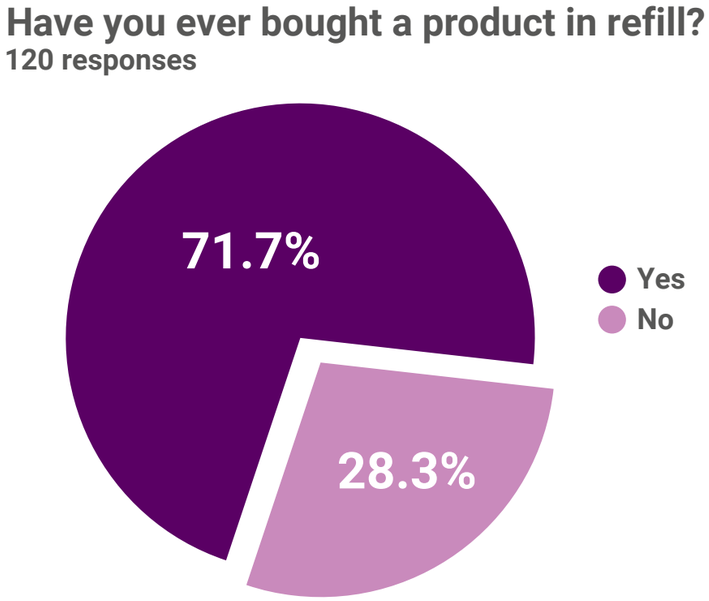
The companies/brands engaging with refill are listed in datasheet B:

Refillable packaging in supermarkets and lightweight refill pouches, boxes, sachets has been available to the consumer for many years. In previous years, uptake of these was slow and the sales of the higher footprint refillable packaging far outstripped sales of the lightweight refills, to the extent that some brands removed the lightweight refills as a stock-keeping unit (SKU). There may understandably, therefore, be scepticism for this method and it generally doesn't provide circularity as the lightweight materials are often not recyclable at kerbside.

However, several surveys and media reports show the landscape is changing (see datasheet A). There is certainly an uptake of refill but it appears to be largely unknown to what extent people are refilling/reusing. The GlobalData 2019 Q3 Survey reported that 71% of UK shoppers are willing to use a refill service, and 44% of 16 to 24 year olds had used a refill service within the previous 12 months. However, many industry professionals talk of a disparity between what consumers say they will do and what they actually do. Refill is still widely termed niche behaviour in the UK.

A poll on LinkedIn created by The Pack Hub showed 72% of respondents have never used an in-store refill system. Paul Jenkins, founder of The Pack Hub, felt the response bias[15] would actually be towards refill because The Pack Hub is ***"biased towards the packaging industry so if anything, they might be more likely to have tried in-store refill than the general populous"***.[16]

15 https://www.nextiva.com/blog/response-bias.html gives a succinct explanation of response bias.
16 Email exchange between Anna Pitt and Paul Jenkins following LinkedIn poll by Paul Jenkins of The Pack Hub.



The author created a Google Forms survey and posted it on LinkedIn, Twitter and Facebook. The survey was initially called "Do you refill? and showed an image of an in-store refill system for clarification. An explanatory text on each post aimed to encourage people who would answer in the negative. For refill as a niche behaviour, the expectation would be to have more answers in the negative, however, towards the start of the survey (first 39 answers) 69% of respondents said they do refill. The title of the survey was then changed to "Shopping Habits", to experiment with response bias, the data still show > 70% of people saying they do use refill of which 55.8% shop this way regularly and 57.1% stating they buy less than 10% of their shopping this way.[17]

The survey aimed to highlight the response bias that's likely to be part of surveys that show consumers want to refill, which perhaps explains the disparity. A far more accurate picture of consumer desire would be from sales data, but this isn't currently available. There aren't currently specific targets for refill within the UK Plastics Pact, so it isn't being specifically measured and businesses are not required to report on it, nor are they being asked to.

17 Google Survey created by Anna Pitt, March 2022: https://forms.gle/u2thuk12i1wzarpj7

Where refill is taking place in the UK

Refill is taking place in the UK through:

- Supermarket prefill/lightweight refill packs (exclusive - not tracked)
- Supermarket prefill and Return banks (sequential - tracked)
- Supermarket refill from bulk hoppers/ dispensers (exclusive - vessel not tracked but sales figures tracked, not disclosed)
- Independent specialist refill shops
- Home delivery in refill
- Home delivery in prefill/lightweight refill packs
- Markets and pop-ups
- Community hubs
- Schools

Prefill/lightweight refill packs

Prefill is currently offered in most supermarkets in the UK by a significant number of brands. For this report a search performed in March 2022 on Sainsbury's website returned 209 refill pack products. A search on the Tesco website returns 169 products. See datasheet B for a list of brands/ products.

This offer is practical for brands as the supply chain and consumer behaviour differ very little from the incumbent system.

The advantage of offering refillable containers and lightweight refill packs is that the overall amount of packaging materials used (usually plastic, aluminium, steel or glass) decreases.

For example, P&G state that their shampoo refill pouches uses 60% less plastic per millilitre compared to the standard brand bottle.[18] Examples of consumer information about Life Cycle Assessment (LCA) can be found in datasheet B and will be discussed later.

These refills are included within the UK Plastics Pact targets. They contribute to decreasing overall material usage. Recycling of P&G pouches is currently available to the consumer through Terracycle. This involves finding a Terracycle recycling point via an internet search (or recommendation from a friend perhaps) or creating an account with Terracycle to collect pouches as a member of the public or organisation e.g. from neighbours, other parents at a school etc. The P&G/Terracycle programme is brand specific and sponsored by P&G so it is free to access for the customer. Many of the Terracycle recycling services are brand specific. Others such as the Garnier-sponsored personal care and beauty packaging recycling[19] are non-specific. Collection is made through the UPS delivery service, customers are encouraged to fill a box (maximum weight 20kg) before sending, they then download and print a label from the Terracycle website. Collection is free to the consumer. (Read more in the EoL section).

18 https://us.pg.com/blogs/reusable-bottles-debut-at-reuters-business-summit/
19 https://www.terracycle.com/en-GB/brigades/garnier-uk#@54.39586446195522:-2.83447377734376zoom:6

Prefill and return banks

Prefill and return is being led by the personal care industry through the Beauty Kitchen/ Unilever Collaboration and their **refill/ return/repeat** project (**Re**). The project has developed a standardised packaging in the form of a refillable steel bottle which can be used across brands. The bottles are tracked using a QR code printed on the bottom of the bottle. This will give the ability to collect data about the number of uses and inform LCA.

As well as trialling the RE system for Beauty Kitchen's own brand with return stations in Holland & Barrett Stores, they are trialling with Unilever branded products in Supermarkets. The system is being trialled in 4 Asda and 2 Co-op stores and the recent successful funding bid will enable the trials to go nationwide within the next 3 years.

The system requires increased capacity for washing of returned bottles. Testing of washing has been undertaken during the last two years. No detergent is used in the washing process, in order to deliver resource efficiencies. Further efficiencies as well as nationwide reach will be investigated under the grant-funded project.

The bottles have the capability to be used hundreds of times. Customers pay a £2 deposit on top of the product price and can return the bottle back to any return point and will receive a coupon for £2 which can be redeemed on products in the system (i.e. in the same bottle format) from any of the participating brands. With the extension of the scheme, return outlets will be positioned in retail stores, shopping centres, universities, train stations, major office complexes and other locations.

Consumers are incentivised to join the scheme with tree planting. They are further incentivised with a tree planted for every 5th return. They also have the opportunity to see how many times a bottle has been used and how many times they have returned a bottle for reuse, with an impact calculation.

Stuart Chidley of RE feels that refill dispensers make for an eye-catching display, and provide good brand messaging, but 'prefill and return' is an easier sell to the customer. It requires less behaviour change at the point at which the customer is embedded in the process of actually shopping. The required change is only that the customer needs to return their empty container to the store. Return bins are currently in-aisle, however, the intention within the RE project is to locate them front-of-store.[20]

The reuse behaviour is similar to the behaviour for reusing shopping bags. This means that monitoring of return rates is crucial. Whilst the sale of single-use plastic bags has declined dramatically, sales of the replacement bag-for-life is reported (e.g. by Greenpeace)[21] to have risen dramatically, implying the ongoing single-use behaviour with a higher environmental footprint alternative.

Transition to prefill and return systems have huge potential for reducing material usage, as indicated by the 98% return rate for German multiple-use "Mehrweg" beer bottles. However, it is likely to benefit from becoming part of a more widespread adoption of a national deposit return system (DRS) that encompasses Reuse and Recycling as the German system does. The UK system of bag-for-life is an exclusive reuse model, based on purchase and ownership of a product, so apart from the small financial penalty of having to purchase bags when one forgets to bring bags to the shop, there's little else that is guiding the majority of behaviour towards reuse and the alternative reusable as single-use is too easy. Hence, in the light of the Greenpeace research, we can say we have system failure.

Muranko et al.(2021) find that sequential reuse models encourage a more careful reuse behaviour. For example they quote a study about milk bottle reuse by Vaughan et al.(2007) finding that: ***"The consumer's intrinsic sense of care for their local community of milk bottle co-users was found to have an important role in driving reuse behaviour and product stewardship."***[22]

This indicates that sequential reuse systems based on borrowing has a very different behavioural pattern to exclusive reuse models, and we might therefore be able to expect a higher number of reuses before the refillable packaging drops out of the system due to damage or through not being returned by the user.

System losses will occur if a user throws a bottle into the domestic waste or recycling or doesn't return a bottle for another reason. The former can be mitigated for in the future through integrating vessel tracking with kerbside collections and material reprocessing facilities. (See later.)

20 From correspondence and presentations in numerous meetings by Stuart Chidley for Anna Pitt

21 https://www.greenpeace.org.uk/news/supermarkets-more-plastic-than-ever/

22 Muranko et al (2021) ibid

Refill from bulk hoppers/ dispensers

Methods of dispensing include refillable bulk hoppers for dry goods, mason jars and gastronorms, as well as reusable bulk vessels for liquids and automated dispensers which have been developed over the last few years in order to make liquid dispensing easier for retailers and customers. Some dispense methods do not have a circular supply chain, some do. A list of companies offering dispense mechanisms can be found in datasheet B. The data show whether reuse is involved higher up the supply chain.

There has been a rapid rise in the number of independent refill stores around the UK. Such stores, often calling themselves Zero Waste or Low Waste Stores and occasionally Plastic-Free stores, dispense goods from bulk containers into customers' own containers. There have been refill offers like this in independent stores for many decades e.g. Newleaf Healthfoods in Bath, which purchased its bulk hoppers over 35 years ago and they are still going strong. This method of dispensing has the potential to reduce primary packaging if customers bring existing cleaned packaging to refill. Many stores collect pre-used, cleaned SUP from customers in order to enable new customers to try out this method of shopping. Some outlets have rudimentary methods of calculating displacement of plastic packaging through reuse.

However, overall reach, customer numbers, sales volumes or total displacement figures are unavailable. Independent stores don't currently have an access option to sign up to the UK Plastics Pact nor contribute to the reporting. A future option might be available as trade associations can become members free of charge. Investigations for setting up a trade association for Zero Waste shops is being undertaken on a voluntary basis by a number of shop owners. No funding has currently been made available to support this initiative and it is therefore a project that will find its own course, but could be a useful addition to the refill landscape in the UK.

There is currently insufficient availability of this form of refill in the UK with only around 750 Independent refill shops and trials in 27 supermarket branches out of over 87,000 grocery outlets in total.

Bricks and Mortar Refill Offer in the UK	No. of Stores	Offering Refill
Tesco	3,400	10
Sainsburys	2,021	0
Aldi	950	0
Lidl	915	0
Asda	646	4
Morrisons	497	0
Waitrose	331	4
M&S	959	11
Co-op	4,050	2
Independent Refill Outlets (est)	750	750

It is unknown at this stage whether an increase in the number of supermarkets offering refill is likely to increase or decrease footfall and growth in the independent sector. Behaviour Change expert Livvy Drake of City-to-Sea says: “The more we normalise the behaviour, the more uptake overall there will be of refill.” She recounted an anecdote from one of her training sessions where Zero Waste store owners from the Oxford area reported an increase in people going to explore their Zero Waste stores when Waitrose opened their Zero Waste trial nearby. Seeing it in the supermarket meant it was on people’s radar, so they felt more inclined to explore it as an option.

Several refill pioneers, including Catherine Conway and Jo Chidley, consider that refill needs to be ‘in aisle’ to really become mainstream. For example, if you are providing coffee and tea in refill it needs to be visible and available in the tea and coffee aisle. 60% of our shopping behaviour according to Drake is System 1 thinking, that is, automatic and unconscious thinking, driven by habit. Drake explains that refill requires System 2 thinking, which involves more time and conscious thought. (There’s more about this in the section on behaviour change.) Without requiring the customer to completely change their thought process while shopping, refill would need to be made as easy as the incumbent SUP system for substantial transition. Having dispensers in-aisle alongside packaged products of the same variety removes the need to completely transfer to a different thinking system to participate. However, the practicalities of this are problematic for the large retailers. Paul Garner, of ASDA, explains: “If you have 4 or 5 bays of refill dispense in a separate area with one set of scales, that is more efficient use of space than having in aisle dispense where you need a set of scales at each dispensing location. You lose two bays.” Asda has trialled their refill ‘in aisle’ and in a separate area. Their view is that for some categories in aisle is key, but for others a separate area works better. For those categories where in aisle is key, then prefill could be a better option.

With the recent allocation of funding to the refill projects mentioned, further trials will be conducted over the next three years to learn what methods of dispense work for refill in a mainstream environment. An essential area of research is the backhaul, paying particular attention to the circularity of the supply chain. In the current landscape the majority of trials have concentrated on primary packaging, with a single-use secondary and tertiary packaging supply chain and manual reload of the bulk dispense mechanisms either in store or back of house. This is also an area of concern and could potentially destroy the current progress of refill in the UK. It has been termed "the dirty secret" of the refill sector.[23]

Anecdotal evidence, media reports, as well as the trial shopping habits survey conducted for this report, show that many early adopters of refill are aligned with reducing single-use plastic. This has been fuelled by mass media productions such as Blue Planet II and War on Plastic.[24] In reality, much of the current refill doesn't have a circular supply chain to support it. Dry goods are delivered mostly in SUP and manually decanted into the bulk hoppers. Most small businesses around the country 'go out of their way to try and get this bulk packaging recycled' or pay additional costs in order to try and ensure it gets recycled, but there's consensus that a circular supply chain is preferable.

Removing the B2C packaging layer does represent a plastic saving. For example, Robin Masefield of Natural Weigh says: "We are always very clear with customers that we are zero waste for our customers and striving to be a zero waste business. At the moment it is very difficult (depending on what you stock) to do as some of the products come with some sort of plastic on them, although most [packaging] is paper or cardboard. What we do is ensure that the plastic from the stock is dealt with properly, we pay for it to be recycled by using Terracycle or Polyprint to recycle it. And it's really important to remember that by buying in bulk and selling small zero waste volumes you are drastically reducing the amount of packaging. Since we opened in March we estimate we've saved 3500 pieces of single use plastic from being used, a big reduction [first 3 months trade]. We looked at what size different items typically come in the supermarkets and went for the larger size available (so if rice comes in 250g, 500g and 1kg we would choose the 1kg). We divided the amount sold by 1kg (for that example) to get the number of bags saved, minus one if the stock came to us in plastic, even though we make sure it gets recycled."[25]

23 Commonly discussed in the Zero Waste shop set-up Facebook group.
24 BBC, War on Plastic - Presented by Hugh Fearley-Whittingstall and Anita Rani - https://www.youtube.com/watch?v=xKYw0qTiywE
25 Extract from conversation on a Facebook group for Zero Waste Shops (included with permission).

There are however, some businesses operating a successful circular packaging model for bulk refill. Many small businesses are leading the way here. SESI Food and Household refill started life as a refill trader, going through various trading models including home delivery and a community shop. This involved having to deal with the large amount of B2B SUP. For example well-known cleaning products brand Ecover bulk containers were not collected back, so these were sent for recycling. Infinity foods, a well-known wholesale supplier of foods in bulk didn't collect back their pallets. For a company trying to eliminate waste, this seemed like a misuse of resources. At the same time, there was a frustration that sustainable products had an over-inflated price tag.[26] SESI's own brand products with a fully circular supply chain at an affordable price were a direct reaction to these issues. Since then Fill Refill (launched 2018) and Miniml (launched 2020) are two companies that have adopted the successful circular business model that SESI uses. Since 2019, SESI has partnered with a small number of food businesses in order to bring the fully circular supply chain model to more products.

They've successfully incorporated the fully circular packaging for chocolate, coffee, crisps and other snacks like fava beans, flour, food oils, and salt. Increasing access to refill through the network of independent Zero Waste shops, SESI has grown rapidly since 2019 and now serves over 500 outlets with their fully circular supply chain. The company has a rudimentary plastics displacement calculator. They don't have the resources to conduct LCA on their business model, but suspect that water usage from the manual cleaning process is the largest inefficiency within the system. SESI conducted work to create a wash station that enabled water recycling, so that fresh water was only used during the final rinse. They looked into the documented requirements for cleaning standards relating to washing containers that have contained cleaning products. BSI confirmed that there were no standards and that such a standard would be useful. (Read more on this in the Cleaning Requirements section). SESI and Fill Refill are both partnering with electric cargo bike companies to minimise emissions where this is possible, starting with London.

26 It is widely recognised that organic and sustainably produced ingredients generally have lower yields, that a living wage to employees is often higher than some brands pay, but these are only a small part of the equation and it is equally well documented that "the consumer willingness to pay for green products" is well-exploited, leading to inflation of price for sustainable products.

Tracking

It is important we learn the lessons about reuse behaviours and build on the body of research which is still in its infancy in order to ensure we build a successful reuse system that truly brings reuse behaviours into the mainstream rather than enabling single-use behaviour with multiple-use packaging, so we're problem solving, not problem shifting. The use of tracking with packaging is an enabler of this and should ideally be encouraged from the outset with all reuse development systems.

Tracking of packaging will be advantageous because it will enable accurate figures for the number of reuses to be calculated. This can aid product development, systems design and behaviour analysis, as well as providing data to enable implementation of the Extended Producer Responsibility legislation. Tracking also has the potential to boost consumer confidence around packaging reuse for FMCGs, enabling traceability, protecting against cross-contamination, allergen-control and potentially reducing product waste through smart date systems. Allergy sufferers are excluded from multiple products that don't contain the allergen but are packed in an environment that might have traces of it. This information could be made available digitally in order to ease the shopping experience for this group of people.

Furthermore, tracking will enable incentivisation to move beyond the simple financial benefit/penalty system of a deposit/fine into a more comprehensive and tailored system of nudges that speak to the diversity of users within the reuse system.

Reath, a circular economy digital infrastructure provider, identified barriers to scaling and optimising reuse systems:[27]

1. Lack of data to track performance and inform system design
   - How will my packaging perform after 10/20/50/100 uses? - failure rate %
   - How many customers will return my packaging - reuse rate %
   - How will these two metrics impact the profitability of my reuse scheme?
2. Integration into existing processes and systems
   - Business processes, systems and software (e.g. inventory management) are set up on the premise of linear systems (buy use dispose).
   - Converting existing processes and systems to circular can be expensive

Reath argues that an open data standard for Reuse, like their Digital Passport, enables businesses to answer these questions and share data around successful reuse models without compromising commercially sensitive information.

Although, this extends to all packaging, not just reusable packaging, Defra note in their Extended Producer Responsibility for Packaging Summary of Consultation Responses and Government Response that: "Through engaging with technology companies, it is our understanding that new technologies are on the horizon that will make tracking packaging easier in the future. We will therefore reconsider allowing the use of estimates for secondary and tertiary packaging reporting as part of the review in 2026/27."[28]

With multiple technology companies working towards traceability for packaging, it is important that standardisation of reporting requirements is agreed upon and that flexibility is built in to tracking software, so that as we learn the importance of certain factors, e.g. as application of LCA science improves, the systems can be suitably adapted.

27 Rampen, C and Rogers, E 2020, How can digital infrastructure speed up adoption of scaleable reuse systems, Reath
28 DEFRA (2022) Extended Producer Responsibility for Packaging Summary of Consultation Responses and Government Response
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1063589/epr-consultation-government-response.pdf

Standardisation and legislation

There appears to be a general agreement that standardised packaging and regulation around its use is another area that will assist the transition to and particularly the efficiencies of a shared system for circular packaging logistics in order to give it the best possible chance to compete with single-use in terms of ease of use and access.

The Defra consultation on Extended Producer Responsibility for Packaging states that: "Some respondents supported requiring reusable or refillable packaging for certain products, believing this option would provide a clear call to action for consumers, reduce pressure on retailers, and avoid creating cheaper non-reusable alternatives to products in reusable packaging."[29]

Jonathan Wragg, Group Sustainability Director at Oceans Integrity (RIO) Plc feels there's a need for firm legislation to be put in place. We discussed the Beauty and Personal Care sector as an example. He said: "While the beauty and personal care industry has a choice nothing will happen. So legislation needs to be used to force action. Imagine if you walked into the shampoo aisle of any supermarket and all the bottles were the same, other than the labelling. Would you even notice? Would you care?

"This kind of standardisation would bring about scope for efficiencies around reuse and recycling as well as behaviour. If the legislation got behind this, the world would change overnight. People say brands would never agree, but look at cigarette packaging as an example. Branding for cigarettes was considered hugely important. Even non-smokers who are old enough to remember when branding was still allowed, are probably aware of the brand colours. But now legislation states that all cigarettes have to be in plain packaging, it has just been accepted."

It is widely discussed that brands in the UK wouldn't accept standardised packaging as branding is considered to be too important (e.g. WRAP 2008).[30] However, the author can confirm having absolutely no problem clearly identifying her Warsteiner from her Bitburger among the plethora of beers available in standardised packaging on German supermarket shelves. She can also confirm that with certain brands, she was convinced that the bottles differed, but conducting a side-by-side test proved the bottles to be the same and the differences were optical illusion from the labelling.

The example of cigarette packaging shows standardisation can happen in the UK with legislation. The Beauty Kitchen / Unilever RE Project trialling standardised personal care product vessels that are interchangeable between brands also shows a positive indicator that packaging could be standardised.

There's other work being done on standardisation of packaging. Wayne Barron of Rethink Packaging has carried out extensive research over the last five years into the global problems of pollution and overuse of resources created by our packaging systems. He concludes that refill and reuse give the greatest opportunity to reduce packaging and its impact on the environment. Barron identifies 13 benefits of standardised packaging including "simplifying the refill process as standardised packaging doesn't have to be returned to its original point-of-origin" and importantly, "promoting the use of more sustainable materials as no supermarket or brand will have a competitive advantage by using more visually appealing substrates."[31]

29 DEFRA, March 2022, Extended Producer Responsibility for Packaging: Summary of consultation responses and Government response https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1063589/epr-consultation-government-response.pdf
30 WRAP, 2008, Refillable Glass Beverage Container Systems in the UK. https://static1.squarespace.com/static/5a60c3cc9f07f58443081f58/t/5ab3e0c30e2e721919eb558a/1521737928044/2008_wrap_refillable_glass_beverage_container_systems_in_the_uk.pdf
31 https://rethink-packaging.com/#THESOLUTION

A set of guidelines or a wishlist for what standardised packaging needs to achieve, such as being stackable rather than collapsible, having smooth surfaces with no nooks and crannies to ease the cleaning process would be a useful collaborative exercise and assist in getting all players on board with the standardisation concept. WRAP's "Defining What's Recyclable and Best in Class Polymer Choices for Packaging"[32] should be a starting point for a consultation as any standardised packaging must have its EoL processes available at the outset to achieve a fully closed loop system. Anything less would be irresponsible, counterproductive to uptake, and prevent the system from evolving i.e. being able to take advantage of new research and developments, without that causing waste due to a shortening of useful life compared to the planned outcome.

Whilst standardisation is not impossible with voluntary adoption, there comes a point where anything but legislation would result in missed opportunities for efficiency, material minimisation and reduction of global warming potential (GWP). Legislation should therefore be considered at the earliest opportunity.

Any opportunity to minimise resource use and GWP should be taken now, with the caveat that we ensure the EoL circularity, discussed above, as we feel our way towards the most efficient system.

There are further advantages of standardisation and legislation in overcoming financial barriers. It is widely accepted by industry professionals (e.g. Conway, Kennedy, Chidley, Lodge) and academics (e.g. Coehlo, Smits Sandano) that price is a significant barrier to consumer transition from single-use to multi-use packaging systems. For mainstream uptake of reusable packaging it has to compete with the single-use alternatives in terms of price and ease of use. It is also widely accepted that for reuse to become comparable in cost to single-use economies of scale need to be achieved.

32 https://wrap.org.uk/sites/default/files/2021-03/WRAP-polymer-choice-and-recyclability-guidance-2021.pdf

Coehlo et al. note that “The financial incentive for a producer or retailer [to adopt reusable packaging] may be different, as the distribution of costs and benefits varies. Today, not all costs of packaging waste management are borne by the producers of packaging.” In the UK the Extended Producer Responsibility has the potential to rectify this. The recent consultation document shows a clear intention to address this. Where the cost of the entire life-cycle of a piece of packaging is borne by the producer, the overall cost of a reusable packaging system will be more attractive and thus aid transition. In order to speed transition from single-use to multi-use packaging systems and ensure equality across industry, legislation must set clear reuse targets and incentivise these in order to mitigate for the higher logistics costs that are an inevitable part of a changing system.

At the same time approaches that incentivise recycling over reuse must ensure they create an equal playing field by favouring mass-balanced approaches and regulating eco-credential claims on packaging. In the run up to the introduction of the UK Plastics Tax[33] rPet was priced at £700 a tonne more than virgin PET.

This is being pushed up by large companies looking for a quick-win eco-message to attract the consumer. Wragg points out that this price differential means it is actually cheaper to pay the tax than to pay for recycled PET. He says: “Why would you pay more for rPET unless you were trying to look better?” Where companies are free to demand as much recycled content as they like as long as they can afford to pay the elevated prices, we’re going to see a continued push towards recycling over reuse as the consumer messaging is appeasing the conscience so that people are more likely to maintain the single-use status quo. This is counter-intuitive to gaining economies of scale for reuse.

In addition, this practice is perpetuating the current problem of more expensive products switching to higher recycled content SUP and leaving cheaper products in virgin SUP. All income brackets can experience eco-anxiety. It is not reserved for the wealthy.

Legislation and regulation could instead be formulated to limit messaging on packaging to whether it is recyclable or not and this is more likely to move plastic recycling to a desired target of 30% across the board, set by the UK Plastics Pact, and have the potential for steady increase, year on year, whilst not promoting a message to consumers that it is ok to use as much packaging as we like. No one knows the recycled content of their aluminium can, nor for the most part their glass bottle.Yet both materials have a recycled content component as standard. Working towards equality of recyclate across the board should be a priority to ensure we avoid an eco divide between those who can afford to pay the higher price tag, and those who can’t. To reiterate, this is an important part of a transition to refill as all methods of refill require an additional cognitive load, even with the easiest form of refill - buying a prefill or a refill pouch as the material requires a level of Return mechanism beyond kerbside collection of recycling currently. The consumer therefore needs to know that the extra effort is worthwhile.

33 The UK Plastics Tax requires manufacturers and importers of plastic packaging with less than 30% recycled content pay a tax of £200 per metric tonne as of 1st April 2022

An absence of targets for reuse within the UK Plastics Pact likely has a knock on effect to other legislation. The EPR consultation document, whilst discussing refill and reuse systems, makes no decisions about refill.[34] As a nation, we are predominantly recycling single use plastic rather than adopting potentially more sustainable refill systems.

Incentivising recycling over reuse isn't likely to drive the behaviour change we urgently need that will lead not just to keeping resources in the economy for longer, but to transition to a more conscious consumerism and the elephant in the room - less per-capita consumption overall.

Legislation regarding refill would be welcome to the refill community, the clarity will support innovation and adoption of new behaviours in the this area. This will mitigate the risks of system change that supports reuse.

As reuse is in its infancy in the UK, we have the opportunity to ensure we build an agile, joined up system with a goal for consistency at the outset. For around three decades, the best educators have been teaching 'how to learn' rather than what to learn, in the full knowledge that young people need to develop skills for systems, problems and technology that's not yet been discovered, invented or enabled. We need to envision reuse infrastructure in the same agile way, so we are not floored by new technology we can't make the most of because it isn't in the contract. Although reuse has been practised for millennia, it was replaced by single-use in order to create efficiencies. However, we didn't foresee the destruction our highly-honed single-use system would cause to the planet. Nor did we foresee the inequality it creates for people, whereby the global south is overwhelmed with plastic pollution from products consumed in the global north and this coupled with a desire to adopt behaviours modelled on the global north.

Clearly we can't go back to an inefficient reuse system long term. We need the research, the finance and the legislation and we need the best brains to come together to envision an agile, resource efficient reuse system and a determined behaviour change strategy to teach people the new knowledge and skills they need to participate so that it is accessible to everyone. The current highly efficient single-use system has taken decades, but we don't have decades. The legislation and finance needs to recognise that and mitigate.

34 (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1063589/epr-consultation-government-response.pdf)

The Innovation Landscape

There is much activity going on to deliver reuse systems in the UK. Jo Chidley describes the current situation as "A convergence around reuse. Everybody is on the cusp."[35]

Gender Imbalance within funding bodies

Innovation requires not just funding, but fair funding, in order to ensure equality, diversity and inclusion. It is widely documented (e.g. BBC https://www.bbc.com/news/business-48934122, https://sifted.eu/articles/female-founders-vc-200-billion-club/) that there's a gender imbalance within the venture capital world, with only 13% of VC decision makers being female and only 1.1% of VC funding in Europe going to female founders in the last reporting period.[36]

Saasha Celestial-One, Co-founder of Olio, finds it far easier to get funding from female funders than from male funders. She says: "Our conversion rate with women is north of 70%, compared to 5% or 10% for male investors," says Ms Celestial-One. There aren't nearly enough women with cheque-writing abilities, so in our experience, we believe a lack of diversity at VC firm level is a real challenge for female founders."

Olio is a food-sharing app. It is all about cutting food waste, which is such a vital part of protecting our planet. It is clear we need more women investors, more women to be part of the funding allocation bodies, but maybe this also says we need better conversion rates for women with male funders?

The Equality, Diversity & Inclusion (ED&I) survey system within organisations such as Innovate UK is there to analyse this. ED&I is a central part of the funding of the innovation landscape with outreach and case studies to attract a diversity of people to seek funding. UKRI have a number of programmes e.g. Women in Innovation and Young Innovators that deal with this and it is important that these continue to be funded. For example: "The Women in Innovation programme started in 2016 to address the under-representation of women engaging with Innovate UK, to get more women with excellent ideas innovating in UK businesses, and boost the economy. Since then the number of women leading applications for grants to Innovate UK has increased by 70%."[37]

35 Anna Pitt's interview with Jo Chidley, march 2022
36 https://sifted.eu/articles/female-founders-vc-200-billion-club/
37 https://ktn-uk.org/programme/women-in-innovation/

The innovation landscape for refill

Funding is often difficult for small disruptive innovators to secure due to the competitive nature of public funding. This system coupled with an emphasis on providing LCA to prove a project, rather than as part of a funded project, puts financial barriers in the way of small companies. Bid writing is a particular skill, and is now an expensive service, with costs that are prohibitive to many a start-up or social enterprise. LCA is a similarly expensive service. For an equal playing field, it might be worth considering whether these services could be provided on a means tested basis for small enterprises and not-for-profits.

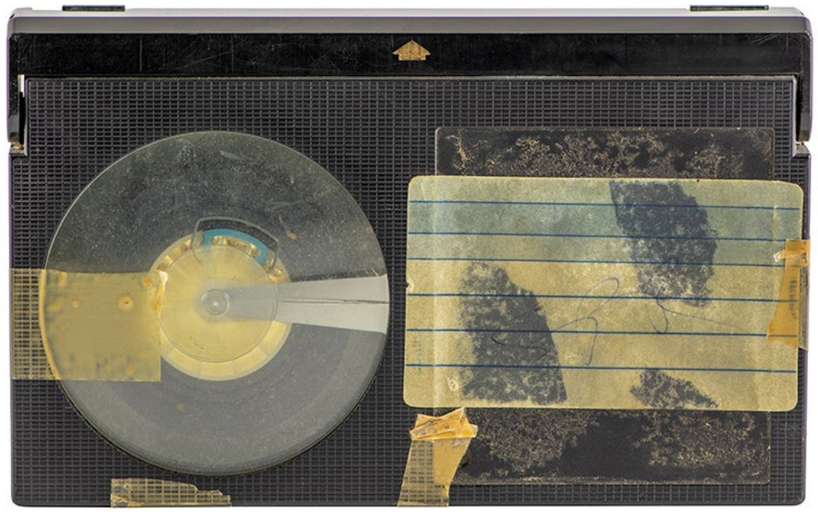
A more collaborative approach is a better method of developing cost-effective, long-term, flexible solutions. There are some good examples of this in the UK Circular Plastics Network and the Smart Sustainable Packaging Collaboration Workshop series.[38]

Collaboration doesn't prevent the innovative and competitive small group or individual creative input. It can however, be de-risked by bringing opportunities to people to be paid to be part of design and innovation collaborations.

However, given that refill/reuse is also a completely different economic basis of a circular rather than a linear economy and has the potential in itself to be coupled with right-sizing and more reflective shopping habits, it is appropriate that it's considered.

The current situation with refill and reuse innovation is that we are trying to solve a problem with a long term aim of reducing consumption. For refill/reuse to work it needs to be coupled with an overall reduction in consumption, not just of packaging but of product. Catriona Tassell of Imperial College says: "Traditional business success metrics are based on the quantity and frequency of sales. However, durables in refill/reuse need to be purchased infrequently if impact reduction is to be met.

38 https://www.ukcpn.co.uk/news/smart-sustainable-plastic-packaging-challenge-webinar-workshops-recordings-available/



When changing business models from SUP to refill/ reuse, new measures of success are needed. It is really nice when you see companies openly sharing their findings on how to do this, helping the whole endeavour to push everyone forward as opposed to just doing it for their own benefit. So that idea of collaboration is crucial."[39]

"No one wants the betamax of dispensers."

Iain Ferguson, CO-OP

As an example, the author was invited to become part of a WRAP/UKRI funded project to develop a dispenser system for personal care products. She explains: "My first thought was to attempt to find out whether similar innovation was being worked on elsewhere. Having located a dispenser (a self-funded project) about to go to trial, I suggested that it might be worth collaborating. This was not thought to be worthwhile pursuing by the main innovators, who were a little more experienced than me in the innovation and funding landscape. At the time, I was unable to find out about a third funded project working on similar technology as it was under NDA.

All three dispenser technologies, of course, have strengths and weaknesses, some similar, some different. To speed transition to refill and make better use of resources we need the best from all these models/ prototypes."

For refill, changing the innovation funding landscape so that we decouple innovation from profit and shift it to solving the problem would be an innovative approach in itself. We need to not just enable refill in an ever-evolving stream of transitions that provide business opportunities but also to enable refill to bring about right-sizing and therefore lower consumption. This is an area recommended for further study. It requires a well-researched impact assessment that looks into the viability of totally new business models - or perhaps a return to business models of the past, such as leasing and service models, which have a greater likelihood of bringing about efficiencies. We need to know what right-sizing of consumption is going to cost us, so we can mitigate financially for achieving what we need to achieve.

39 Anna Pitt's interview with Catriona Tassell, April 2022

Access for micro businesses and start-ups

An important equality issue is access to incubator space and funding. Neil Walcuch of Tenschul, whose WRAP/UKRI funded project saw the development of a potentially fully circular supply-chain dispense model for wet-product, highlighted that the major difficulty for working within the current innovation landscape is cash flow. He explained: "You can't get a bank loan when you don't have a revenue stream. This means that you can't innovate unless you have a bucket-load of spare cash in your back pocket and where does that come from?"[40]

Walcuch sees two fairly easy changes that would make a difference. With the current UKRI funding system, he points out that: "You have to spend money to claim money. That's fine for large companies but where do small companies or start-ups get it from? We were turned down for start-up funding." He suggests that the first few months of funding should be given up-front, rather than in arrears. A second issue is the availability of affordable office space. He explains: "We had to fight to get space. The place we were at was originally a charitable start-up space. But it was sold off to a global corporation.

For a 200 square foot unit we had to pay £750 per month as a non VAT-registered company. In addition, we were asked to pay an extra £200 per month for "premium" internet connection (standard is 2mb download speed) and £75 per month, per registered vehicle for parking. And this is supposed to be Luton's incubator space for start-ups?"

These issues can be solved through tax breaks, and regulation and an analysis of nationwide provision would be advisable if it is not already underway or completed.

40 Anna Pitt's interview with Neil Walcuch, April 2022

04

Examples of other systems working internationally

such as ‘Mehrweg’ and Pfand in Germany

UK CIRCULAR PLASTICS NETWORK

UKRI Innovate UK

The Mehrweg system in Germany

The Mehrweg/Pfandflasche system in Germany is a take back system for both reusable and recyclable bottles and cans in plastic, glass and metal. It was developed in 2003 and initially retail outlets were only required to take back packaging from items they sold. In 2005, a uniform Pfand (deposit) system was set up. All single-use bottles and cans currently have a 25 cent deposit that's paid by the consumer and the consumer receives a coupon from the deposit return machine. For all carbonated and non-carbonated soft drinks, water, beer, beer mixes and alcoholic mixes the standardised deposit is mandated. For reusable bottles, the deposit is variable and lower than for single-use bottles, ranging currently from 0.02 cents to 0.15 cents.[41]

In 2006, the system changed to increase convenience and boost return rates. From 2006, Mehrweg bottles can be returned to any reverse vending location as long as that location sells products in Mehrweg bottles. An Einweg Pfand (single-use deposit paid) bottle can be returned in any take-back system, rather than just the outlet that it was purchased from. Supermarkets such as Aldi and Lidl don't sell drinks in Mehrweg Pfand bottles, and they therefore are not required to take them back.

In 2008, an LCA update study was carried out to compare single-use PET bottles with single-use "Mehrweg" glass bottles and "Mehrweg" PET bottles. The study aimed to look at the effect of improved efficiencies during the washing phase of Mehrweg, and the increasing distance that single-use PET bottles travel and how this differed from the LCA studies of 2000 and 2002, which found strongly in favour of Mehrweg over Einweg. The study concluded that Mehrweg PET bottles (better quality than Einweg PET bottles were the most environmentally friendly packaging option, with Mehrweg glass bottles being only narrowly worse than their PET counterpart, but that both these were significantly better for the environment than single-use PET. In terms of their specific contribution to climate change, the study reported that the difference between returnable bottles and single-use bottles was marked, in that reusable PET halves the emission of climate-damaging carbon dioxide compared to disposable PET. The study calculated that consistent use of Mehrweg for bottling soft drinks could save 1.25 million tonnes of CO2e in Germany every year.[42]

41 https://www.mehrweg.org/einkaufen/pfand/
42 Source: https://www.mehrweg.org/fileadmin/user_upload/redaktion/Mehrwegsystem/Oekobilanz_NEU_Kopie.pdf

Image Credit: Anna Pitt

The system in Germany is not perfect, but it is widely considered to be a very good system. It has achieved packaging return rates well in excess of 90%.[43] It has resulted in an unofficial litter reduction/take-back increase whereby many citizens will pick up bottles and cans from the environment, including from litter bins in order to get the deposit money. The author notes: "I witnessed this last week, watching a family picnic in the local square. A man was asking people in the square for money. I saw the family speak to him. When the family left, they carefully tidied away their picnic stuff except for an aluminium can. The woman placed the can very prominently on the wall behind the bench where they had been sitting. For a moment, I thought it was really odd behaviour. Then I realised they'd left it for the man to collect and get the deposit voucher. When I looked that way again a few minutes later the can was gone."

The customer may not necessarily be aware or care whether the packaging they are returning via the DRS is single-use or reusable, though businesses are mandated to display whether packaging is "Einweg" or "Mehrweg". This requirement isn't necessarily on a product by product basis. It can simply be for an entire bay or even aisle.

Behind the scenes, the bottles are usually machine-sorted via their barcode into single-use for recycling and reusable for transport to a preparation for reuse facility in the locality.[44] Prepared bottles (these can be glass or plastic) are then sold and delivered to businesses in the same way single-use is delivered, usually by palletised load.

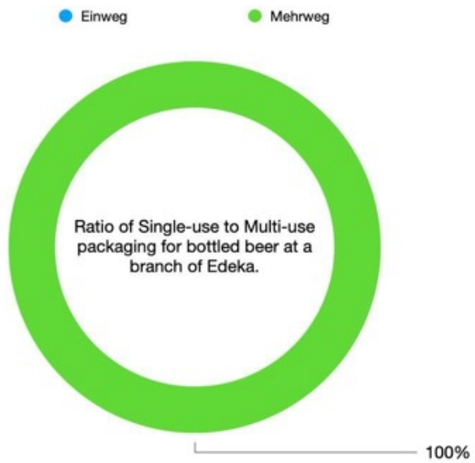
The system is optimised because the transport and washing is efficient within the use phase by enabling shared systems, standardised packaging (though still with a considerable variety), and minimising transport miles.

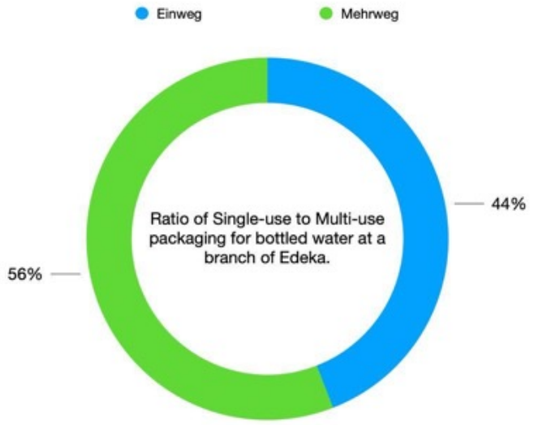
Despite the high return rates, the German DRS is in no way a comprehensive circular solution. Systemiq's recommendations for system change[45] reports a net saving of nearly 1bn euros by 2040 or around 4mt of plastic savings. Increasing reuse systems could provide a saving of 909kt (23%) of plastic material usage by 2040. This could be achieved through a combination of transitioning more food grade bottles to reusable bottles rather than single-use bottles, increasing B2B and B2C reusable transit packaging and extending refill and reuse models such as dry goods in bulk hoppers in mainstream retail.

With regards to food grade bottles, Germany already has a target of 70% of bottles to be reusable. However, they are not currently meeting this target overall.

While 80% of beer bottles are reusable deposit scheme bottles, sales of mineral water and fizzy drinks in reusables are falling and juice, milk and wine are currently exempt from the DRS, though milk and juice in returnables is sufficiently common now to be noticeable. Systemiq's System Change Scenario (SCS) suggests that mandatory targets, together with enforcement measures as well as commitment from brands and retailers should be established to achieve 70% reuse by 2030 and an increase to 80% by 2040.

The standardised beer bottle with its very successful pool system plays a part in the 80% achievement for beer in reusable bottles. The author's own survey of beer and soft drinks formats revealed over 917 SKUs in reusable bottles in a medium sized Edeka supermarket compared to 555 SKUs in single-use. The number of beer bottles in reusable glass is 100%, with some beers available in single-use aluminium cans. The ratio of Mehrweg to Einweg for water is 123:97.





Source: Author's own data

43 https://www.dw.com/en/how-does-germanys-bottle-deposit-scheme-work/a-50923039
44 The sorting stage is well described by a Sielaff marketing video https://www.sielaff.de/produkte/ruecknahmesysteme
45 https://www.wwf.de/fileadmin/fm-wwf/Publikationen-PDF/Unternehmen/WWF-Report-Pathways_to_a_circular_plastic_packing_system_in_Germany.pdf

Legislation in France for refill floor space

In France, legislation was passed in 2021 to promote refill and reuse in mainstream supermarkets as part of the environmental protection measures. By 2030, all retailers exceeding 400m2 must dedicate 20% of their floor space to refill systems (vente en vrac).[46] A 2021 YouGov survey showed that 74% of shoppers surveyed in France have bought products in refill, with 40% of people in France having bought dried fruits in refill, 20% having bought pasta in refill and 7% having bought personal care products. 55% of respondents said they purchased in refill to reduce packaging waste and 32% said they bought in refill to reduce cost. 57% of respondents purchase refills in supermarkets and 43% said they purchase refills in organic shops.

46 https://www.assemblee-nationale.fr/dyn/15/textes/l15b3875_projet-loi#D_Article_11

Algramo in Chile

Algramo started as a social project and has now grown into a scalable, sustainable solution. Founder, José Manuel Möller, was living in La Granja, one of the poorest districts of Santiago. He noticed that when people were buying on a day-to-day basis just what they needed in the quantity they needed in their local family-run retail outlets, they were paying more per gram of product than when buying in larger quantities in larger stores. He described this as a 'tax on poverty', whereby traditional business models with a long supply chain of packaged goods disproportionately affect people who are forced to buy in small formats. He designed a system that could dispense products bought in bulk and therefore benefitting from wholesale prices, to end-customers in the exact quantities they needed or could afford, at a fair price. Algramo's first prototype was a dispenser for powder detergent in 2013.

This was followed by non-perishable food basics such as beans, chickpeas, lentils and rice, offering prices around 40% cheaper than their packaged equivalent when bought in small format. The dispensers were installed in small, family-run neighbourhood stores of which there are around 2,000 in Santiago, helping to support the neighbourhood life around them. Algramo were successful in winning two rounds of competitive funding, which helped them establish their business model and develop their technology. By 2015, the company had partnered with 100 small retailers that had their dispensers installed. The company then developed its robust, reusable packaging system and by 2017 was reaching 1,500 affiliated stores with an 80% return rate supplying its own-brand personal care range.

In 2018, Algramo positioned itself firmly as a tech-enabling operation, and developed the Packaging as a Wallet (PaaW) platform and a new generation of dispensers equipped with Internet of Things (IoT). Customers create an account on the algramo.com website and each RFID tagged reusable container is logged to the user's account. For each reuse of the container, customers receive a cash incentive which accumulates on their account. José Manuel Möller describes this as packaging becoming like a payment card. The incentive encourages customers to look after their packaging in the same way they'd look after their payment card.

Algramo partnered with Unilever in 2019 to expand into branded goods with a home delivery model using electric tricycles. In 2020, they partnered with Nestlé to sell Purina dog food in home delivery. Customers can book a delivery through the Algramo app. The company have now taken their business model to other Latin American countries and more recently have developed standalone kiosks for installation in New York.[47] In 2022, Algramo announced its arrival in the UK through a partnership with Lidl.[48]

47 Source: https://algramo.com/en/our-journey/ and https://fondazionecartaeticapackaging.org/storie-di-etica/the-story-of-algramo/?lang=en
48 https://packagingeurope.com/news/refill-stations-for-laundry-detergent-launched-at-lidl/8172.article

05

Primary, secondary and tertiary packing for refill systems

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The current state of refill via dispense/ hoppers in the UK, as discussed above, is primarily focussed on displacement of consumer packaging. Refill in supermarkets is still in test and learn mode and with recent funding for further trials that's likely to continue for another two years. In the meantime smaller brands such as SESI, Fill Refill and Miniml have proved a fully-circular supply chain is possible, selling to a growing network of independent retailers. Research and development is needed to look into how to scale a fully circular supply chain model, and how to minimise washing and transport resources as this is where the highest carbon footprint arises (discussed further in the next section on LCA).

Enabling a fully circular supply chain for liquids is recommended as a higher priority than for dry goods due to the weight and potential for reuse of the containers in current use in the B2B supply chain. Many companies provide B2B liquids for cleaning and personal care mostly in 20l and 5l containers. Further research conducted by SESI alongside independent retailer, HISBE, and dispense technology innovator, Tenschul on the use of 20l bulk containers found that the savings of bulk dispense into pre-used customer vessels was only 25% when the bulk containers were not reused. Even though bulk refill is very low compared to single-use plastic (SUP) currently, it is already a huge missed opportunity for plastics savings.

Multiple companies/brands offer bulk dispense without collecting back the bulk containers for reuse (e.g. Bio-D, Ecover, Faith in Nature). SESI estimates that these bulk containers can be used 100s of times. They've calculated that their containers have been used on average nine times in the two years to July 2021.

Whereas B2C SUP has been successfully lightweighting plastic packaging to make plastic savings, the lightweighting of bulk containers is unlikely because of the weight of liquid that they need to carry. So there's no change of packaging required - but systems change could swiftly enable this supply chain to become fully circular. A national network of shared wash and return services, might easily compete with the single-use price of £6 to £8 per bulk container and enable more companies to transition to a fully circular supply-chain. In addition there's an opportunity for job creation as this is a new service that needs to be provided in the UK.

As discussed above, there are several successful secondary and tertiary packaging models in use internationally and increasing uptake of these should be a priority within the UK in order to speed the transition to refill.

Pallet wrap

Overall in the UK the estimated usage of single-use pallet wrap is widely reported as 150,000 tonnes per year. Pallet wrap is an issue widely discussed in the Facebook support groups for the independent retail sector. The use of single-use pallet wrap and single-use pallets by some of the main suppliers of bulk goods to the sector is a reputational damage risk. Some businesses have asked the suppliers to find alternatives.

The problem is two-fold: firstly, the individual business don't have enough buying power to force the change and secondly there aren't yet good solutions for reusable pallet containment.

SESI tested the Gaprie pallet wrap net[49] for transport of a palletised load of 20 litre containers of detergent but the load failed at the first corner after just a few yards of journey.

SESI has developed two prototypes. The first was with Tex with A Difference (Tex), a social enterprise in Cornwall, and 10 of these were made from reused scaffolding net. These prototypes are in circulation, but are prone to breakage. They are now used exclusively for containment of empty bulk vessels. SESI has explored taking this project further with a view to Tex then being able to create a network of workshops in areas of under-employment, similar to Cornwall, around the UK, but this would require funding in order to further test the prototype, develop and test improvements and agree a working solution to then be rolled out.

SESI Pallet Containment Prototype with Scaffold Net

Zero-waste suppliers don't want single-use pallet wrap

49 https://www.gaprie.com/pallet-wrap

SESI conducted further research into materials suitability. This led to a second prototype made by Stuart Canvas using material used for load cover on lorries. This material shows promise, but lacks additional structural support in order to cope with the lateral forces of heavy liquid products.

SESI have not yet had the opportunity to improve the design in order to take this further and in the meantime, a prototype from Packoorang[50] looks promising as a solution. Packoorang's Palloorang reusable pallet wrap is currently in trials with Decathlon in Poland and with others in Sweden. SESI have not yet had the opportunity to trial the Palloorang as availability was significantly delayed and development is slow.

It is likely to be the culture of single-use and widely accepted empty backhaul that is responsible for the lack of investment and take-up of reusable pallet wrap. This is evidenced by the fact that there has long been availability of reusable pallets in the UK, through CHEP,[51] yet there's still a percentage of single-use pallets brought onto the market. It is widely reported that there are 250 million wooden pallets in circulation and estimates of new pallets brought onto the market range between 42 to 45 thousand.

50 https://www.packoorang.com/products/palloorang

51 https://www.chep.com/us/en/why-chep/how-chep-works

Image Credit: Faye Jennings Mosquera

Pallet lids and layer pads

Sheffield-based company Loadhog[52] have a wide range of reusable tertiary packaging including reusable pallet lids, collapsible containers and layer pads. They have a pooling and washing system in Sheffield that can service over a million layer pads per month.

Penguin Random House invested in 500 RFID tagged pallet lids in order to reduce single-use pallet wrap. They reduced their single-use pallet wrap by 47% during the first year trial period. The preparation time per pallet is reduced from 3 minutes to just 20 seconds and unwrapping time for the customer is seconds compared to significant time removing single-use wrap and having to dispose of it. In addition, the pallet lids allow pallets to be double stacked in delivery vehicles, giving further CO2 savings through reduced delivery mileage. They rapidly invested in 500 more pallet lids as apart from the CO2 savings, through reduced mileage and packaging materials, it was a time saver as well. At the time of interview, they reported no losses.[53]

52 https://loadhog.com/about-us/
53 Interview with Neil Springall, Head of Operations, Penguin Random House, July 2020.

Pooling systems for reusable crates

Reusable, collapsible crates are widely used throughout Europe through a number of pooling systems (e.g. Vpool, Euro Pool System).[54] Similar to the Mehrweg bottle pooling system in Germany (and Netherlands and Denmark), the pallet rotations are optimised through sequential rather than exclusive ownership. The empty pallets are collected from customers, cleaned and returned to customers nearby rather than back to the original customer who first purchased the pallet. The original customer has their pallet return fulfilled from other pallet customers/cleaning stations near them, hence minimising miles travelled.

Pandobac is a local pool system based at Rungis market in Paris, providing secondary packaging for fruit and veg, meat and fish. These containers differ in that they are stackable, rather than collapsible so they are easier to clean. Anais Ryterband, CEO and founder says: “We started working with wholesalers who were buying their own packaging and doing their own order preparation. The key selling point is that wholesalers pay a similar price to the SUP e.g. cardboard and wooden crates, styrofoam boxes. There are many food suppliers around Paris who want to be packaging free.

Wholesalers gain new markets if they can offer Zero Waste deliveries.

Pandobac is approaching the market from three angles, the wholesaler, the retailer and the producer.”She explains that the producer is the hardest to target, not because they are unwilling to transition but because they are geographically diverse and all different sizes. So it is really important to have shared collection and cleaning facilities.[55]

In June 2020, Reusable Packaging Europe (RPE)[56] was launched, with the aim of promoting reusable packaging as a circular service and bringing together pooling systems. Signposting to this service and easily accessible information about how a business can transition to a reusable secondary packaging pooling system would be helpful. Currently a Google search such as a company might undertake using the terms “reusable secondary packaging UK” or “reusable collapsible crates UK” doesn’t reveal a straightforward pathway to transition. For further acceleration of reusable secondary and tertiary packaging, outreach could be considered as an option.

54 https://www.vpool.eu/en, https://www.europoolsystem.com/pooling-solutions, https://www.europoolgroup.com
55 Interview with Anaïs Ryterband, CEO and Founder of Pandobac, April 2022. https://www.pandobac.com
56 https://rpeurope.eu/about-us/#ourmission

06
Comparative LCA versus incumbent systems

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Importance of the use phase

There appears to be no clear and comprehensive guidance in the public domain that proves that all refill has a lower carbon footprint than the SUP in all situations. The number of refills per vessel, transport within the supply chain and by the consumer and washing systems are key variables that will impact LCA.

Coehlo et al (2020) state: "Of the main three stages of a product's life cycle — production, service life (or use phase), and disposal— the most impactful in terms of GWP is usually different for single-use and reusable packaging. While for SUP it is typically the production phase that is the most intensive in terms of GHG emissions, for reusable packaging it is the use phase that tends to generate higher emissions, mainly due to transportation. This is because: 1) Reusable packaging demands return logistics, while single-use requires only one-way transport; 2) The impacts associated with the production phase are evenly distributed through the service life of the reusable packaging (across the various reuse cycles), while impacts related to transport are presented in every cycle (reuse) of the reusable packaging; and 3) Reusable packaging tends to be heavier than SUP which further increases the transportation impacts." [57]

The paper discusses different LCA results depending on miles travelled during the use phase:

"A study which analysed the impact of different travel distances on GWP found out that reusable packaging had lower environmental impacts compared to single-use for distances lower than 1200km. The study found that when a transport distance of 200km between the bottling plant and the local distributor was applied, the reusable bottles had a lower impact than single-use bottles after only two uses. However, if this distance is increased to 400km, reusable bottles must be reused at least 4 times in order to have the same impact as single-use bottles, and if the distance is further increased to 800km or more, not even 30 reuse cycles would make reusable packaging the environmentally preferable option."

57 https://zerowasteeurope.eu/wp-content/uploads/2020/12/zwe_reloop_report_reusable-vs-single-use-packaging-a-review-of-environmental-impact_en.pdf.pdf_v2.pdf p.24

LCA example for shampoo bottles

A study conducted by David Fawkes, an industrial designer with Renfrew Group International, for SESI compared like for like 300ml refillable shampoo bottles in plastic (PET), aluminium and glass and compared them to the same format plastic bottle used as single-use. The plastic bottles were made and sold for single-use rather than reuse, but the properties were suitable for multiple refill cycles. Fawkes used the built-in LCA feature of CAD software package, Solidworks.[58]

In sum, the findings showed that a plastic bottle reused once has a lower carbon footprint when refilled once compared to a same format single-use plastic bottle. A same format aluminium or glass bottle requires five uses to perform better than single-use plastic.

The extract from the Fawkes study below shows the comparison of three types of refillable pump bottle with a single-use plastic pump bottle. Fawkes clarifies that: "An estimated 30g of CO2e could be caused by heating the warm water to wash the bottle, but this hasn't been included because SESI customers might heat their water with renewable energy or simply wash the bottles with other items."[59]

The study also considered the effect of a customer driving in an average car 1.5km further (generating an additional 180g CO2e) to refill compared to accessing a single-use product. The chart below shows that not even 20 refills in this scenario is more favourable than single-use plastic. However, it should of course be noted that this scenario is based on refilling only one product using that extra distance.

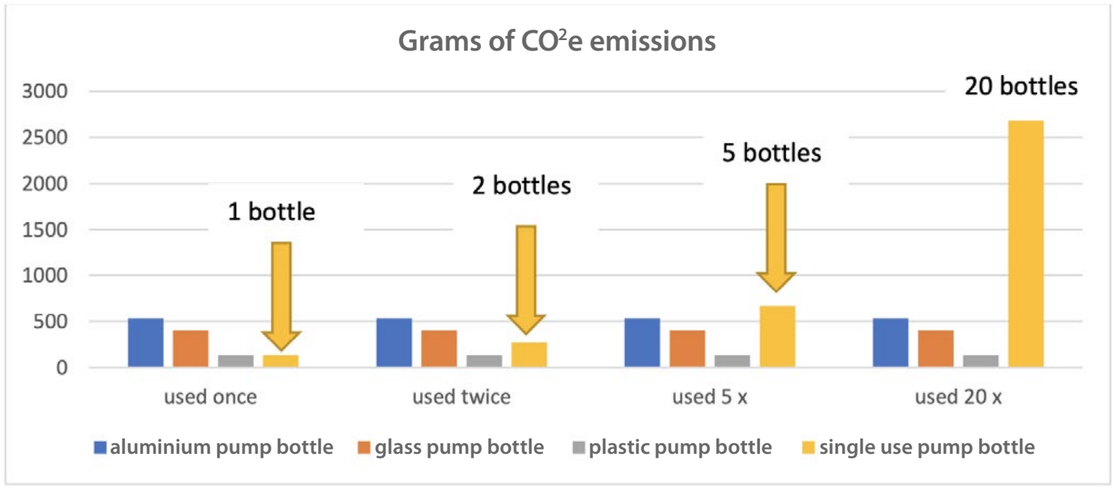

Chart reproduced with permission: David Fawkes

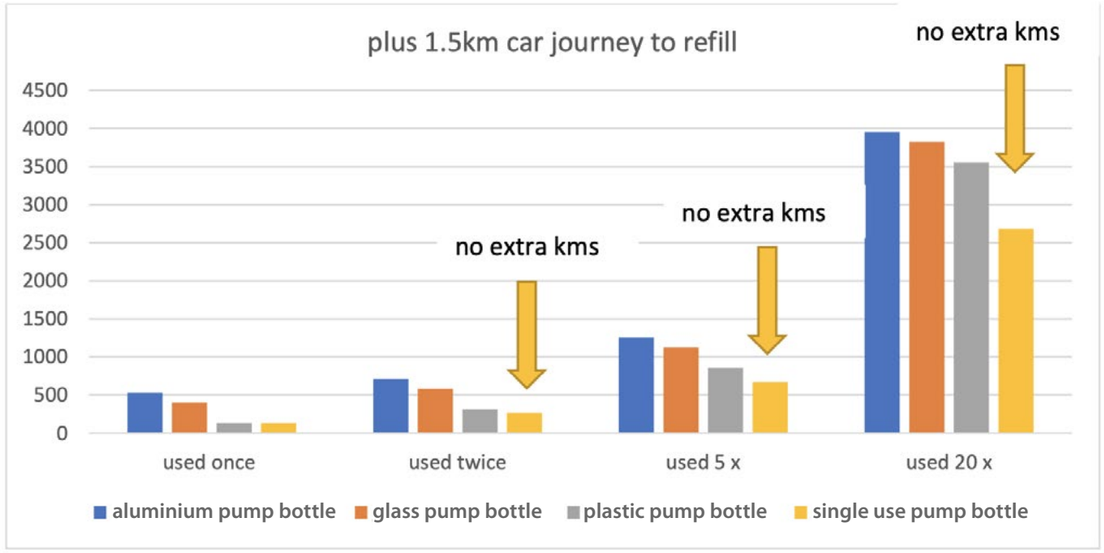

Chart reproduced with permission: David Fawkes

58 https://www.solidworks.com/solutions/what-life-cycle-assessment-lca
59 A study carried out by David Fawkes, of Renfrew Group International, for SESI Food and Household Refill LLP

Number of use cycles

In terms of the number of uses, Coehlo et al. (2020) synthesises numerous LCA studies of reusable packaging systems and finds variations on the number of uses that make the break-even point.

The paper advises however, that: "The emissions associated with a reusable packaging are deeply influenced by the number of cycles it undergoes, but only to a certain point, at which point a plateau is reached. This plateau can be explained by the fact that there are emissions that occur in every regular cycle of the reusable packaging, such as cleaning and transportation. Therefore, the impacts that are only present in the initial and last cycle, such as those related to transport between the stages of raw material extraction and packaging production and to disposal after its service life, are less significant in the overall impact rather than the distances that will be travelled in every cycle of a reusable packaging, here called backhaul and resupply distances. Thus, shorter backhaul and resupply distances should be prioritised."

This is what is already done well through shared pooling systems for pallets (e.g. CHEP, La Pallette Rouge) throughout Europe. There's room for improvement, and also for extension to primary reusable packaging and reusable products with sequential ownership.

NB: Wash systems will be discussed further in a later section.

Due to the lack of clarity already shown, of where LCAs are bound and how accurately they portray real life scenarios, there is naturally scepticism over LCA as a decision tool for reuse. This is confirmed by the Defra EPR consultation, where they find: "Many were concerned that a Life Cycle Analysis approach may be unreliable, as reusable packaging may be heavier than light-weight single use plastic packaging, and the carbon and published health benefits of reusable packaging are not proven."

The accepted standards applied to LCAs are ISO14040 and ISO14044. It is important to consider cradle to grave in order to have a properly comparative study. However, this is not always the case. As Brian Lodge of RBC explains, LCA's are a very tricky area. He says: "Where does the LCA start and finish? To be relevant and factually correct they have to be peer-reviewed and many aren't because the cost of doing this is prohibitive - in excess of £10K. Many companies use an online tool like GaBi."[60]

He says he's seen wonderful LCAs of paper trays to replace PET trays, but the paper company left out the fact that PET trays can be recycled, and also left out the growing of the trees for paper.

Amienyo et al. (2011) looked at different formats and materials as well as how far packaging affects the GWP of fizzy drinks. Packaging represents between 59 and 77% of the overall GWP. The paper concludes: "The drink packaged in 2l PET bottles is the most sustainable option for most impacts, including the carbon footprint, while the drink in glass bottles is the worst option. However, reusing glass bottles three times would make the carbon footprint of the drink in glass bottles comparable to that in aluminium cans and 0.5l PET bottles. If recycling of PET bottles is increased to 60 %, the glass bottle would need to be reused 20 times to make their carbon footprints comparable."[61]

20 reuses is a figure widely quoted for glass bottles, and sits well within the reuse potential and the average uses currently reported (e.g. Zero Waste Europe).

Gallego-Schmid et al. (2018) compared take-away containers in various materials with reusable "Tupperware" containers and reusable PP containers. They found that Tupperware has to be reused 16 times to balance out all impacts compared to aluminium single-use containers. Tupperware containers can be reused on average 43 times before being discarded, so there's potential for reuse to be more favourable than single-use, in terms of LCA. PP performs slightly better, matching all the impacts of aluminium after only four reuses.[62]

60 Anna Pitt's interview with Brian Lodge, March 2022

61 David Amienyo, Haruna Gujba, Heinz Stichnothe, Adisa Azapagic (2011) Lifecycle environmental impacts of carbonated soft drinks. In: The International Journal of Life Cycle Assessment, Volume 18 Number 1, Springer

62 Gallego-Schmid A, Mendoza J M F, Azapagic A (2018) Environmental impacts of takeaway food containers, in Journal of Cleaner Production 211 (2019) Elsevier

LCA as a decision tool or a guidance for ongoing improvement

It is unlikely that reuse in the UK as it stands currently would out-perform the highly-honed single-use supply chains in terms of LCA as there is significant R&D and financial investment required to reach an optimised system, and you have to start somewhere. An exception might be a model such as the SESI model (also used by other personal care/cleaning product wholesalers) whereby the containers are the same containers made for single-use, the backhaul is optimised, and end-customers bring previously used single-use containers to refill from retailers. Outlets are generally in places that customers are going anyway. The additional resource compared to single-use is cold water to wash containers. The water use is arbitrary and SESI has the intention to find resource efficiencies. However, it is a small company that aims to keep cost of product low, in order to widen access to refill to lower income brackets. LCA studies are out of their reach, financially, but they would be open to allowing an outside organisation to study their system if it could be 'for the greater good'.

Similarly, Tom Struthers of Draught Drop says they haven't conducted an LCA as it is too complex and expensive and may even be misleading particularly during the development phase when things are constantly changing and operations are not of comparable scale to single-use competitors. Changing the source of the bottles or improving bottle return rates for instance can substantially change the LCA. They do, however, refer to a comprehensive study available on the Reloop platform (this is the Coehlo et al (2020) paper) which shows the effect of transport during the use phase. This is why they source locally and combine delivery and collections, using local EV/Cargo bike services with zero emissions.[63]

Paul Garner of Asda said: "I like the SESI distribution model, where the supply chain is fully circular. Assuming the LCA shows efficiencies, this looks like a good model."[64]

Body shop recently invested 4 million in transitioning to the bulk dispense model using 5 litre containers across all their stores. It is unconfirmed, at this stage, whether the 5 litre containers are cleaned and refilled or just recycled.

Such interest in this model suggests that an independent LCA assessment of the common models (prefill / lightweight refill; milk round model; prefill and return via drop-off point (effectively a form of DRS), bulk dispense to pre-used vessel in a fully circular system, bulk dispense to pre-used vessel without circular bulk container usage) might be a useful investment in order to speed up and smooth a transition to refill nationwide, particularly in the light of the current DRS discussions.

Whilst there's clearly a need for further study of the LCA of reuse compared to single-use, LCA methodology is unlikely to take into account other important aspects of reuse. For example, Coehlo et al. (2020) suggests: "By changing the way in which consumers think about the use of natural resources and how they relate to the products they buy, reuse can incentivise a shift toward more conscious consumption."

63 Anna Pitt's interview with Tom Struthers, March 2022
64 Anna Pitt's interview with Paul Garner, March 2022

07

Material sustainability for reuse

(glass, aluminium, steel, paper/card pros and cons)

See datasheet B

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The need for further research

There does not appear to be good data about which materials are most suitable for refill. Elliot Woolley, Lecturer in Sustainable Manufacturing at Loughborough University, confirms that there is still work to be done to satisfy this question.

The Amienyo et al paper builds a case for reuse of glass bottles but the purpose of the paper was to conduct LCA on various materials for fizzy drinks rather than making a conclusion about which material is more suitable.

Glass is widely considered to be a luxury packaging but clearly heavier than plastic. However, with enough reuses and localised transport we can infer from the Amienyo et al. paper and the Mehrweg.org study that it is a highly suitable material for refill given that it can withstand high temperatures and doesn't stain. After multiple reuses calcification is evident on the outside of bottles around the moulding lines.

Woolley points out that there's been a move away from plastic for reuse.[65] For example, RE have chosen steel for their bottles and Loop uses aluminium. The complexities of plastic and the overwhelming negative public opinion about plastics means this is an important area of study that needs to be funded. This should be considered alongside standardised packaging design and consultation.

Sarah Greenwood, project co-lead of the Many Happy Returns Project spoke about work they are undertaking to find plastic packaging suitable for yoghurt in refill.

An example from Germany is the Soonwald dairy which supplies milk, yoghurt, ice cream and other dairy products in refill. Their containers are made from Tritan, which withstands temperatures of 80 degrees Celsius for the cleaning process. Such containers do not appear to be available in the UK. However, the material warrants investigation. Containers need to be dishwasher safe. Tritan provides that. The EoL scenario in the UK, however, requires investigation as the author has been unable to establish this to date.

There is no clear information about materials for refill and their suitability. A guide should be established as a repository for the latest data on the subject. This guide should include a facility for converters to register their refillable packaging options and signposting for producers considering transition. The Packhub or similar could be a useful consideration for this purpose. At the time of interviewing Packhub founder, Paul Jenkins there were 477 refillable and reusable initiatives currently listed on the Packhub Data Repository (8.4%) of entries with an average of 3 new initiatives a week.[66] It would be useful to have a closer focus on the refill specific market in order to build a world-class depository for refill specific or suitable packaging, with an explanation of what makes it suitable.

Understanding refillable packaging and sourcing it is currently time consuming and this is a significant barrier to speeding transition.

Image Credit: Anna Pitt

Image Credit: Sally Beken

65 Anna Pitt's interview with Elliot Woolley, March 2022
66 Anna Pitt's interview with Paul Jenkins, March 2022

08
Consideration of the EoL in a multiple use supply chain

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Insufficient capacity for EoL collection

What's clear from the research for this report is that reuse is currently developing at pace due to customer will and therefore market demand, but without a suitable system or even requirement for an efficient end of life scenario.

For example, the prefill/lightweight refill model has a major flaw in that the EoL provision is wholly inadequate. In this model SUP has been replaced with a more substantial bottle e.g. aluminium and an accompanying lightweight polymer refill pouch.

The lightweight pouches are not accepted in kerbside recycling collections whereas the SUP that's been displaced is widely accepted. Provision for EoL is through Terracycle drop-off locations. There are 382 drop-off locations around the UK. This is insufficient compared to in excess of 13,000 outlets where the products can be purchased. Yet, the pouches are marketed as recyclable. For example, P&G state: "The leading beauty brands will launch a refill system for their shampoo, thanks to a new reusable 100% aluminium bottle and recyclable refill pouch, made using 60% less plastic (per mL versus standard brand bottle)."[67]

67 https://us.pg.com/blogs/reusable-bottles-debut-at-reuters-business-summit/

Disconnect between what's technically recyclable and actually recycled

There is wide recognition among environmental experts that the term "recyclable" has a consumer interpretation similar to the term "recycled". However, in the UK as in other nations, there's a disconnect between what is technically recyclable and what is actually recycled. All plastic waste is technically recyclable, by either mechanical or chemical means, but the widely quoted figure that less than 10% of plastic produced globally has been recycled[68] shows this is a long way from being the norm.

The SSPP funding has gone some way to address this, in that it states that novel materials won't be considered for funding unless EoL solutions are widely available. However, there's no current legislation that prevents products from being brought to market without a suitably accessible take-back scheme, yet recyclability claims can still legally be made. This has been discussed widely (e.g. GRIPS) and is currently being addressed by OPRL's labelling system that clearly tells consumers: "Recycle" or "Do Not Recycle".[69]

68 e.g. UNEP https://www.unep.org/interactives/beat-plastic-pollution/
69 https://www.oprl.org.uk/our-latest-initiative/

Unplanned losses

Żaneta Muranko reminds us that we cannot decouple Reuse from Recycling. All reusable packaging products will eventually have come to the end of their useful life and we need to ensure that the EoL scenario isn't more damaging environmentally than the incumbent system.[70]

With reusable products generally having a higher carbon footprint than SUP, it's a problem when they reach the end of life sooner than we intend. Muranko et al. describe numerous points along the consumer journey where the reusable product can drop out of the reuse cycle, for example when the consumer no longer wants to be part of the system, perhaps because they no longer want the product or service, when the consumer disposes of the reusable product outside of the intended system e.g. by putting it into the recycling, losing it (e.g. in the environment) or by forgetting to return it.

Catriona Tassell says: "The reality is that we are introducing refill/reuse within the context of continued overconsumption and disposal.The intention is that durable alternatives to SUP are kept and reused. However, companies and consumers are still in the trial-and-error phase, testing these new products and replacing them too early when they do not meet expectations.

With an influx of new refill/reuse offerings arriving on the shelves, consumers can be easily tempted to switch, resulting in a high likelihood that previously used durable components meet the end of use or end of life too quickly. Some of the take-back services being introduced offer an interesting solution to try and deal with this problem. For instance, even though it requires more effort to be invested by the consumer, the kind of doorstep delivery/return schemes mean that at least the resources are retained by the company in some way even if people are over consuming.

So they can continue to circulate rather than ending up in landfill [or incineration or recycling which means it's also lost to the system] earlier than we intend."[71]

Michael Shaver, Director of Sustainable Futures at the University of Manchester says: "It really doesn't matter if something is recyclable, reusable or biodegradable if it isn't recycled, reused and biodegraded. So the system has to ensure that what we promise or what we imagine for a future of a material is actually enabled."[72] This, of course, applies to systems too. It is essential that we design reuse systems that preempt the failure points at the outset and have a mechanism for them in order to prevent unintended negative consequences from refill.

Good practice examples for preempting unplanned losses

There are good examples of where this is occurring, to some extent at least. The RE project enables consumers to return their bottle and spend the voucher they receive in exchange on another brand or product within the scheme. The Vytal system of food on-the-go containers is set up to automatically charge consumers for the container if they don't return it within two weeks. Vpool pays customers the value of the material for broken collapsible plastic crates that are collected along with any other returned crates. CHEP has a helpline that anyone can ring if they see a blue CHEP pallet discarded in the environment and it will be collected and returned to the pool. None of these methods are failsafe, but provide lessons learned to ensure material within reuse systems is kept in circulation for longer and can reach the correct EoL scenario at the appropriate time. A study of these interventions across multiple businesses, showing what works and what doesn't, would be advantageous.

70 Interview with Anna Pitt March 2022
71 Interview with Anna Pitt April 2022
72 Michael Shaver, Director of Sustainable Futures, University of Manchester, SSPP Session: **Designing Sustainable Plastic Packaging** at GRIPS 2022

09

Collaboration within the supply chain

See datasheet A

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Large collaborations among market leaders

There are several examples of good collaborative work that encompasses multiple parts or entire supply chains. The encouragement of collaboration is vital at this stage of transitioning to refill as the sector is battling against a highly efficient single-use system and deeply embedded behaviours throughout the supply chain from raw material producers through to consumers. Although refill is certainly returning to consciousness and growing in popularity the volumes are still too small to make obvious business sense and is mostly still in the hands of 'the believers' rather than the decision makers.

Brian Lodge, of Berry Global says: "There are a lot of people trying to adapt existing packaging rather than designing for reuse. This is likely because the volumes are tiny at the moment, so specific design is going to be expensive.

Berry is working on a refill system with something a bit more bespoke, but it can only be done bit by bit as they have to find a market. The whole industry is chicken and egg at the moment. Berry can see applications, but no one is able to implement them because the market isn't big enough. They are still looking for customers for the ideas they have. Most customers want to see a successfully launched product, but none exist yet.

"It is a goal for all converters to get into reuse, but it is difficult as they're only one small cog in the wheel. It needs the brand, the fill-line, the reverse logistics in order for it to work."

Small/grassroots collaborations

With the recent SSPP funding focussing on solid collaborations featuring big brands and market leading supermarkets, it is likely that the next two years will see some good information, good products and a widening of access for refill.

It could be worth considering methods of support for smaller grassroots collaborations that could capture the current consumer desire and media interest. With good signposting of information smaller producers with shorter supply chains could get off the ground in two months, rather than two years. This is unlikely to bring volume, but could helpfully encourage the larger collaborations towards full circulatory in their own supply chains, just by providing working examples and case studies.

Example case studies might be the collaborations between Good Club and Milk and More; the collaboration between SESI, Hugo's Eco Deliveries and a number of producers such as Just Crisps and Dorset Sea Salt forming an entirely UK circular supply chain; the WRAP/UKRI funded Mangrove dispenser collaboration between SESI, Tenschul and HISBE; or Fill Refill and Planet Minimal. Such collaborations achieving circular supply chains, albeit not at scale, could provide a basis for research where the behaviours (discussed later) that are widely acknowledged to be the hardest part in transition, are already in place.

10

Consideration of the logistics and cleaning required for transition

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A lack of standards

There are two considerations within the realm of cleaning. Firstly, there's the hygiene aspect and secondly there's the user perception of cleanliness that contributes to reusability and therefore system efficiency. Not enough is known about either.

We do know that efficient reuse systems require optimised cleaning and backhaul (Muranko et al., Coehlo et al.). It is widely acknowledged that cleaning in a dishwasher is more efficient than manual cleaning, which suggests sequential reuse models are likely to be more efficient than exclusive reuse models. However, this is difficult to measure as consumer behaviour will likely differ. For example, a widely circulated tip within the Zero Waste community is to rinse out shampoo bottles for your last (few) hair washes in order to make the most of the product. The rinsed bottle will then need no further washing before it is refilled by the consumer. It is similarly difficult to measure the water/energy usage of rinsing packaging for recycling - a practice that is undertaken by many consumers and encouraged to some extent by local authorities/media (e.g. Metro 2018[73], Derbyshire County Council (ND)[74])

Michael Archer of CHEP said: "We need the washing standards. There is no ISO standard. There's nothing that says if you want to refill, this is how you have to clean the vessel. For anything that's not a premium product and therefore needs to be cheaper than the SUP equivalent, then that's one issue that needs to be addressed."[75]

Further work is required to create a comprehensive set of cleaning standards for refill. BSI confirmed to the author in 2020 that no cleaning standards for refill of non-food products exists. A project at Loughborough University is currently studying the cleaning assurances necessary for refill.

73 https://metro.co.uk/2018/02/15/happens-dont-bother-washing-recycling-7315366/
74 https://www.derbyshire.gov.uk/environment/rubbish-waste/waste-myth-buster-information/waste-and-recycling-myths-busted.aspx
75 Michael Archer, CHEP, SSPP Session: **Re-use: Game changer or logistical nightmare?** at GRIPS 2022

User perception

Professor Thomas Webb's team at the University of Sheffield's Many Happy Returns project, have been studying responses to the signs of wear that typically accrue from reusing containers. He says: "Our research suggests that as soon as there is any sign of wear or previous use people don't want to use it [packaging] again (Baird et al., 2022). We morph containers from perfectly clean through to very, very dirty in 100 steps and once it gets to 15 or 20 on that 100 point scale where zero is perfectly clean people don't want to use it."[76]

It should be noted that there's likely to be more staining on food containers than drinks or personal care products. So some sectors would naturally benefit from more use cycles than others before consumers decide they are undesirable.

76 Anna Pitt's interview with Professor Thomas Webb and Sarah Greenwood, March 2022

Efficiencies

With the use phase being the most impactful in a reuse system, it is important that work is carried out in the area to fully understand the cleaning requirements and then once the knowledge is there, there will be an education need, so system users throughout the supply chain understand the cleaning and hygiene processes and implications.

The 2008 environmental survey of the Mehrweg DRS in Germany showed improvements in LCA, largely attributed to a reduction of energy use in the wash process.[77]

Archer says that efficiencies are critical to the cost-effectiveness and they are critical to the LCA as well. He says: "Trick number one is move the empties by 'anyway transport' as much as you can, so it will cost nothing. The second key issue is about distance and density. It is cheaper to move things in bulk than one at a time so you need that density and volume. With the need for cleaning and washing facilities, scale makes a huge difference to the ability to be able to automate the engineering of washing." He draws the analogy with the home dishwasher scenario. There's more to the unloading and loading than the actual washing, so that's the bit you need to automate.[78]

However, there's a critical mass of consumer behaviour ready and waiting to refill, demonstrated by successful supermarket trials and the rapid growth of businesses such as SESI (reporting 422% growth between August 2019 and July 2021), Fill and Miniml in the personal care and cleaning products sector and businesses like Good Club and Draught Drop who have fully refill based business models.

So although there are still many unknowns, we have to start somewhere. Jo Chidley, of RE and Beauty Kitchen, says: "You need to set up the system first, then target the inefficiencies."

77 https://www.mehrweg.org/mehrwegsystem/oekobilanzen/
78 Michael Archer, CHEP, SSPP Session: **Re-use: Game changer or logistical nightmare?** at GRIPS 2022

Examples of cleaning systems

It is important to note that companies are getting started with refill and reuse even when their systems aren't perfect. They're just getting on with it and making improvements as and when they can. Once off the ground, companies are often able to rapidly introduce efficiencies within the use cycle.

For example, Ben Patten of Good Club says their new integrated site has halved the cost of the reuse cycle with further savings to come through increased automation and the digital tracking of the pots. Their first custom-made packaging will go live in September 2022 - making reusable packaging more convenient in the home and more efficient to handle in the supply chain. The new packaging is also made from innovative new materials. They have started to sell beyond their D2C business, with one retailer partnership live and two more due to go live in the Autumn of 2022.

Draught Drop manages a fully circular B2C supply chain for home delivery of beers in returnable bottles in London, using the milkman model, whereby customers place their empties on their doorstep before the next delivery. Draught Drop bottles the beer, operates the retail, delivery and reverse logistics for over 30 breweries.

Co-founder, Tom Struthers would love to see a standardised UK wide system like the German Mehrweg system with localised and optimised collection, cleaning and deposit returns, but says this needs large-scale government intervention. He says: "The system prevalent in Germany, Austria and other places is only possible because of a very active state mandating the system and it becoming embedded in consumer behaviour and routine. We did have bottle reuse systems in the UK and they've been phased out. I believe that a nationwide reuse system is the future but until we have large-scale interventions from the government, change will be led by mission-driven businesses operating private loops. We need to do that, as we are doing and lots of other businesses are doing, because consumer behaviour takes a long time to change and the world can't wait. There's a real chicken and egg problem because if you don't have anyone operating circular businesses, then consumers cannot choose circular and no circular logistics providers spring up. We've got to get going with something to prove the potential, knowing that the technologies and business models could change quite drastically, as we scale and as reuse becomes more standard."[79]

SESI has been operating refill since 2006 and have for many years hand washed bulk tubs and air dried, a method they still use currently for non-food bulk containers. As and when they have to find new services, they respond and adapt to improve their carbon footprint whenever possible. Washing of bulk containers for food oils is outsourced to one of their local producers and comes at a similar price point to single-use containers at the small purchase quantity price point.

In January 2019, SESI pioneered a low tech solution that minimised water consumption by capturing and recycling the washing water so that only the final rinse used fresh water. However, this system had to be dismantled due to Covid regulations for social distancing in the workplace and they haven't yet been able to acquire extra space to reinstate the project.

SESI co-founders Rina Melendez and Paul Godden want to target inefficiencies in the wash process, but again, they are just getting on with the job, responding to an increasing demand from a network of independent retailers who have a customer base keen on fully circular refill. They recognise that their manual wash station won't cope with much more scaleup, and plan to invest in machine washing once they have sufficient space.

Image Credit: Draught Drop

79 Anna Pitt's interview with Tom Struthers, March 2022

Materials, design and cleaning assurances

Elliot Woolley, Lecturer in Sustainable Manufacturing at Loughborough University, has been studying cleaning of food-to-go packaging. He says: “We’ve established that the current pack types are not suitable at all because if you want to clean something to any standard which the Food Standards Agency recognises, you have to go up to seventy degrees. The vast majority of current packaging is PET or rPET and their glass transition temperature (Tg) is just over seventy degrees so once they get close to that they start to warp and degrade. So for reuse we need to use different materials.”

He explains that there are other plastic types that withstand higher temperatures. For example polypropylene, like the takeaway containers, is fine up to 120 degrees. So they’re fine in a dishwasher. People use them all the time. However, there are two problems with this. Firstly they are not normally as transparent. People want to see their sandwiches or their salad. Secondly, the recycling streams aren’t set up for them as successfully as for PET. So for industry, there will be a transition. He thinks it would be preferable to stick to rPET and find a solution for that. With some of their partners, they are currently investigating ways they can still use PET, or a version of PET, without that washing issue.

For cleaning assurance Woolley’s team uses ultraviolet fluorescence. Most foodstuffs will fluoresce under ultraviolet light. They are designing a process whereby they can put a pack with an unknown amount of fouling under an ultraviolet light of the correct wavelength, which depends on the type of packaging material and the type of fouling they are expecting to see and then working out whether they can correlate the results to a standard. They are using ATP swabbing as the standard currently. ATP swabbing is used to test surfaces after clean down, but this method can’t be used for food packaging because swabs are £2 each and they contaminate the surface and it’s a long process. So they are trying to find a rapid optical process to replicate the assurance of ATP swabbing.

Woolley also confirmed that there were as yet no clear standards for cleaning for reuse of packaging. There’s a food agency standard that commercial dishwashers tend to conform to consisting of a chemical wash at 50 degrees then a final rinse at 80 degrees.[80] It’s that final high temperature rinse that kills all the bacteria. The assumption is that if this is acceptable for washing crockery and cutlery for a cafe then this should be suitable for packaging. But if we need to wash at even higher temperatures, that starts to create a problem when we’re looking at polymers.

Overcleaning

There is also a likelihood that we are overcleaning, and therefore overusing resources. Woolley explained that equipment cleaning processes are based on worst-case scenario. He gives an example of a situation where experts might say that based on experience they expect something will take 20 minutes to clean, so recommend cleaning for 30 minutes, so that it is definitely clean. If something is actually clean after 12 minutes, you’re cleaning a clean system for 18 minutes, so you’re wasting water, energy, chemicals and have a loss of function time. So there’s a need to monitor the cleaning process during the cleaning cycle with the ultraviolet testing to find the point where it is clean enough. We need to minimise over-cleaning to improve system efficiency and lower GWP impact.

With food products there may not be a dedicated cleaning line, so the allergens are a particular issue. Their technology isn’t testing for allergens particularly, but they may be able to test on the basis of if there’s no food particle present, then there are no allergens. But at the moment there isn’t even that check.

In relation to non-food products, the SESI process likely involves overcleaning. It is a case of visually cleaning the outside to gain an acceptable standard, which is of course arbitrary, and the inside is about avoiding cross contamination. SESI is looking at improving labelling, to find labels that last longer through the wash process, and don’t have to be removed and replaced as often. This saves water, and they would like, when the technology is available and affordable to be able to look into how many times they can refill with the same product without washing. They have also identified that tracking of containers would be helpful to the washing process, as it would help them identify parts of the system where tubs are becoming dirty and this would enable more targeted education around tub care. However, at this stage this is beyond reach financially.

80 Final rinse temperature, confirmed on Google search and online chat with industrial-warewashers.com, is generally between 80 and 85 degrees. This is above the actual required temperature, thought to be for additional safety.

Research to inform cleaning standards

Woolley describes the following developments that are needed for the implementation of safe and efficient refill systems:

- Development of appropriate standards
- Automation of quality and safety assurances
- Development of a greater range of materials suitable for reuse
- Definition of how many times a pack needs to be reused for economic and environmental benefit.

Clear and accurate standards are needed to make resource use in the ‘use phase’ of refill more efficient. This, in turn, needs more research on cleaning assurances. But we shouldn’t wait for that to happen. We should continue to learn as we implement for non-safety critical product types. Making information about cleaning efficiencies public will be helpful so that the efficiencies will come sooner, not forgetting the importance of education of consumers in this process.

It isn’t sufficient to use current food safety standards as these imply a chemical wash followed by an 80 degree rinse. Why would manufacturers of personal care products who have carefully honed their recipes and particularly those with minimal and natural ingredients be happy with a chemical wash? Beauty Kitchen, for example, has been testing washing for two years and has proved it doesn’t need detergent. SESI washes in cold water with no detergent. The tubs contain cleaning products that are all largely similar in base properties - they all clean, so sufficient product residue mixes with the cleaning water, without introducing more chemicals to the cleaning process.

The most important part of the cleaning process is the drying as the most contamination one would expect would be from water residue in the tubs before filling. Tubs must be completely dry before filling. At SESI, this is currently done through air drying outside in order to minimise impact. However, the manual processing is hampering their ability to scale, due to lack of space for washing and drying, particularly with longer drying times in winter.

Funded projects looking at cleaning

Three SSPP funded projects are researching, developing and testing the cleaning issues around reuse: Again, RE and The Refill Coalition.

Again is a start-up and has won UKRI funding under the SSPP Business-led R&D competition. Again's vision is to develop a network of UK wide cleaning hubs for reusable packaging that make reusable packaging "simple, CO2 beneficial and the same price as single-use packaging".

Founder and CEO, Matt Kennedy, says: "The economics of reusable packaging is not currently scalable for big business as the cost is currently between 5 and 10 times the price of single-use packaging. This high cost of access means very few brands are likely to scale the adoption of reusable packaging. The cost of backhauling packaging is a barrier. Cleaning structures that are in place currently date from the 80s milkround. They are largely chemical heavy and inefficient."

Again has prototyped a scalable (i.e. to numerous locations around the country) cleaning facility for reusable packaging that fits inside a shipping container. These facilities can be sited next to business depots. This will enable companies to collect back packaging within their reverse logistics, Again will be responsible for preparing the packaging for reuse and will provide it back to the company in a palletised load in the same way they'd receive SUP. Each "Clean Cell" could service many businesses, thus bringing down the cost of reusable packaging.

The goal is to match the cost and format of single-use, so as to integrate with existing fill-lines.

Glass beer bottles and spirit bottles are an easy switch, but Again is rapidly moving to other formats including plastic packaging. They are already working with Abel & Cole, The Modern Milkman and Milk & More.

They will soon embed "Again Tags" on brand packaging for traceability, LOT code compliance, and optimisation insights. These laser-etched unique QRs will be readable by production lines, CleanCells and consumers.

Kennedy says: "Packaging is only waste because the people who possess it are not the people who benefit from its reuse."

He says there's a confusion over packaging ownership that is hampering reuse logistics in general. The waste management companies consider that the brands own the packaging, the brands want the packaging back because of the current and forthcoming taxation on SUP, but don't have the infrastructure yet to switch to reuse over recycling. Again is hoping to provide the missing link to close the loop, whereby they are able to take packaging from the waste management companies or bypass waste management companies with consumer return methods, prepare the packaging for reuse and sell it back to brands at a price that competes with single-use.

Kennedy predicts that the number of collection methods will snowball over the next few years. For instance, there's the forthcoming national DRS, there's the Beauty Kitchen method of drop off locations (bring banks), there's the Abel and Cole method whereby the previous week's containers are collected at each delivery. Again will continue their challenge to integrate with all these methods.

Again's charging model is currently a monthly access fee and a small unit fee. This equates, for example, to a current cost of 24p for a 70cl glass bottle. They want to get this cost down to 8 to 10p per item so that it's slightly below the single-use price. Fill-line investment can be in excess of £20 million and be expected to last 25 to 30 years. For reuse to really take off it needs to be a no brainer and slot straight into a manufacturer's existing system.

Their current R&D project will take away a lot of the problems as it will be just like single-use for the manufacturers in that the manufacturer will take delivery of a palletised load of ready-to-use vessels, just like they do now, but from Again, rather than their current single-use supplier.

A fundamental consideration is that 20% of all packaging goes into closed loop settings such as bars and stadiums. This part makes collection easy. But 80% of packaging goes into homes. How do you get that packaging back? We need to look at ways of collection for reuse from the home in the same way we collect for recycling. That will be the game-changer, taking it from a couple of million units to a couple of billion units.

The current system at Again is an 8 to 10 week onboarding process for companies. There's an R&D facility in south London that firstly proves if current packaging is reusable. Then they look at the collection methods and pilot for a couple of months. The aim is then to have CleanCells localised. They plan to launch 4 CleanCells in the upcoming year.

Beauty Kitchen founders, Jo and Stuart Chidley also secured funding for the RE project offering standardised packaging for the beauty and personal care industry. Jo Childley says: "RE is a scalable whole system approach for refill and return on the go, using smart reusable packaging and removing the barriers to retailers, brands and consumers who want to participate in the circular economy. This product as a service would give brands, retailers and consumers the opportunity to lease packaging."

Chidley describes their vision as a business opportunity to enable the creation of jobs within areas of social deprivation. RE will initially be operating their own wash station to continue research and development, however, they will also collaborate with Again. They will be offering consumer collection points in major supermarkets. These collection points will offer a DRS service, giving the consumer a voucher for the deposit that can be used on any brand that uses the same standardised bottle.

Initially the collection points will be in aisle alongside the products for sale in the standardised packaging, but ultimately it is planned that the return points will be front-of-store to provide additional convenience. They will collaborate with LOOP and the return points will be shared.

The Refill Coalition's SSPP demonstrator project also plans to tackle the scalability issues around refill, including cleaning. Current bulk hoppers are saving consumer packaging but are not part of a fully circular reuse supply chain. This means that single-use bulk sized packaging is used to transport goods from supplier to store, where staff manually wash and refill the hoppers with product - adding both cost and single-use packaging into the supply chain. To scale refills, it is necessary to transition to a system where the hoppers (redesigned to withstand the pressures of the supply chain) will be filled at producer fill lines rather than in store. This will reduce costs across the supply chain and eliminate single-use packaging all together. This system has been designed along open source principles meaning any company in the supply chain can use the technology. After a two-year closed trial period, Conway says that the system will be opened out to industry.[81]

Miwa[82], a Czech company, is already providing hoppers (or capsules) that are washed off site. The 12 litre capsules circulate between manufacturer, retailer and wash facility. When filled, the hoppers then carry information about the product. However, these capsules also use a single-use liner. The difference between the Miwa system and the currently used bulk hopper system in the UK is that Miwa controls the reprocessing of the liner bags. In the independent sector some report making an effort to get the bulk packaging recycled. This includes paying for facilities such as Terracycle collection boxes. Many report that they are unable to recycle this bulk packaging. However, a better system should be prioritised, particularly as the changes required of the customer need to be seen to be worthwhile, rather than just moving the single-use waste problem up the supply chain. For this reason, cleaning standards, assurances and fully circular supply chains - replacing the single-use aspects - should be a priority. If fill lines are to change, then they are likely to change for a period of 25 to 30 years. We need to get this right at a system level so manufacturers don't change to a system that is only slightly less bad. Cleaning assurance and prevention of cross contamination within the fully circular supply is therefore key.

81 Catherine Conway, Unpackaged, SSPP Session: Re-use: **Game changer or logistical nightmare?** at GRIPS 2022
82 https://www.miwa.eu

Labelling

Sarah Greenwood of the Many Happy Returns Project points out that: “Standardised packaging is key and that’s going to be a point of friction between the brands because each brand is going to want to stand out. The more that the brands have different packaging, you’re going to get fewer efficiencies, so that does need to be addressed.”

This shows that labelling and glue technology also needs to become an important part of the cleaning considerations with a project that shows labelling as a more important means of branding than different packaging shapes or colours.

Work carried out by Wayne Barron of Rethink Packaging gives a clear example of how labelling alone can be used to great effect within standardised packaging usage.

Where the jars differ, there’s a lot of visual processing to be done by the consumer. Taking away the differences to the jars, makes the labels “pop”, becoming easier on the eye and the brain of the consumer. It is the label alone that helps the consumer make their purchasing decision.

There are also two different approaches to consider for labelling which have directly opposing needs:

1. Labels that are easily removed during the washing process, so packaging can be shared across products, brands and manufacturers, thereby gaining efficiencies through minimising mileage. That is, vessels are cleaned locally and sent for reuse by the company that is closest.
2. Labels that are reusable, i.e. can withstand a certain amount of cleaning, so packaging can be reused multiple times with only spot cleaning externally, where it is collected and cleaned and refilled by the same company. There may be efficiencies from refilling with the same product multiple times without cleaning, likely to be possible in the case of non-food vessels. Even with cleaning, there may be advantages to keeping vessels in use for the same product (as SESI do currently) in order to protect against cross- contamination of allergens, such as nut-oils commonly used in cleaning and personal care products. An example of a suitable label might be a waterproof label, with glue that maintains the contact when washed in cold water but would allow the label to float off in a wash that is not too hot that it deforms the container.

With so much still to learn about cleaning, it is vital that flexibility is built into cleaning technology, and that user perception as well as drying and measuring cross-contamination are not forgotten.

Image credit: Rethink Packaging

11

Behaviour change, what's happening and what's required

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Consumer desire and consumer behaviour

A 2019 survey by GlobalData reported that 71.3% of UK consumers across all demographics are willing to use refill services.[83] Waitrose found their Oxfordshire refill trial reduced SUP by 90% which if implemented across the whole FMCG supply chain would result in the elimination of more than 2 million tonnes annually of SUP. Catherine Conway explains: "Over an 11 week trial Waitrose removed 130,000 pieces of single-use packaging, which represented a 90% reduction for those applicable categories, which just shows the amount of packaging you can take out of the system with a reuse or refill alternative."[84]

The National Retail Federation/IBM report 77% of consumers saying sustainability is important to them and 57% are prepared to change their shopping habits to reduce negative impact on the environment.

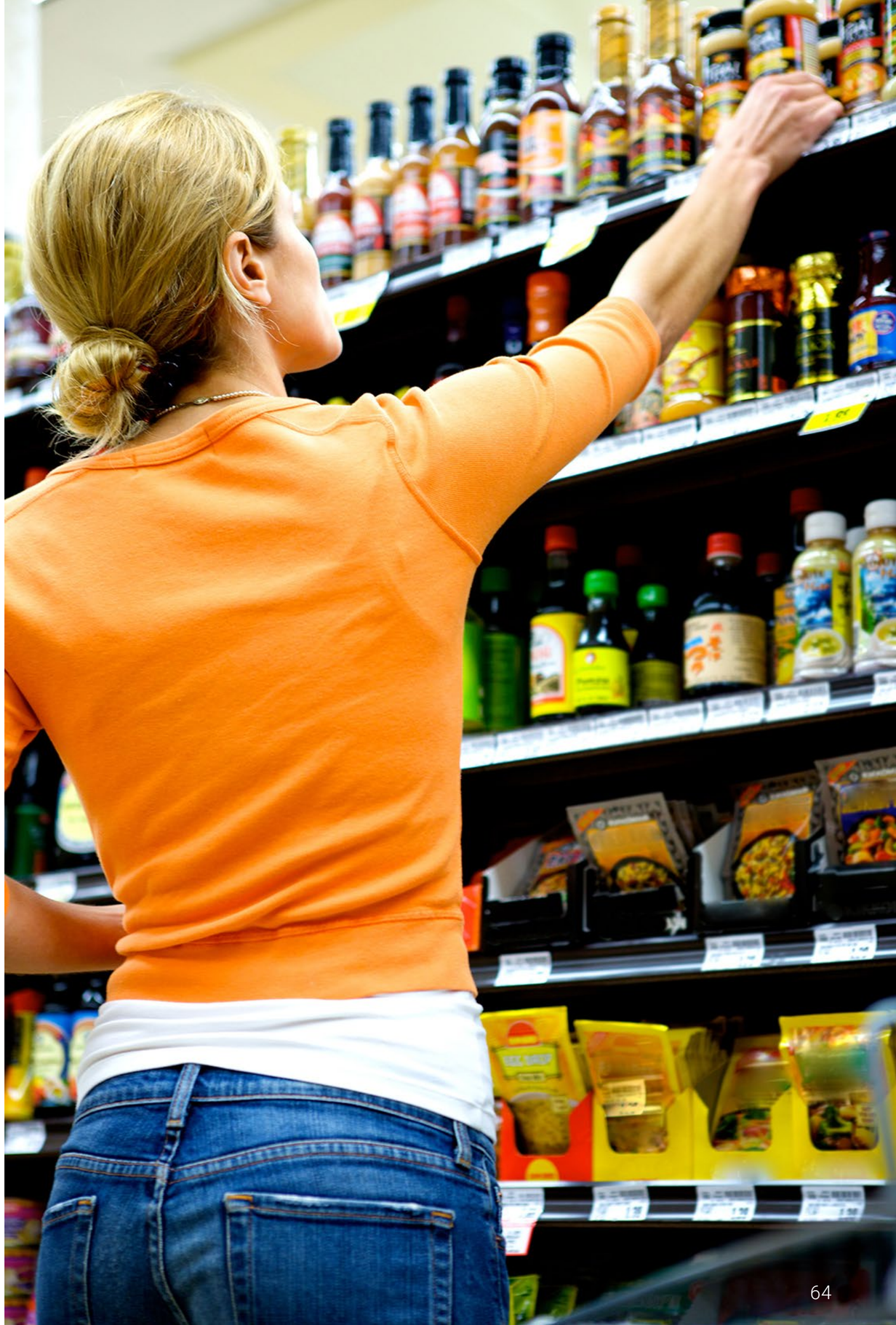
However, despite many people saying they want this, refill purchases are currently estimated at < 0.1%. Ecover have offered refill for over 20 years, and state that they have over 700 refill points across the UK.

But this is a fraction of the number of outlets where their refillable bottles are bought by customers as single-use.

Livvy Drake, of City-to-Sea and Paul Garner of Asda both speak of the value-action gap, whereby there's a mismatch between what people say they will do and what their actions show them doing.

Rorie Parsons, of University of Sheffield's Many Happy Returns Project, has carried out informal interviews with shoppers accessing refill services. These have been followed up with informal observational chats where they follow shoppers on their refill journey. He says: "The observations from kitchen tours helped them see that whilst people said one thing, and they defined things in one way, when we came to observe them and join them on their daily routines, they were doing things totally differently."[85]

Tom Domen, Head of Long-term Innovation at Ecover, writes: "The key is understanding the reasons why people do(n't) refill."[86]



83 https://www.globaldata.com/35-of-consumers-more-likely-to-purchase-products-without-any-plastic-at-all-compared-to-goods-with-recycled-plastic-says-globaldata/

84 Catherine Conway of Unpackaged, SSPP Session: **Re-use: Game changer or logistical nightmare?** at GRIPS 2022

85 Rorie Parsons, Many Happy Returns Project, SSPP Session: **New Strategies for Understanding Citizen Behaviours** at GRIPS 2022

86 Basis Research / Ecover, 2022, The Refillution Has Begun, https://www.ecover.com/blog/refillution/the-refillution-has-begun/

Parsons is in the process of publishing a paper on reuse systems for beverages in other international contexts and its potential in informing the establishment of UK reuse systems. He says: "While the success of reuse systems is often attributed to heightened levels of environmental consciousness, we argue that understanding national variations in levels of reuse requires greater attention to the commercial drivers, regulatory context, and infrastructural factors that underpin these systems.

"We suggest that current understandings of 'environmental consciousness' are a 'landscape' factor and, while it may put pressure on existing regimes to move towards a circular economy, we emphasise that this does not dictate transition or transformation.

"With reference to 'landscape' factors, MLP is a widely used framework (see, for example, Santos and Lane, 2017; Rut and Davies, 2018; Kirsner et al., 2019) for understanding processes of innovation and socio-technical change through reference to the interactions between niche, regime, and landscape scales. In this perspective, regimes refer to relatively stable configurations of institutions and technologies that constitute the prevailing organisation of particular sectors. When existing regimes are replaced by new socio-technical arrangements, a transition is said to have taken place.

Innovations are typically developed at the niche level and are said to break through when changes at the landscape level (such as macro-economic trends, political belief systems and global shocks) put pressure on the dominant regime and create windows of opportunity. Our view in this paper is that greater attention to interactions and dynamics at the regime scale are instructive for understanding the trajectories of reusable packaging in the beverage sector."[87]

We should therefore be mindful that an apparent increase in consumer desire to refill doesn't constitute transition and we are really looking for system infrastructure change as the behaviour that's required for transition.

87 Email exchange between Rorie Parsons of University of Sheffield and Anna Pitt, June 2022

Design as a pathway to behaviour change

Garrath Wilson identified three ways to achieve the change from a linear take-make-break- dispose system to a circular economy.

Route 1 - Change the product[88]

Route 2 - Change the behaviour

Route 3 - Change the product and the behaviour

Lofthouse and Prendeville (2018) argue for the advantages of design-led pathways to speed up transition to refill: "Designers are recognized as having the skills to understand people, influence values, attitudes and perceived user wants and desires (Vezzoli and Manzini 2008). Through the construction of symbolic meaning, designers are well positioned to shape culturally dominant value systems (Wahl and Baxter 2008)."[89]

They suggest a need to focus on "the duality of human and technological aspects of innovation". That basically means that when designing products, the way humans will use/abuse the system/product needs to be thought through at the outset, rather than just designing something and expecting people to use it in the way it was intended. What will people do wrong?

Rachel Gray of WRAP says: "The cognitive load for refill is immense, at least while you are learning."[90]

Lofthouse and Prendeville (2018) studied the additional effort required by the consumer in some refill models: "This externalization of labour, known as the 'third job' is the work outsourced to the consumer by service providers, all of which puts pressure on the consumer and means they have less disposable time (Toffler 2013). Further, the more the customer is asked to do by way of unpaid work, the more important this sector of the market becomes (Toffler 2013)."

They ask: "What are the ethical questions that need to be drawn out with respect to designing for users in circular economy contexts? In particular, what power imbalances, data and privacy rights, as well as uneven development issues are at play? How can designers reconcile these issues? … Research on design in the circular economy needs to develop knowledge on designing products and services by considering norms, behaviours, attitudes and the contexts of people's social lives. This needs to be considered in light of past research on alternative consumption models, recognizing the immense challenges of behaviour change and sustainable consumption."

They make reference to the number of high-end circular economy offerings and conclude by arguing that: "Changing the way that the circular economy is framed so that it is more inclusive of people and their behaviours would open up a broader and more nuanced debate on the role of design within a multitude of possible circular economy futures. Expanding the designer's opportunity beyond what we observe as positivist design engineering approaches, would present opportunities to respond to the very real societal issues that we face."

In order to design systems that will be used successfully we need to understand everything we can about behaviour in relation to refill and reuse.

88 For the purposes of this report we'll consider a product to be the sum of the product and any packaging.
89 Lofthouse V. & Prendeville S. (2018) Human-Centred Design of Products And Services for the Circular Economy – A Review, The Design Journal, 21:4, 451-476, DOI: 10.1080/14606925.2018.1468169
90 Anna Pitt's interview with Rachel Gray, March 2022

Barriers: lack of access

There's no doubt that, to a large extent, the small market sector occupied by refill is down to lack of availability. There are in excess of 87,000 grocery stores of varying sizes around the UK. Despite the trials in supermarkets, the proliferation of independent refill and zero waste stores with many new outlets popping up over the last three years, an increasing refill availability in farm shops, for instance for frozen goods, these outlets number around 1000 currently. This means that for the vast majority of us, we don't have the option to refill on a regular basis locally. Surveys show that most people refill 'to help the planet' and it is widely understood (even if actions don't necessarily match that understanding) that driving long distances to access refill is counterproductive to that aim.

A regular refill customer says: "I often only find out about zero waste shops through Instagram and by eventually stumbling across them. There are some websites trying to collate lists but there's often missing or outdated information and it relies on a person updating it. Having a more standard, easy access place for a company to say 'here I am, this is what you can refill here' would be useful. Though I can also see a slight downside of it possibly making people travel further to refill."

Barriers: habit

Where refill shops do exist, particularly where there are independent shops, customers are not always queuing out of the door to access the service and there are many independent refill shops that have opened and since closed again as they don't have enough footfall to cover costs. The lack of take up is often to do with habit. We've got into the habit of doing much of our shopping at or via supermarkets. Changing habits is a hard task for any of us.

Michael Archer of CHEP says: "If reusability, for me as a shopper, is only about one product item that I buy occasionally, then I will keep forgetting. If on the other hand it just becomes a habit and I'm doing it every day, every time I pop into a supermarket, in the same way that I pickup my reusable shopping bag, that I didn't use until ten years ago, I need to make sure I pick up my other reusable things and take them with me. It's doing it in such a way that we enable shoppers to create those good habits."[91]

The author makes the observation that the success of the German "Mehrweg" DRS system is very likely connected to ingrained habits around sequential reuse in numerous scenarios in daily life. At events use of pooling systems, big and small, are commonplace. People expect to be able to use a reusable glass, cup, crockery or cutlery and pay a deposit with the first purchase of food or drink.

Each subsequent purchase would involve an exchange of the vessels wherever that takes place i.e. items don't have to be returned to the same place they were borrowed from and on leaving the event the last used item is returned and a deposit is repaid (anywhere within the event) when no exchange is made. In addition, it is customary to leave items outside your house usually with a sign saying they are available for people to take away if they can be of use to them. It is therefore ingrained as a habit from children that we pass things on for reuse rather than throwing them away.

Livvy Drake, of City to Sea says, however: "In every refill/reuse scenario you have to think of it as a different kind of behaviour. So refilling a water bottle is very different to refilling a plastic container for your washing liquids, because one of them is a habit, so you do it regularly. People get into the habit of taking their water bottles with them every day, so they've always got it on them. So it is easy to refill it. Refilling your cleaning products is something you do every three months, so it's less of a habit."

91 Michael Archer, CHEP, SSPP Session: **Re-use: Game changer or logistical nightmare?** at GRIPS 2022

Ease of use

Drake explains: “There’s also the need to think about the ease of doing those behaviours. If you’ve ever experienced refilling a washing-up liquid, it’s messy - it takes a long time - whereas filling your water bottle is very quick. So the work that’s being done by RE [and others e.g. Tenschul] is all about reducing the time it takes to refill, removing those barriers, that messiness. We have to think about what barriers there are to doing it, what are the friction points and what will incentivise and motivate people. So, what’s the existing behaviour and what’s the choice architecture which creates that behaviour so people know how to do it?

“Supermarkets are set up to be quick, easy and the way that it is all laid out is you have particular products together. They are designed to maximise sales. They [supermarket companies] know about how behaviours work. The statistics are that 60% of shopping behaviours are system 1 behaviours where it is automated and habitual or impulse purchasing. Supermarkets are set up for that for quick thinking and when we are on autopilot. Whereas in a situation where we have to decide whether we buy x or y, then we have to be conscious about it and it takes us more time. This is our System 2 brains. This one uses more energy and our brains try to minimise that. Refilling is System 2 behaviour. It is more involved and our brain doesn’t like thinking. There are lots of barriers to those behaviours.

So we need to think about how we make it as attractive as possible and as easy as possible. What do we do that makes people feel good about doing it, and what kind of nudges are there to remind us?” [92]

Drake talks about a model called ‘Easy, Attractive, Social and Timely’, which is a very simple way of understanding how we encourage behaviour change. She says: “The social part of it is “what’s socially acceptable”. There’s anecdotal evidence to suggest that one of the things about refill shops, as in zero waste shops, is for a lot of people they feel intimidated by them or they don’t go in them.

“The timely thing is at the point where you are thinking ‘I need some beans or some rice’ you realise you can just get it from the refill point. One of the barriers to going to a refill shop is their opening hours e.g. 9 to 5, Monday to Friday in a town centre, whereas supermarkets have set themselves up so that you can go shopping at 8pm. So unless your refill shop is as easy as going to the supermarket it is another barrier to adoption.”

92 Anna Pitt’s interview with Livvy Drake, March 2022

Cost considerations

Another barrier to refill uptake is cost - or at least perceived cost. There's a widely held perception that refill is more expensive. In centre of town locations, this may be a necessity because of the high cost of running bricks and mortar establishments. It is also because many of the independent stores, where refill is on offer, are also concerned about regenerative farming as well as social good, so the products are often organic and/or from small producers. They are not benefiting from economies of scale and in addition they are paying fair prices for a quality product.

Catherine Conway, founder of Unpackaged, says: "I think there's probably an assumption that it's a more well off customer or someone who has the time, money, luxury to think about the types of food that they are buying. However, as we are talking to more and more retailers, actually we're finding there's a customer base in every market, whether it is at the more basic end, the more value end, because these products can be really, really good value. It is actually a very cheap way of feeding a family."[93]

Steph Van de Pette of So Sustainable, Watlington drew the comparison of a jar of thyme with a cost range of 70p in Tesco and £2.15 from Ocado. It can be refilled for about 20p in her shop. Mario Kyprianou from refill @ The Grange in North London mentioned an increasing popularity of refill for cookery projects in school where he enables school pupils to buy only the quantity they actually require for a recipe, thus saving money and potentially food waste.

A recent tweet by Her Whey, an independent refill Store in Ryde, Isle of Wight, showed an example of a significant cost saving when buying unpackaged:

93 Catherine Conway, Interview with Paul Jenkins for The Pack Hub, https://www.youtube.com/watch?v=3_kYjGtwF4c

Pasta Price Match

Shop	Brand	Weight	Price	Price per Kg
Sainsbury	Own brand	1kg	£1.30	£1.30
Tesco	Own brand	1kg	£1.30	£1.30
Asda	Own brand	500g	70p	£1.40
Ocado	M&S	500g	75p	£1.50
Asda	Napoli	500g	£1.10	£2.20
Sainsbury	Own brand wholewheat organic	500g	£1.20	£2.40
Tesco	Own brand wholewheat organic	500g	£1.20	£2.40
Asda	Gino D'Acampo organic	500g	£1.25	£2.50
Sainsbury	Napolina	500g	£1.40	£2.60
Tesco	Napolina	500g	£1.30	£2.80
Good Club	Zero Waste	500g	£1.50	£3.00
So Sustainable	Zero Waste Organic	500g	£1.50	£3.00
Ocado	Garofalo Organic	500g	£1.82	£3.64
Good club	Zero Waste Organic	500g	£2.05	£4.10
Ocado	Garofalo	500g	£2.50	£5.00

Source: Anna Pitt, prices correct March 2022

The Thyme Table

Shop	Brand	Weight	Packaging material	Price	Price per 10g
Asda	Bodrum	50g	Flexible plastic	60p	12p
So Sustainable	Own brand organic	Sold in increments of 10g	Fill customer's own jar	25p	25p
Good Club	Own brand	60g	Returnable plastic tub	£2.28	38p
Asda	Own brand	17g	Glass	65p	38.2p
Tesco	Own brand	16g	Glass	70p	44p
Ocado	Own brand	16g	Glass	85p	53.1p
Sainsbury	Own brand	12g	Glass	85p	71p
Ocado	Own brand organic	17g	Glass	£2.00	£1.18
Ocado	Bart	18g	Glass	£2.15	£1.19
Asda	Schwartz	11g	Glass	£1.65	£1.50
Ocado	Schwartz	11g	Glass	£1.75	£1.59

Source: Anna Pitt, prices correct March 2022

In the above price comparison tables, the rows highlighted in yellow show products in refill.

There are many examples of products in refill offering the consumer a cost-saving, either through direct price comparison or through the ability to buy less of a product according to needs. However, there is a concern within the independent refill sector that as more supermarkets start to offer refill, it will bring further damage to the independent sector, as supermarkets with their economies of scale can afford to offer 'lost leader' pricing on some goods in order to attract shoppers to their store.

Refill and right-sizing

Consumer expectation is a key factor in the acceleration of take-up of refill. A study by Lofthouse et al. (2017) found that consumers were unwilling to pay more for a concentrate even when it was made clear that it would last longer, suggesting an inability or unwillingness to calculate or consider the true cost of a product in relation to its number of applications.[94]

This is perhaps an extension of consumer expectation whereby the larger the quantity of product a consumer buys the lower the price per volume they expect to pay. This has long been a model in use in supermarkets in the UK and elsewhere. There is a general belief that this is due to the cost of packing and packaging of smaller quantities representing a higher proportion of the cost of the overall product. In reality, the price structure isn't a straight-forward reflection on the actual product cost. It is likely this results in waste within the home. This brings two considerations as we transition to refill:

1. Refill brings the opportunity to right-size according to need if the product is the same price whether you buy a lot or a little. This may have the potential to break the cycle of over-purchase leading to waste.
2. If customers right-size their purchasing, will businesses see a drop in sales and will they accept the drop in sales, in the knowledge that they are reducing over-consumption?

At the launch of The Blue Paradox exhibition, Richard Walker, CEO of Iceland, reported a 25% reduction in sales of fresh fruit and vegetables when they took the decision to remove all packaging from this product sector.[95] They therefore switched from plastic to cardboard packaging. The implication was that he felt they were losing customers to other stores still selling fruit and vegetables packaged. However, this could also be attributed to customers picking up three rather than four apples. This would be worth further investigation.

94 Lofthouse et al (2017) https://doi.org/10.1002/pts.2337
95 https://www.blueparadox.com

What behaviour change is right and why?

A further barrier is that the supply chain for refill isn't always fully-circular which leads consumers to think it is just "greenwashing" and not genuinely reducing carbon footprint and waste. Given the additional effort required and particularly the more conscious shopping experience refill leads to, consumers are likely to want to know they are doing the right thing and that their effort brings results i.e. reduced waste and lower carbon footprint. The author's small scale survey showed these two points as the most popular drivers for refill.

Many would agree that refill has really taken off in the UK thanks to the "Blue Planet Effect". With the rapidly expanding refill offer in all its formats, it is confusing to know what the right path might look like. We're not at a stage yet where we can make that judgement call. As Professor Thomas Webb of University of Sheffield explained:

"Lots of people want to 'do the right thing' but we don't yet know exactly what that thing is. This leads to the often cited gap between intentions and action (Sheeran & Webb, 2016).[96] There's a broad understanding that reducing plastic is necessary, but no clear information about exactly what that means in terms of behaviour change.

Switching away from plastic because of the negative side of leaking into the environment emphasised by Blue Planet 2 has for some consumers taken the place of removing packaging altogether. It is clear from the LCA studies for SUP, plastic has a significantly lower carbon footprint than glass, aluminium or steel. We do need to ensure that we are not problem shifting by material shifting instead of moving away from single-use materials altogether where we can.

Paula Chin of World Wildlife Fund (WWF) echoes this concern. In relation to the Plastics Pact Targets and our progress towards them, she says: "One of the things I was disappointed about was the lack of transparency on material switching. Some of the supermarkets have introduced an additional 'r' into the waste hierarchy - 'replace'. 'Replace' is not part of the waste hierarchy. For example, Morrisons removed plastic bags but they replaced them with paper bags. So let's think about the fact we're replacing single-use with single-use. It kind of defeats the object in my view."[97]

Whether this is "greenwashing" or just misleading consumers by not telling the whole story is uncertain. But what's clear is, there's work to do to ensure the correct messaging is going out not just to consumers but to businesses too.

Jonathan Wragg says: "For me, any industry will promote itself and knock the others, that's just business. But greenwashing isn't business, it is simply a con. By greenwashing, you are conning customers, the public, or even yourself that one product is better than the other by using certain stats and figures that are in your favour. In fact, I believe it should be three questions. Forget about the marketing, forget about the data, and forget about what you think the public wants to see. Just ask the below when switching away from plastic:

Q1. Does the alternative product work equally or better than the plastic version?

Q2. Is the alternative product equal or better to recycle than the plastic version via household recycling?

Q3. Is the alternative product better than the plastic version if it does not get recycled?"[98]

96 Sheeren and Webb, 2016, The Intention-Behavior Gap, online at: https://compass.onlinelibrary.wiley.com/doi/abs/10.1111/spc3.12265
97 Paula Chin, WWF, SSPP Session: **Are we on target for 2025? Is the UK Plastic Pact a destination or a stepping stone?** at GRIPS 2022
98 https://packagingeurope.com/comment/are-paper-bottles-greenwashing-the-answer-isnt-so-simple/7971.article

Understanding behaviour change and how to encourage it

For the right behaviour change to happen in order to speed transition to refill, we need to remove the barriers. Alongside this, we need to educate consumers to show how these barriers are being removed, how they can access refill, and why they should access it, rather than continuing the pattern of overconsumption of SUP.

The Refillution Report identifies three major misconceptions about how people perceive packaging:

1. Packaging is worthless
2. Recycling is the answer
3. Convenience is everything.[99]

Challenging people's attitudes to these three key assumptions is necessary to create the paradigm shift. We're already at a stage where we're moving slowly from early adopters to early majority. It is widely acknowledged that changing attitudes is hard, but we've seen such change before, including the change from shopping locally with minimal packaging pre 1950s. We've seen societal changes such as cars going from no seatbelts to almost everyone wearing a seatbelt - some of us will remember "Clunk-click every trip"[100] even though we might not want to because of other associations.

Again, many of us will be aware of "Smoking Kills" slogans on cigarette packages even if we've never smoked. These behaviour change campaigns share the commonality that they are government backed, nationwide, on TV. One quarter of adults still smoke in the UK, showing that behaviour change campaigns are never 100% successful. It is also worth considering the Keep Britain Tidy campaign. Whilst it is difficult to measure the success of that campaign, as we don't know how bad Britain could be without the 70 years of campaigning, Britain is far from tidy.

Learning from past behaviour change campaigns will be vital to widespread adoption of refill, with a well designed behaviour change campaign that helps people focus on the benefits to them of refilling rather than the problems caused by not refilling i.e. remaining with SUP.

Żaneta Muranko said: "I see reuse models can offer 'something for everyone'. The reuse models on the FMCG market currently operate across two types of reuse behaviours - exclusive and sequential, both of which can appeal to various consumer segments for different reasons.

99 Ecover and Basis Research (2022) The Refillution has begun, https://www.ecover.com/blog/refillution/the-refill-report/
100 https://en.wikipedia.org/wiki/Clunk_Click_Every_Trip

There are offerings that enable us to reuse packaging we own, if ownership matters to us (e.g., if it mitigates perceived contamination), or offerings that provide a level of convenience that is somewhat similar to how we consume in the single-use system, such as in sequential reuse, when buying consumables that are pre-filled by someone else for us. Businesses can therefore use a multi-model approach to increase the reuse options in specific offerings, such as we can allow people to bring their own packaging to refill stores, as well as provide them with rental packaging so that they can still practise reuse in circumstances when they do enter a retail space to buy stuff but not have any reusable packaging on them."[101] If we remember this we have the capacity to build a multi-model refill system that can fulfil everyone's needs and adapt to all differing capabilities for behaviour change.

Conway says that the most important thing is to consider who your customer is. She says: "The customer who goes to a small independent Zero Waste store is very different to the customer who goes to the refill section of a supermarket. The early adopters who will go to a Zero Waste store will undergo any amount of hassle, inconvenience, complexity, balancing something on their knee to get to something else. That doesn't work in a supermarket."[102]

The Refillution Report says: "If we want to precipitate a change in behaviour, every step – practical or cognitive – in that new behaviour is a potential point of failure. The longer and more involved the journey we expect shoppers to go on, the more of them will not complete the journey as a step fails or gets missed."[103]

However, it should also be noted that imperfections in a refill scheme that is up and running, widely available and starting to make an impact in resource saving is better than delaying the start of a system for fear we haven't got every element right, as with the long and still awaited DRS system. As long as the system is designed with circular economy and agile principles, then improvements can be made to that system as we learn more. It is for this reason that we must ensure that we don't decouple refill/reuse from recycling. Everything we design and build as we further develop a nationwide refill infrastructure must be designed in such a way that it can be adapted, improved, dismantled and its resources reutilised.

Jo Chidley refers to the behaviour change model: Access, Convergence, Choice and Value as the important factors to achieve consumer behaviour change. Chidley's project is studying various sales models to find which models create the necessary uptake i.e. the necessary behaviour change by consumers. For example, ASDA in Glasgow is trialling refills 'in aisle', with prefill and return points, whereas York is trialling a specific refill area. So far, they've found there's more uptake in aisle.[104]

The trials are showing that customers want to refill. An example that proves this is one brand has put its lowest selling SKU in a refill dispenser and they are getting more uptake in refill than in single-use. They've increased their market share of this product thanks to the refill sales, so they are getting shift. This shows customers indicating a preference for refill.

101 Anna Pitt's Interview with Żaneta Muranko, March 2022
102 Catherine Conway, Unpackaged, SSPP Session: **Re-use: Game changer or logistical nightmare?** at GRIPS 2022
103 https://www.ecover.com/blog/refillution/the-refill-report/
104 Anna Pitt's interview with Jo Chidley, March 2022

Cameron Galloway, Director at Martek Zero Waste, a supplier of bulk hoppers, also believes that refill needs to be 'in aisle' for people to change their behaviour and transition to refill.

There is, of course, behaviour change for retailers too. Galloway says: "Martek aims to be a one-stop shop for refill. They want to enable retailers to get on board without having to overthink delivery."
They are working on the consumer journey and how people flow around the retail space. He's concerned that companies are getting it wrong. For example, he mentions Biocoop and Carrefour in France are putting in aisles of 100 to 200 gravity bins and just expecting people to come. Martek is looking at much smaller set-ups that integrate refill into the existing consumer experience. He feels we should be starting with 5 to 10 bins amalgamating packaged and unpackaged. He gives the example of curry and suggests gravity bins for rice, scoop bins for herbs and spices and then packaged naans.[105]

The importance of social norms cannot be underestimated. Just like litter attracts more litter, seeing people taking part in refill is what is most likely to speed transition. Successful companies like Apple will put a great deal of marketing effort into making sure that their latest gadget is seen everywhere.

Chilly[106] is a good example of successful marketing with images of smiley, happy people carrying their Chilly bottle now everywhere. Empty aisles of refill hoppers/ dispensers do nothing for the speed of transition to refill - in fact, it will rather have an adverse effect. So if footfall doesn't come naturally - fake it, until it does. Fake shoppers have long been employed in a security role, so this is not beyond possibility.

The greater cognitive load required for shopping with refill, the need for more System 2 thinking, can be looked at as an advantage and a behaviour we absolutely need to encourage, given the overall need to reduce our consumption and reduce waste product as well as waste packaging. This is because the decision-making about what to buy shifts from the point of picking an item off a shelf, to the point of using up a product, preparing the container for reuse and putting it into our shopping bag. However, it can and will still involve a lot of habits. As an experienced refiller, the author says: "I get to my refill shop and can't remember what I came to buy until I lift the container out of my shopping bag to refill. The container tells me what I need, its size dictates how much I need, and this is where the mindlessness begins and I start to fill, or I hand over my containers to be filled for me while I chat about the topics of the moment.

It's much harder to buy more than I need. And that means that even if I'm paying a premium for my produce for whatever reason that might be - e.g. a centre of town location with premium rent, because it is organic and local or produced by a small business, it is hard to increase my spend and it is hard to buy too much. That in turn reduces waste."

The focus is very much about doing everything the consumer might possibly want and with infinite variety. However, it should perhaps be considered, at least, that infinite variety, abundance, flexibility of formats is perhaps the very problem that we are actually now forced to try and overcome because of the negative impact on our environment. Should we perhaps reconsider how much free choice we give consumers? It is a survival necessity that we minimise our use of resources and our levels of consumption, not a business decision in order to make more profit. So perhaps it is time to face up to the harsh reality that we need this transition, not for its business opportunity that's responding to consumer desire, but in order to create a sustainable future. So if we add a little consumer inconvenience, force a little more mindful behaviour, and at the same time take away some of the choice, would that be a bad thing?

105 Anna Pitt's interview with Cameron Galloway, March 2022
106 Chilly reusable water bottles https://www.chillys.com/uk

The Refill app

It is now widely understood that social gaming is a great way of encouraging the behaviour change we're looking for. City to Sea's Refill app started out as an enabler for people to find water to refill their reusable drinking bottles when out and about. City to Sea have already started work to expand the app to show take-away and grocery shopping opportunities in refill. There's potential to expand this to help consumers understand impact.

App usage has to become easier and particularly the always available aspect of being logged in so that registering your refills or showing someone your refill on the app is quick and easy. The Refill app team is already working on such improvements as funding becomes available. Ludo McCormick, App Business Development Manager at City to Sea, explains that they are increasing their offer to businesses and councils to give tools to Report on plastic and carbon savings. The individual logged Refills aggregate into one figure. This helps to show impact and transition towards refill as a social norm.

The current position for the Refill app is shown below:

- There are seasonal peaks of app engagement (focused around World Refill Day of >40k users)
- There were >197k active users in 2021
- Average session length was 2 minutes 19 seconds in 2021
- 79% of the app users are UK based

With improved monetisation coupled with increased funding through SSPP, this brings exciting opportunities for the use of nudges and gamification. A lot can be learnt and applied through study of successful apps such as Duolingo[107] and Strava.[108]

107 Duolingo is an app that uses social gamification and nudges to encourage language learners to participate in language learning

108 Strava is an app that uses social media style posts and gamification to encourage people to stay active: https://www.strava.com

Equality, Diversity & Inclusion

The author's trial survey picked up concerns over access and over cross contamination as concerns that need to be addressed as refill and reuse develops in the UK. Whilst the survey did look at barriers to refill, it didn't specifically collect demographic data. This could be added to the survey and it could be circulated to a greater number of respondents in order to provide a better picture of ED&I considerations as refill systems move forward.

There are plenty of stories, particularly in the Independent sector of not getting things right at first, having to move things around, but there's an attitude of 'let's try it and see what we can improve as we learn more'.

Van de Pette[109] explains, for example, that the square footage that's affordable for her business doesn't allow for wheelchair access in her centre of town location. She uses the example of another independent retailer in her town who has an accessible doorbell, so a member of staff can serve a customer from the door. She offers a click and collect service to overcome access issues. The current variety of formats, however, is an advantage to meeting the needs of all sectors of the community. The disadvantage is that there aren't enough outlets. This needs to be addressed through a general increase in uptake of refill in order to support more businesses.

It is widely discussed that an imperfect system is better than no system. Conway[110] says: "I wouldn't want the fact we can't meet everyone's needs at the outset to be an excuse not to do refill."

109 Anna Pitt's interview with Steph Van de Pette, March 2022
110 Anna Pitt's interview with Catherine Conway, May 2022

12

Companies active in the supply chain

See datasheet B

UK CIRCULAR PLASTICS NETWORK

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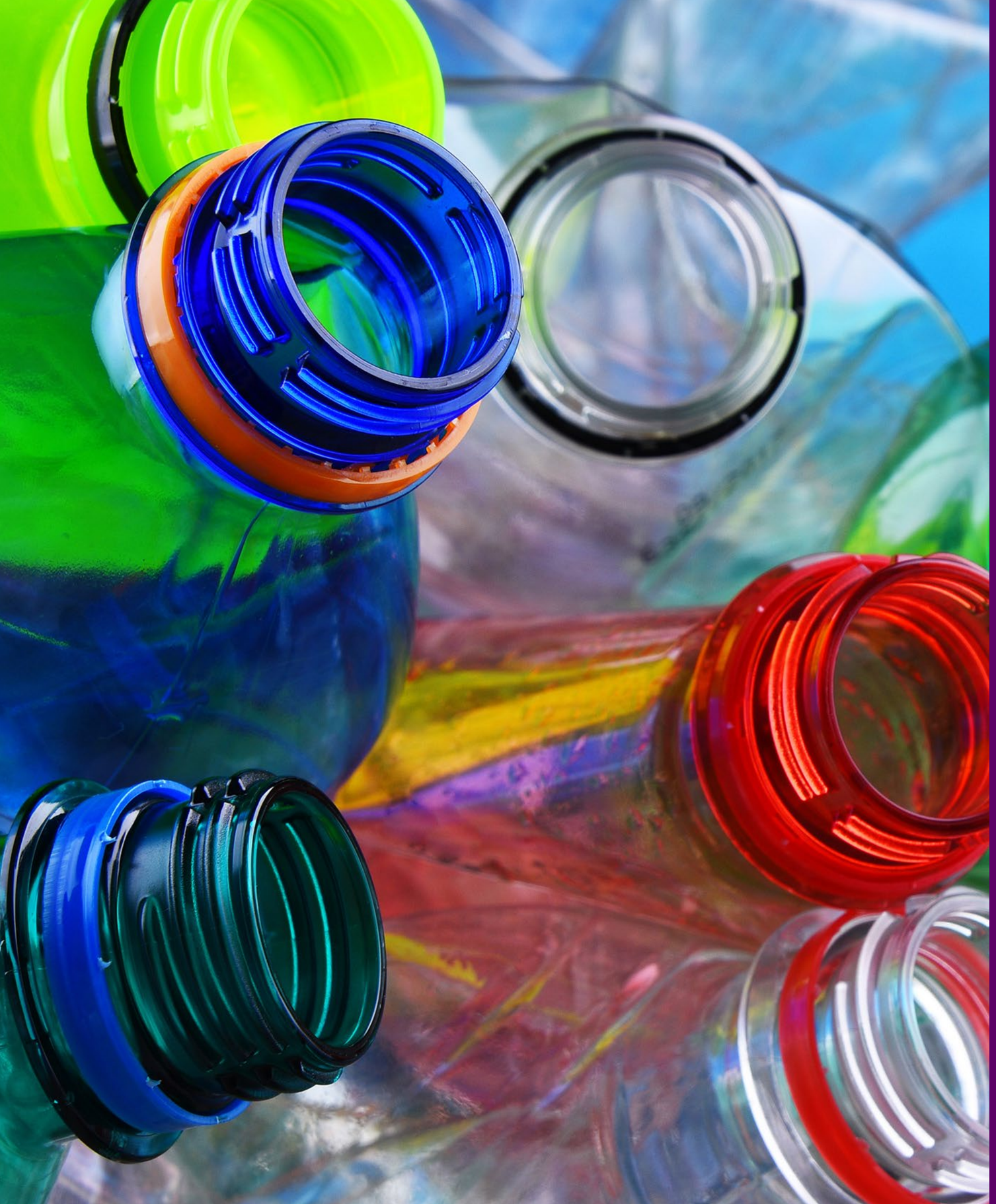

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Conclusions & recommendations

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In terms of carbon footprint savings, the arguments for refill are marginal, particularly while the supply chain is in its infancy and the behaviours are still to be learned, not just by the consumer, but right the way up the supply chain.

Refill is expensive to implement, yet for it to take off, we need it to offer a consumer price point that is at least overall, on a parity with SUP. Refill is disruptive to the highly honed FMCG supply chain, requiring more thought, more effort, again for both consumer and supplier. It is possibly also bad for business, in that the higher cognitive load required for refill compared to the autopilot grabbing at speed of goods in single-use has a high potential to lower overall shopping baskets.

However, refill has a potential to reduce not just plastic waste, but product waste for the householder. It should be noted that in the UK in excess of 70% of food waste has been found by WRAP to happen within the home. A 2019 BBC program, War on Plastic with Hugh and Anita,[111] highlighted the huge numbers of personal care and cleaning products people have inside their homes, often with multiples of the same product or multiple products for the same purpose.

Refill has an important part to play in a much wider issue for people and planet, in that it is considered by various experts to be important to society as a route to re-valorising resources. This aspect of refill needs more study. There's urgent need to guide the focus of our transition to circular economy, so that we are not just finding circular solutions that enable us to keep making more and more stuff but with the same resources, as this omits the consideration that the making of stuff even within the circular economy and with renewable resources has a carbon footprint.

We have to consider the circular economy transition as part of an overall aim to reduce our consumption. Chin says: "We need an overall material reduction target. We need to reduce the material consumption in the UK by 40%."[112]

There's a need for further discussion about refill as a distinct topic, with a view to particular measurable targets within the existing targets of the UK Plastics Pact that include it with recycling and composting.

111 BBC, War on Plastic with Hugh and Anita, 5th June 2019, https://www.bbc.co.uk/programmes/p07c90fp

112 Paula Chin, WWF, SSPP Session: **Are we on target for 2025? Is the UK Plastic Pact a destination or a stepping stone?** at GRIPS 2022

Chin says: "If we are going to pursue reuse as a priority agenda, we have to make sure that the success criteria are in place to ensure that the benefit of reuse is realised and it doesn't lead to an overall increase in material consumption and that it does displace SUP."

There's a further area of refill, in relation to the independent sector, that is largely unexplored in the literature and that is the social wellbeing advantages. There's anecdotal evidence that the small businesses that are largely in markets, high street and centre of community locations (e.g. attached to a community building like a village hall or school) or offering home delivery in a personalised manner are an important social service as well as a way to reduce waste.

So what's the future of refill and does it even have one?

Stuart Chidley of Beauty Kitchen says: "The biggest way we can create consumer pull is by not confusing consumers with mixed messages. Being powerful, confident and strong saying this is happening, means people have to get on board. How do you pull everything together to create the consumer pull? If there are enough of us pulling in the same direction, it would be a lot easier."[113]

Conway says: "The system as it is now is very clunky. Refill as it is now is not necessarily the refill of the future, but perhaps we have to be wary of not ''techifying' too much for people who are unable to use tech for many reasons. It's about understanding the different needs in the various retailers rather than a one size fits all."

Being careful not to over-techify, as Conway puts it, is an important short-term consideration in order not to marginalise some sectors of society who don't have access (e.g. a smartphone), or the ability to access a high-tech solution. But we have almost unwittingly accepted such a huge amount of tech into our lives, technology will be a vital part of the solution to the speed (or current lack of) and mess of dispensing into refill. Once the body of research has reached a tipping point, we'll have the standards in place to automate a system well. AI is therefore naturally going to become the 'community aunty'. AI will provide the nudges that guide our behaviour, as well as the means to enable the system to become as easy, mindless and habitual as single-use is now.

Evidence gathering to show how many people are refilling will be helpful to normalise the behaviour. This could be through widening access and participation in a more considered version of the Refill Survey tested for this report.

There's still clearly a lot to learn about refill and how to make it efficient, convenient and desirable for both consumers and businesses. Already, though, refill is gaining momentum and becoming more visible. Whilst further trials are much needed in order to test and learn, grassroots refill is likely to be a better, faster place to get the wave of visibility and following that, acceptance, that will enable trials to be more realistic and efficiencies to become viable.

As discussed, it could be that the more refill becomes normalised as a behaviour, the more customers who already favour local, small businesses, regenerative farming will access refill outside of supermarkets and footfall could increase across the sector. This is not yet known. Interestingly, independent zero waste businesses are closing already even though supermarkets are only in trials. One prospective refill business owner said: "It's just the fact that supermarkets are trialling refills, that makes me think I don't want to commit my life savings to it. Supermarkets shut down everything." However, the majority view is that to conquer refill, it is the supermarkets that need to do it.

113 Stuart Chidley, Co Founder of Beauty Kitchen, SSPP Session: **Re-use: Game changer or logistical nightmare?** at GRIPS 2022

Regardless of the sector and the refill model, what can Innovate UK KTN do to accelerate the transition wherever it is going to take place and make sure that it brings carbon savings and reduces litter? The following actions can be considered, working together with businesses.

1. Improve the data about who is refilling what and where so we have a clearer picture of reach. This can be done through consumer surveys to find out the who and the what and desk research to obtain a data-map of where refill is available. This will need to be multi-organisational as no single organisation at present has good data about the extent of refill taking place.
2. Consider the set-up of a group for standardised refill packaging. This is an area that needs collaboration in order to avoid a huge potential for wasted time and resources and some significant unintended consequences through failure of refill systems well before the intended end of life that makes them carbon efficient.
3. Carry out an impact assessment of the cost of right-sizing consumption.
4. Examine the availability and cost of start-up space for innovators and taxation models.
5. Signposting of information about reusable primary, secondary and tertiary packaging.
6. Knowledge transfer/outreach to businesses to look at packaging and fill line transition.
7. Conduct LCA of current business models where businesses can't access LCA themselves.
8. Carry out a comprehensive study of EoL scenarios for refill and their success/ failure rates and ensure any funding enables open systems with adaptability and circularity built in, with credible and accessible (not just aspirational) EoL scenarios.
9. Consider a multi-organisation, government-backed behaviour change campaign and get it on TV.
10. Consider support mechanisms for the independent sector of refill, such as support to create a Trade Association. A Trade Association could help these businesses contribute to the UK Plastics Pact targets, but also could help them survive, e.g. through shared information, insurances, memberships and combined buying power. Other than business closures being bad for high streets and communities, the benefits the sector provides for neuro-diverse, immunocompromised and lonely citizens is of value to society.
11. Develop a data-standard for displacement of packaging through refill that is accessible to all sizes of business and conduct an initial survey across all sectors of refill. This should be expanded through outreach work to provide a reporting mechanism accessible to all sizes and forms of refill retailers.
12. Set achievable, measurable and incremental targets for transition to reuse.

The transition to refill and reuse is not just the next best innovation. It is a necessary stepping stone for managing consumption and reducing it.

Don't wait for all the knowledge.

Don't wait for perfection.

Get started with a system, then look at improving it.

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Appendix A: list of interviewees and contributors

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List of interviewees and contibutors

INTERVIEWEE	COMPANY	AREA OF EXPERTISE
Anaïs Ryterband	Pandobac	Co founder & CMO - Reusable secondary packaging system in Paris
Annie Penn	Tillex (Smokin' Donut)	EPOS system for Refill shops
Ben Patten	Good Club	Business owner of home delivery refill
Brian Lodge	RPC Containers Ltd	Converter
Cameron Galloway	Martek	Dispense mechanisms for Refill
Catherine Conway	Unpackaged	Consultancy for Refill sector
Catriona Tassell	Imperial College London	Researcher - Reuse behaviours
Elliot Woolley	Loughborough University	Lecturer in Sustainable Manufacturing
Hugo Lynch	Abel & Cole	FMCG Retailer - home delivery
Joanne Chidley	Beauty Kitchen and Re	FMCG Manufacturer and Reuse supply chain innovator
Jonathan Wragg	Oceans Integrity (RIO) Plc	Group Sustainability Director (and Packaging Expert)
Livvy Drake	City to Sea	Behaviour Change Specialist
McCormick	City to Sea	Data Analyst
Matt Kennedy	Again	Washing & logistics for Reuse
Neil Walcuch	Tenschul	Dispense Innovation
Paul Garner	ASDA	Sustainability Manager
Paul Jenkins	The Pack Hub	Packaging Specialist
Rachel Gray	WRAP	Behaviour Change Manager
Rorie Parsons	University of Sheffield	Many Happy Returns Project
Rupert Wylie	Be Circular	Sustainability Expert
Sarah Greenwood	University of Sheffield	Many Happy Returns Project Co-lead
Steph Van de Pette	So Sustainable	Refill Shop Manager
Thomas Webb	University of Sheffield	Many Happy Returns Project
Tom Shaw	Waitrose	Packaging and Plastics Coordinator
Tom Struthers	Draught Drop	Circular supply chain for breweries
Wayne Barron	Rethink Packaging	Packaging Design Expert
Żaneta Muranko	Imperial College, London	Behaviour Change Researcher

Acknowledgements

This report was funded by Innovate UK KTN.

The author wishes to thank all the interview participants for their generosity of time and their insights.

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Appendix B: Datasheet A

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Datasheet A

ACADEMIC STUDIES

Title	Authors	Publication Date	Reference
Improving the environmental sustainability of reusable food containers in Europe	Marinella Levi, Sara Cortesi, Carlo Vezzoli, Giuseppe Salvia		https://www.sciencedirect.com/science/article/abs/pii/S0048969718305187
A Comparative Life Cycle Assessment of Disposable and Reusable Packaging for the Distribution of Italian Fruit and Vegetables			https://onlinelibrary.wiley.com/doi/abs/10.1002/pts.946
Reusable packaging in supply chains: A review of environmental and economic impacts, logistics system designs, and operations management	Monirehalsadat MahmoudiIrandokht Parviziomran		https://www.sciencedirect.com/science/article/abs/pii/S0925527320301201
A closed-loop packaging network design model to foster infinitely reusable and recyclable containers in food industry	Riccardo Accorsi, Giulia Baruffaldi, Riccardo Manzini		https://www.sciencedirect.com/science/article/abs/pii/S2352550920302578
Characterisation and Environmental Value Proposition of Reuse Models for Fast-Moving Consumer Goods: Reusable Packaging and Products	Muranko,Z.;Tassell,C.; Zeeuw van der Laan, A.; Aurisicchio, M.	2021	https://doi.org/10.3390/su13052609
Reverse Logistics: Quantitative Models for Closed-Loop Supply Chains	Edited by Rommert Dekker, Moritz Fleischmann, Karl Inderfurth, Luk N. van Wassenhove		https://books.google.de/books?hl=en&lr=&id=6i4b1F0zX90C&oi=fnd&p-g=PA1&dq=the+decline+in+reuse+models+in+the+UK&ots=hwg9o4V-VK1&sig=EMvwbGCWdcmzf8I01V_by0mRdBI&redir_esc=y#v=onepage&q&f=-false
From Open to Closed-Cycle Fast Moving Consumer Goods (FMCG) Packaging Systems: An Overview of Potential Avenues for Progress	Robert Hamlin		https://library.oapen.org/bitstream/handle/20.500.12657/49695/9783038978725.pdf?sequence=1#page=118
Human-Centred Design of Products And Services for the Circular Economy – A Review	Vicky Lofthouse and Sharon Prendeville		https://www.tandfonline.com/doi/full/10.1080/14606925.2018.1468169
Reinventing refills: guidelines for design	Vicky Lofthouse, Rhoda Trimingham, Tracy Bhamra		https://onlinelibrary.wiley.com/doi/10.1002/pts.2337
Barriers and Incentives to Zero Packaging Food Retail: A Global Stocktake	Alexia Smits Sandano	2016	https://lup.lub.lu.se/luur/download?func=downloadFile&recordOId=8893352&fileOId=8893353

Datasheet A

ACADEMIC STUDIES

Title	Authors	Publication Date	Reference
Reuse v Single-use Packaging: A review of environmental impacts	Patricia Megale Coelho, Blanca Corona, Ernst Worrell	2020	https://www.reloopplatform.org/wp-content/uploads/2020/12/zwe_reloop_report_reusable-vs-single-use-packaging-a-review-of-environmental-impact_en.pdf.pdf_v2.pdf
Why some plastic packaging is necessary to prevent food waste and protect the environment	Dr Manoj Dora and Dr Eleni Iacovidou	2019	https://www.brunel.ac.uk/news-and-events/news/articles/Why-some-plastic-packaging-is-necessary-to-prevent-food-waste-and-protect-the-environment
Mapping the plastic packaging landscape: social and cultural conditions influencing the consumer attitude / behaviour gap	Maria Piacentini et al	Ongoing	University of Lancaster
Sustainability of reusable packaging–Current situation and trends	Patricia Megale Coelho, Blanca Corona, Roland ten Klooster, Ernst Worrell	2020	https://www.sciencedirect.com/science/article/pii/S2590289X20300086
Lifecycle environmental impacts of carbonated soft drinks.	David Amienyo, Haruna Gujba, Heinz Stichnothe, Adisa Azapagic	2011	
Behaviour chains in circular consumption systems: the reuse of FMCGs	Muranko,Z.; Aurisicchio, M.; Baxter, W.; Childs, P.	2020	https://www.researchgate.net/publication/341993317_Behaviour_chains_in_circular_consumption_systems_the_reuse_of_FMCGs
A Sociology of Reuse: Deconstructing the Milk Bottle	Paul Vaughan, Matthew Cook, Paul Trawick	2007	https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1467-9523.2007.00432.x
This has already been used! A paradigm to measure the point at which people become unwilling to use reusable containers	Harriet M.Baird, Keelan Meade,Thomas L.Webb	2022	https://www.sciencedirect.com/science/article/pii/S0959652622019254
The Intention–Behavior Gap	Paschal Sheeran, Thomas L. Webb	2016	https://compass.onlinelibrary.wiley.com/doi/abs/10.1111/spc3.12265

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BUSINESS-LED REPORTS

Title	Authors	Publication Date	Reference
The Reffilution has Begun	Ecover and Basis Research	March 2022	https://www.ecover.com/blog/refillution/the-refill-report/
Responsible Beauty	P&G and WWD Studios	June 2020	https://assets.ctfassets.net/zyvr84rwvj68/5KseBki2Kj5IRwFLOqkNoO/f8b940a5ada747f1afc95a1667da80be/REPORT_P_G_RESPONSIBLE_BEAUTY.pdf
Meet the 2020 consumers driving change: why brands must deliver on omnipresence, agility and sustainability	IBM / National Retail Federation	2020	https://www.ibm.com/downloads/cas/EXK4XKX8
How can digital infrastructure speed up adoption of scalable reuse systems?	Reath	2020	https://reath.id/reuseid
Refilling the market gaps | Category focus – reusable packs	PB Creative		https://pb-creative.com/news/refilling-the-market-gaps-category-focus-reusable-packs/

NGO REPORTS

Title	Authoring Body	Publication Date	Reference
Re-use - Rethinking Packaging	EMF	2019	https://emf.thirdlight.com/link/rzv910prtxn-tfiulo/@/preview/2
Fixing the system: why a circular economy for all materials is the only way to solve the plastics problem	Green Alliance	2020	https://green-alliance.org.uk/publication/fixing-the-system/
Breaking the Plastic Wave Report	Systemiq	ND	https://www.systemiq.earth/breakingtheplasticwave/
Reducing Household Food Waste and Plastic Packaging	WRAP	2022	https://wrap.org.uk/resources/report/reducing-household-food-waste-and-plastic-packaging
Form Pollution to Solution: a global assessment of marine litter and plastic pollution	UNEP	2021	https://www.unep.org/resources/pollution-solution-global-assessment-marine-litter-and-plastic-pollution

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NGO REPORTS

Title	Authoring Body	Publication Date	Reference
On the journey to a circular system for plastics: Annual Report 2020-21	WRAP	2021	https://wrap.org.uk/sites/default/files/2021-11/The%20UK%20Plastics%20Pact%20Annual%20Report%202020-21.pdf#page=8
Supermarkets putting more plastic on their shelves than ever	Greenpeace	2019	https://www.greenpeace.org.uk/news/supermarkets-more-plastic-than-ever/
For disabled environmentalists, discrimination and exclusion are a daily reality	Greenpeace	2022	https://www.greenpeace.org.uk/news/disability-environmental-movement-exclusion/
Burning Questions - Pathways to a circular plastic packaging system in Germany	WWF	2021	https://www.wwf.de/fileadmin/fm-wwf/Publikationen-PDF/Unternehmen/WWF-Report-Pathways_to_a_circular_plastic_packing_system_in_Germany.pdf
Forderungspapier zum Mehrwegschutz	Initiative Mehweg	2020	https://www.stiftung-mehrweg.de/fileadmin/user_upload/downloads/Forderungspapier-Mehrwegschutz-2020.pdf
How does Germany's Bottle Deposit Scheme Work?	Deutsche Welle (DW)	2021	https://www.dw.com/en/how-does-germanys-bottle-deposit-scheme-work/a-50923039
Our planet is choking on plastic	UNEP	-	https://www.unep.org/interactives/beat-plastic-pollution/
Refillable Glass Beverage Container Systems in the UK	WRAP	2008	https://static1.squarespace.com/static/5a60c3cc9f07f58443081f58/t/5ab3e0c30e2e721919eb558a/1521737928044/2008_wrap_refillable_glass_beverage_container_systems_in_the_uk.pdf
Reuse Systems Unpacked	Hubbub	2022	https://static1.squarespace.com/static/5a60c3cc9f07f58443081f58/t/5ab3e0c30e2e721919eb558a/1521737928044/2008_wrap_refillable_glass_beverage_container_systems_in_the_uk.pdf

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VIDEO/PODCASTS

Interviewee/Presenter	Interviewer/Producer	Subject	Reference
Catherine Conway	Paul Jenkins	Refill trends	https://www.youtube.com/watch?v=3_kYjGtwF4c
John Kreger from Montgommery County Food Bank (USA)	Sustainably Speaking - Joshua Baca	Plastic preventing food waste	https://plasticmakers.org/podcasts/preventing-food-waste/
Hugh Fearnley- Wittingstall and Anita Rani	BBC	War on Plastic	https://www.youtube.com/watch?v=xKYw0qTiywE

HEADLINE FIGURES

Fact	Source	Date
Plastics are the largest, most harmful and most persistent fraction of marine litter, accounting for at least 85 per cent of total marine waste.	https://www.unep.org/resources/pollution-solution-global-assessment-marine-litter-and-plastic-pollution	2021
Plastics in the oceans has been estimated to be around 75-199 million tons	https://www.unep.org/resources/pollution-solution-global-assessment-marine-litter-and-plastic-pollution	2021
Under a business-as- usual scenario and in the absence of necessary interventions, the amount of plastic waste entering aquatic ecosystems could nearly triple from some 9-14 million tons per year in 2016 to a projected 23-37 million tons per year by 2040.	https://www.unep.org/resources/pollution-solution-global-assessment-marine-litter-and-plastic-pollution	2021
Using another caluclation, the amount is projected to approximately double from an estimated 19-23 million tons per year in 2016 to around 53 million tons per year by 2030	https://www.unep.org/resources/pollution-solution-global-assessment-marine-litter-and-plastic-pollution	2021
The global plastic market in 2020 has been estimated at around US$ 580 billion	https://www.unep.org/resources/pollution-solution-global-assessment-marine-litter-and-plastic-pollution	2021
Monetary value of losses of marine natural capital is estimated to be as high as US$ 2,500 billion per year.	https://www.unep.org/resources/pollution-solution-global-assessment-marine-litter-and-plastic-pollution	2021
The level of greenhouse gas emissions associated with the production, use and disposal of conventional fossil fuel-based plastics is forecast to grow to approximately 2.1 gigatons of carbon dioxide equivalent (GtCO2e) by 2040, or 19 per cent of the global carbon budget	https://www.unep.org/resources/pollution-solution-global-assessment-marine-litter-and-plastic-pollution	2021
A survey of 2000 particpants, 71% of shoppers want to use a Refill Stations. 44% of 16 to 24 years report having used a Refill station with the previous 12 months.	GlobalData 2019 Q3 survey widely quoted e.g. https://www.packagingnews.co.uk/features/refilling-market-gaps-category-focus-reusable-packs-13-02-2020	2019
GlobalData's monthly survey of 2,000 UK respondents found that 44.1% of 16-24 year olds who had purchased food and grocery products in July had used a refill station in the last 12 months, compared with 35% of 25-34 year-olds and just 25.4% of 35-44 year-olds.	https://www.packagingnews.co.uk/features/refilling-market-gaps-category-focus-reusable-packs-13-02-2020	2019

Datasheet A

ACTIVE GROUPS SUPPORTING/RESEARCHING REFILL

Group	Reference
The Reloop Platform	https://www.reloopplatform.org/
In the Loop: London	
Re	https://beautykitchen.co.uk/pages/cradle-to-cradle
The Refill Coalition	https://www.refillcoalition.com/
Mangrove	https://www.tenschul.com/post/great-christmas-news
The Industrial Technical Centre for Plastics and Composites	https://www.effra.eu/ctipc
Hubbub	https://www.hubbub.org.uk/Blog/new-1-million-bring-it-back-fund-launched-by-hubbub-and-starbucks-to-boost-reusable-packaging
Recoup	https://www.recoup.org/our-members?showmember=370
UK Circular Plastics Network	https://www.ukcpn.co.uk/about-ukcpn/landscape-map/

MEDIA COVERAGE

Reporter/s	Media Outlet	Date	Title	Reference
Jonathan Wragg	CAP Environmental		Are Paper Bottles Greenwashing? The answer isn't so simple.	https://packagingeurope.com/comment/are-paper-bottles-greenwashing-the-answer-isnt-so-simple/7971.article
Oliver Balch	Raconteur	2020	Is Refillable Packaging the Future?	https://www.raconteur.net/packaging/refillable-packaging-future/
Dieuwertje Nelissen & Tauhid Pandji	New Security Beat	2021	The Circular Business Model behind Indonesia's Reuse System	https://www.newsecuritybeat.org/2021/03/circular-business-models-indonesias-reuse-revolution/
Zoe Wood	The Guardian	2022	Plastic Packaging Increases Fresh Food Waste, Study Finds	https://www.theguardian.com/environment/2022/feb/24/plastic-packaging-increases-fresh-food-waste-study-finds
Alexander Tullo	C&EN	2016	The cost of plastic packaging	https://pubs.acs.org/doi/10.1021/cen-09441-cover
Paul Davidson	Packaging Europe	2021	Tackling the plastics packaging challenge	https://www.packagingnews.co.uk/features/comment/paul-davidson-tackling-plastics-packaging-challenge-11-11-2021
Andrew Don	The Grocer	2019	Three-quarters of shoppers want to use Refill Stations	https://www.thegrocer.co.uk/consumer-trends/three-quarters-of-shoppers-want-to-use-refill-stations-says-survey/597192.article
	Inside Packaging/ Global Data	2020	Nestlé trials refillable packaging amid Covid-19 concerns	https://inside-packaging.nridigital.com/packaging_jul20/nestle_refillable_packaging_coronavirus
Tony Corbin	Packaging Europe	2020	Refilling the market gaps: category focus - reusable packs	https://www.packagingnews.co.uk/features/refilling-market-gaps-category-focus-reusable-packs-13-02-2020

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CONSULTATIONS & LEGISLATION

Date	Country	Title	Organisation	Reference
March 2022	Nairobi	End plastic pollution: Towards an international legally binding instrument	UNEP	https://wedocs.unep.org/bitstream/handle/20.500.11822/38522/k2200647_-_unep-ea-5-l-23-rev-1_-_advance.pdf?sequence=1&isAllowed=y
June 2021	UK	Introducing a Deposit Return Scheme in England, Wales and Northern Ireland	DEFRA	https://consult.defra.gov.uk/environment/consultation-on-introducing-a-drs/
Upd November 2021	England	Resources and waste strategy for England: monitoring and evaluation	DEFRA	https://www.gov.uk/government/publications/resources-and-waste-strategy-for-england-monitoring-and-evaluation
March 2021	Wales	Our plan to make the circular economy in Wales a reality where we keep resources in use and avoid waste.	Welsh Gov	https://www.gov.wales/beyond-recycling
March 2020	N Ireland	Waste Prevention Programme for Northern Ireland 2019	DEFRA	
March 2022	UK	Packaging and packaging waste: introducing Extended Producer Responsibility	DEFRA	https://www.gov.uk/government/consultations/packaging-and-packaging-waste-introducing-extended-producer-responsibility
March 2022	UK	Packaging in and out of scope of Plastic Packaging Tax	HMRC	https://www.gov.uk/government/publications/examples-of-packaging-in-and-out-of-scope-of-plastic-packaging-tax/packaging-in-and-out-of-scope-of-plastic-packaging-tax
March 2022	UK	Extended Producer Responsibility for Packaging Summary of Consultation Responses and Government Response	DEFRA	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1063589/epr-consultation-government-response.pdf
March 2022	UK	Plastic Waste - Research Briefing	UK Gov	https://researchbriefings.files.parliament.uk/documents/CBP-8515/CBP-8515.pdf

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Appendix C: Datasheet B

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Datasheet B

COMPANIES ACTIVE IN REFILL

Company/Brand	Product Category	Country of Operation	Reuse Model	Circular Supply Chain	Delivery Category	Vessel Material	Details
Abel and Cole	Fruit & veg	UK	Sequential	Courier	Own vehicle/drivers	Cardboard	
Abel and Cole	Dry Goods	UK	Sequential	Courier	Own vehicle/drivers		
Abel and Cole	Toiletries/detergent	UK	Sequential	Courier	Own vehicle/drivers		
Beauty Kitchen	Personal Care	UK	Sequential	Courier		Steel	
Humanrace	Personal Care	USA	Exclusive	Local			
Men u	Personal Care	UK	Exclusive	Local			
Woods Distillery	Beverages	UK	Exclusive	Courier	Royal Mail	Glass / reusable plastic refill	
P&G Olay	Personal Care	UK	Exclusive	Local	Supermarket	Glass / recyclable plastic	Recycled paper Refill pods that slot into Substantial refillable pot.
P&G Pantene, Aussie, Head & Shoulders and Herbal Essences	Personal Care	UK	Exclusive	Local	Supermarket		Aluminium bottle and lightweight plastic Refill pouch saves 60% of plastic compared to single use
Nestle, Purina	Animal Food	Chile	Exclusive		Specific Home Refill Delivery	Tracked container (plastic?)	Purina dog food in Chile, though home delivery by Algramo.
Nestle, Häagen Dazs	Dry Goods	Canada					
Nestle Nesquik	Dry Goods	France					
Nestle Ricore	Dry Goods	France					
Nestle Nescafe	Dry Goods	France					
Nestle Milo	Dry Goods	UK?					
Nestle Chocapic Bio (Cereal)	Dry Goods	UK?					
L'Occitane	Personal Care	UK	Exclusive	Local		100% Recycled aluminium "Forever Bottle" and "Eco-Refill" pouches.	
Kiehl's	Personal Care	UK	Exclusive	Local	Royal Mail	Plastic refill pouches	

Datasheet B

COMPANIES ACTIVE IN REFILL

Company/Brand	Product Category	Country of Operation	Reuse Model	Circular Supply Chain	Delivery Category	Vessel Material	Details
Kjaer Weiss	Personal Care	UK	Exclusive	Local		Paper	100% refillable, compostable and recyclable
Hermès	Personal Care	UK	Exclusive	Local			Lipstick refills
SESI	Toiletries/ detergents	UK	Sequential	Courier	Own vehicle/drivers	Plastic returnable 5l and 2l containers	Secondary packaging B2B fully circ supply chain
SESI	Food	UK	Sequential	Courier	Own vehicle/drivers	Plastic returnable 1.5kg/4kg tubs weight depends on product	Secondary packaging B2B fully circ supply chain
Miniml	Toiletries/ detergents	UK	Sequential	Courier		Plastic returnable 5l and 2l containers	
Fill	Toiletries/ detergents	UK & Europe	Sequential	Courier		Plastic returnable 5l and 2l containers	
Blooming Eco	Toiletries/ detergents		Sequential	Courier			
Uncommon Ground	Coffee/Tea						
Cotswold Gold	Rapeseed Oil					Customers use own container	
Just Crisps	Crisps & Snacks	UK	Sequential	Courier		Plastic	Fulfilled by SESI or posted/pallet delivery
Dorset Sea Salt	Salt						
Jericho Coffee Traders	Coffee		Sequential	Courier		Customers use own container	b2b
Aethalis	Olive Oil		Sequential			Customers use own container	b2b

Datasheet B

LCA STATEMENTS

Platform	Material Comparison	Link
Perfectpackaging Org	Flexible pouches to HDPE bottles for shampoo	https://perfectpackaging.org/wp-content/uploads/2020/06/Shampoo.Glenroy_PTIS_Case-Studies.pdf

SUPERMARKETS OFFERING REFILL

Company	Location	Dry Goods	Loose fruit & veg	Personal Care	Cleaning	Food Liquids	Frozen	Other	Details
Asda	Glasgow Toryglen			Refill & Return in SS and Dispense					Featuring cereals, rice, pasta, tea, coffee, toiletry and laundry products sold in specific aisles
Asda	Middleton			Refill & Return in SS and Dispense					
Asda	Milton Keynes			Refill & Return in SS and Dispense					9 bays with branded and own-label cereals, pasta, rice, tea, coffee, snacking, desserts and baking products. The store will also sell refillable pet food, laundry and toiletry products within specific aisles.
Asda	Rugby			Refill & Return in SS and Dispense					
Asda	York			Refill & Return in SS and Dispense					18 standalone bays featuring over 70 branded and own-label products in refillable format with brand new product types including dried Mars pet food such as Whiskas and Pedigree and additional ranges of snacking, desserts and baking products
M&S	Hedge End								Adding Lisburn, Stratford City London, Sears Solihull, Gyle, Vangarde Monks and Wolstanton Stoke
M&S	Manchester								
M&S	Staines								
Waitrose	Botley, Oxford								
Waitrose	Abingdon								
Waitrose	Cheltenham								
Waitrose	Wallingford								
Tesco									
Morrisons									

Datasheet B

REUSABLE PACKAGING PRODUCTS

Company	Country of Origin	Product	Primary/Secondary/Tertiary	Link
Repack	Finland	Envelopes/Postale packaging	S	
Palloorang	Norway	Pallet Sleeves	T	
CHEP	Global	Pallets	T	
Silverskin	Global	Thermal reusable pallet covers	T	https://csafeglobal.com/bulk-air-cargo/thermal-covers/
La Pallette Rouge	Europe	Pallets	T	https://www.lpr.eu/
Schoellerallibert	Europe	Pallets, IBCs, Collabsible Crates	T/S	https://www.schoellerallibert.com/uk/markets/pooling/

DISPENSE MECHANISMS

Company	Location	Products	Liquids	Dry goods	URL	Example	Material
The Milkstation	UK	Dispense/Vending/ Frozen goods	Yes	No	https://themilkstationcompany.co.uk/products/table-top-milk-station/		
HL	Sweden	Gravity Bins, Scoop bins, fresh produce coolers	No	Yes	https://www.hl-display.com/our-offer/packaging-free/	ASDA	Partially Recycled or Bio Plastic
Martek	UK	Gravity Bins, Scoop bins, Oil and vinegar drums	Yes	No	https://www.martekzerowaste.co.uk/	ENGRAIN	100% Recycled and Recyclable
Trade Fixtures	USA	Gravity Bins		Yes	https://www.tradefixtures.com/		Food-grade BPA free and made from EA free fully recyclable copolyester as well as being NSF certified.
Jean Bouteille	France	Gravity Bins and Dispensers	Yes	Yes	https://jeanbouteille.fr/	Day by Day	

Datasheet B

SCALES & EPOS

Company	Location	Scales	EPOS	App	Payment Partner	Link
Avery Berkel	UK	Yes				https://www.averyberkel.com/en/products/scales-printers/zero-waste-scales/
Bizerba						
Smokin Donut	UK		Yes	Tillex		
Martek	UK	Digi	Yes	Wayify	Any but partner with Dojo	https://www.martekzerowaste.co.uk/scales-pos-systems/
Digi						
Shoppify			Yes			
EPOS NOW			Yes			

DELIVERY CATEGORIES

Delivery Category	Code	Notes
Own vehicle/drivers	O	
Courier	C	
Local	L	
National	N	
International	I	
Royal Mail	P	
Supermarket	S	
Specific Home Refill Delivery	R	e.g. Algramo, Milk and More
Independent Home Refill Delivery	H	

Authored in July 2023 by: **Anna Pitt**

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Find out more by visiting the UK Circular Plastics Network (UKCPN) website:
ukcpn.co.uk
Join UKCPN at the following programme page:
iuk.ktn-uk.org/programme/ukcpn

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