

Digital technology and consumer trends:

Future scenarios for waste and resource management



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Executive Summary

This report was commissioned to explore how advances in digital technology are changing how and what we consume and driving supply chain innovation, with particular reference to packaging and the grocery sector.

The research identifies a number of strengthening trends:

- UK consumers are showing a greater propensity to shop online than in many other countries around the world;
- online grocery sales are on the rise and new entrants in the marketplace are driving innovation and competition, particularly on the delivery front;
- the Internet of Things means smart, interactive technology is moving into the home and changing the way we buy things; and
- new ways of purchasing food, for example in the form of pre-measured ingredients for a specific meal, are on the increase.

It finds that these new trends and disruptive consumption models are not yet translating into significant changes in packaging design and packaging waste and suggests that this is because they have so far broadly been framed within the context of established supply chain models and consumption patterns, and pre-existing sustainability initiatives. However, it posits the potential for radical change in the future, for example as the traditional 'bricks and mortar' high-street store and supermarket approach is replaced by 'dark stores' dedicated to servicing 'click & collect' and home delivery customers. It also highlights the added impetus for change coming through at both an EU and global level as circular economy thinking gains traction and action on food waste intensifies.

Supply chain feedback on a number of future scenarios suggests that retailers and designers are very aware that the relationship with the consumer is changing, and that this will have a significant impact on business models, packaging form and function, and waste and recycling. In terms of the latter, much of the feedback focuses on how better environmental outcomes can be shaped, where responsibility lies, and the role of policy as a driver for change.

Consumer research on online shopping habits carried out for the report, meanwhile, found that 68% of respondents favour home delivery and around 80% would be interested in taking part in packaging-related trials, including returnables, refillables and the collection of recyclables at the point of delivery. This suggests a willingness by consumers to engage with sustainability initiatives in this sphere.

In conclusion, the report suggests that consumer behaviour and expectations will continue to change, supported by technological and digital innovation. At the same time, there is the potential for a significant shift in responsibility for, and influence on, wastes and resources towards manufacturers, suppliers and brands.

Both of these trends will influence the types and volumes of waste for which the public and private sector waste industry has to plan and present new opportunities to improve resource efficiency. These opportunities will only be fully realised, however, through a more robust approach to waste and resource flow data, smart and evidence-based policy making, and 'collective responsibility' across the supply chain.



1. Introduction

This report has been commissioned by CIWM (Chartered Institution of Wastes Management) to explore the rapid advances in information technology and supply chain innovation that are having a profound impact on consumer lifestyle and behaviour trends and will ultimately shape the resources we use and the wastes we produce in the future.

The volume and composition of post-consumer (and business) wastes has changed beyond recognition through the post-war era, and continues to change in response to the growing shift towards online shopping, increasingly sophisticated home delivery options, smart domestic appliances, and even tailored, ready-to-cook meals delivered to the door.

At the same time, a stronger focus on product stewardship has seen supply chain innovation through smart design, material substitution, and other innovations that are reshaping the relationship between manufacturers, retailers, the consumer and the environment.

Understanding these trends is essential for a number of reasons. Not only do we need to be able to develop the right services, infrastructure and policy frameworks in the medium term to manage these trends and their impact on resource use and waste, we also need to be mindful of the longer term outlook. Rapid global population growth and changing demographics are putting ever greater pressure on the world's resources and planning for this future needs to take careful account of current consumption trends and how they are likely to evolve.

This report draws on a qualitative assessment of some of the more important forces at play in how we consume from a grocery retail and packaging perspective. It is supported by a quantitative assessment by Valpak based on what they can already see changing through their very detailed packaging information, plus expert panel and consumer input.

This is not a packaging witch-hunt: packaging plays a critical role in protecting products, increasing shelf-life and reducing wastage caused by spillages, contamination and damage. Significant strides have also been made to reduce environmental impacts across the retail supply chain over the last ten years. As many of the experts who have generously given of their time to this report have noted, however, we are on the cusp of a combination of genuinely challenging changes, a crossroads of technology and innovation, and a potentially important tipping point in the way we buy and consume products. Building a better, shared understanding of how this might impact on resource management in the round is, therefore, essential.



The timing is right for this assessment. The EU, national and local governments are exploring what policy frameworks, technologies, planning structures, services and infrastructure will be needed to recover more value from waste and deliver essential industrial feedstocks for the future as part of a more 'circular' materials economy. Many of these important pieces of policy development – the EU Circular Economy Package and Action Plan, the National Infrastructure Assessment, the recently published Industrial Strategy Green Paper and Defra's 25 year Environment Plan – are all looking to set the direction of travel through to the mid 21st century and need to be informed by as clear and accurate picture as possible both of the type and volume and potential value of the wastes we will be generating and the resource efficiency opportunities that will become available .

This report acknowledges that this cannot be done by looking backwards or by taking a simple snap-shot of where we are now. It is a contribution by CIWM to the debate about what kind of data and collaborative working will be need to ensure that the waste and resource management sector can make a genuine contribution to a more resource efficient future.

A handwritten signature in black ink, appearing to read 'MR Bates', with a long horizontal line extending from the end.

Professor Margaret Bates
CIWM President 2016/17



2. Methodology

The project was overseen by a Steering Group comprising:

Professor Margaret Bates, CIWM President 2016/17 and Professor of Sustainable Wastes Management, University of Northampton

Chris Murphy, Deputy Chief Executive, CIWM

Sarah Wakefield, Food Sustainability Manager at The Co-operative Group

Sophie Thomas, founding director, Thomas Matthews

The research was carried out in several stages:

Stage 1:

Desk research on trends, data sources and recent commentary on the impact of technology on consumers, consumption and waste.

Stage 2:

Development and testing of three scenarios via the Steering Group and expert round table discussions* to look at consumer and packaging challenges of the future. The scenarios were based on trends that are already developing, including:

- uptake and adoption of smartphones and their impact on online shopping;
- increase in convenient click & collect and home delivery;
- adoption of automated services in-store by retailers and consumers;
- changes to waste/packaging arisings and flows; and
- introduction and early adoption of 'last mile' providers.

Stage 3:

A 'snap' online consumer survey of shopping habits to

support the scenarios and identify the level of consumer support for trialling additional resource efficiency measures. Four questions were asked for this report by Icaro Consulting as part of a survey of 2,436 UK adults aged 18+ between 22 and 28 September 2016.

Stage 4:

A baseline packaging review carried out by Valpak, analysing changes in packaging across different product types.

*The experts brought together for the round table brainstorming of the scenarios comprised:

Group 1 - Retailers

Iain Ferguson, Environment Manager, The Co-operative Group

Mark Caul, Technical Manager - Packaging, Tesco

Alice Ellison, Environment Policy Adviser, British Retail Consortium

Group 2 - Designers/innovators

David Godber, Group CEO, Elmwood

Rob Maslin, Director, We All Design

Susie Hewson, Sales & Marketing Director, Natracare

Sophie Thomas, Founding Director, Thomas Matthews

Mark Shayler, Founder, Ape Studios (corresponding)

Chris Sherwin, Director, Root Innovation (corresponding)

Stuart Hayward-Higham, Technical Development Director, Suez (corresponding)

Erica Purvis, Director, Technical Nature (corresponding)



3. Technology and retail trends

The uptake of technology has been rapid, nowhere more so than in the UK. The impact of improved connectivity and faster access, expansion and adoption of online e-commerce, smart systems and connected products, the 'uberisation' of the last mile, and significant delivery cost reductions have combined with new market entrants to present us with the 'perfect storm' – new consumption models, genuine customer relationships inside people's homes, and competition from new entrants better geared to the 'digital age' than established retail supply chains.

Connectivity and propensity to shop online

The UK is now a 'smartphone society'. In recent years, with the roll-out of new technologies and services, increasing numbers of people have gained access to superfast broadband and 4G mobile network services. More and more people are shopping online, increasingly on mobile devices, and there is no real upper age limit to this switch, with older age groups just as likely to shop online. UK consumers are more likely to shop on a mobile device than those in the US and other nations around the world, making the UK one of the largest online markets globally.

Smartphones have overtaken laptops as the most popular device for getting online, Ofcom research¹ has revealed, with record ownership and use transforming the way we communicate. Two thirds of people now own a smartphone, using it for nearly two hours every day to browse the internet, access social media, bank and shop online. Almost eight in ten households (78%) now have a fixed broadband connection. As at May 2015, 89.5% of premises had outdoor coverage from at least one 4G mobile network, an increase of 17.7 percentage points since June 2014. During 2014, total UK 4G mobile subscriber numbers increased from 2.7 million to 23.6 million, taking the proportion of total mobile subscriptions that were 4G to 28% at the end of 2014, compared to 3% at the end of 2013.

Overall, smartphone users now spend nearly two hours (114 minutes) using the internet on their mobile phone, almost twice as much time as the average adult spends online via a PC or laptop (69 minutes).

As well as communication, what do we use them for? Almost half of smartphone users are making purchases online (45%) and using them to access online banking (44%). Sixty-two per cent of those who use the internet at home or elsewhere say they buy things online; 61% bank online. Internet users aged 55 and over are as likely as all users to say they buy things online, but are less likely to bank, use social networking sites or watch TV content online.

Research carried out by ecommerce platform provider Episerver² surveyed the mobile shopping habits of ten nations in Europe, North America and Asia-Pacific. It found that the UK is becoming a nation of smartphone shoppers, with more consumers from the UK opting to hit the January sales on mobile devices than those from other regions around the world.

Out of the regions surveyed, UK consumers were the most likely to shop on a mobile, with 59% of respondents making a purchase via their device's web browser in the last month. This figure drops to 50% in the US, 46% in Australia, and dips as low as 36% in some European nations (Belgium and the Netherlands). However, it's not all bad news for high street retailers, with 50% of UK respondents placing 'on the high street' in their top three locations for using a mobile device.

According to IMRG³ (Interactive Media in Retail Group), the trade body for internet retailers, 51% of online sales between November 2015 and January 2016 in the UK involved hand-held devices rather than traditional computers or laptops. A year earlier the equivalent figure was just 40%. The surge in shopping on the go is attributed to a combination of bigger screens on smartphones and improvements to online shopping sites by retailers, making them easier to view on mobile devices.

The IMRG Capgemini e-Retail Sales Index⁴ (tracking trends in internet shopping) shows that 66% of visits to retail websites over the same period came through mobile devices (up from 53% the previous year). Year-on-year, online sales continue to increase, driven in the large part by clothing retail.

Looking to the future, Retail Times reports that research commissioned by BBC Radio 4 shows 75% of shoppers think they'll do the majority of their shopping online in 10 years' time⁵. Over the same period, 60% also think the high street will not exist as we know it.



Here the potential influence of ‘Millennials’ (people born between 1980 and 2000) could be profound. There is growing evidence to suggest that for this segment of the population, access to a convenient, reliable, customer-focused service is more important than ‘ownership’ of a product. Why own a car when you can easily hail a lift? In addition to expecting to have an interactive relationship with those who provide products and services, there is also an ethical dimension for Millennials, 87% of whom, according to a recent Deloitte report⁶ believe “the success of a business should be measured in terms of more than just its financial performance”. How a company goes about its business is fast becoming as important as what a company does in its business. And these shifts in expectation and demand may not be confined to Millennials. Author James Wallman argues that all of us are showing signs of a move towards valuing experience over stuff⁷.

Buying groceries online

The £169 billion grocery market is showing steady growth and continuous innovation, fuelled by competition in the convenience, low-cost and online channels. The fastest growing channel is online, with more and more shoppers who have already made the jump increasing the proportion of purchases they make online. The switch is supported by competition in the ‘last mile’ delivery market, and by new entrants shedding the traditional ‘bricks and mortar’ high-street store and supermarket approach reliant on footfall, instead implementing ‘dark stores’ dedicated to servicing click & collect and home delivery customers.

A Mintel survey⁸ has found that 3 in 10 online grocery shoppers have increased the amount of food purchases they make online. 48% of all shoppers are now shopping for groceries online. Mintel states that retailers will need to cater for “consumers turning away from the main weekly shop to more fluid, when-needed shopping.”

Another Mintel survey⁹ reports that Millennials in particular exhibit a desire to enjoy the instant gratification of the digital experience in ‘real world retail’ and 25–34s are twice as likely to have collected online grocery orders from a drive-through collection point. Furthermore, 16–24s are more likely to consider paying a higher delivery charge for same-day delivery of groceries (46% versus 34% on average).

Established names and new market entrants are both driving and capitalising on this trend, with a plethora of developments in the last twelve months.

- Online retailer Amazon has launched its new Amazon Fresh service, and is offering grocery delivery for Amazon Prime & Fresh members at no additional cost
- In February 2016, Google launched grocery-delivery service Google Fresh¹⁶ in Los Angeles and San Francisco, and North American retail giant Walmart is

“...the potential influence of ‘Millennials’ could be profound. There is growing evidence to suggest that for this segment of the population, access to a convenient, reliable, customer-focused service is more important than ‘ownership’ of a product.”

- customers pay an annual service delivery charge, and can then have as many deliveries as they wish, paying only for the products. Same-day and early next day delivery is available in certain locations. Amazon launched Fresh in the UK in June 2016¹⁰, and for many commentators it was seen as a potential turning point in the battle for online customers and a potential revolution in the grocery home delivery market.

- In June this year, Uber launched its UberEats food delivery business in London, swiftly followed by an announcement that it intends to roll out the service in 22 countries¹¹.
- Ocado, the first major online retailer to offer home delivery in 2002 through a partnership with Waitrose has since launched its on-the-go app, own-label range and recently commenced a new partnership with Morrisons. In June 2016, Edelivery reported¹² that Ocado has seen a 14% increase in sales and increased profits. Ocado’s chief executive, Tim Steiner, said: “The last few years have shown beyond doubt that British shoppers are choosing the benefits of grocery shopping online and we believe that the momentum of channel shift away from bricks and mortar stores will continue.”
- Sainsbury’s, meanwhile, has announced¹³ a one-hour delivery service in central London, taking the fight to Amazon Fresh in the capital via a new app called ‘chop chop’. Up to twenty items can be delivered by bike, something the retailer first offered over 100 years ago. The retailer has also now completed its takeover of Home Retail Group¹⁴, which includes Argos, and 200 new ‘click & collect’ points will be opened in stores by the end of 2016. Argos in turn has an exclusive relationship with eBay, meaning that new digital collection points will also open in Sainsbury’s stores. The service extends to Tu clothing and DPD parcels.
- Aldi and Lidl have both entered the online/delivery market, expanding the range of products offered; Lidl has been buying start-ups¹⁵ in the home delivery ‘recipe box’ market in native Germany, as a precursor to evolving UK services.



partnering with Uber, Lyft and Deliv platforms in the USA to test a grocery delivery service, in a bid to directly compete with similar offerings from Amazon^{17,18}.

There are other major moves to expand, specialise, consolidate or enter the online grocery/home delivery market. Planet Organic¹⁹ is ramping up its food delivery service in a bid to compete with the major online retailers through a new partnership with Hubbub offering next day delivery in one-hour slots, enabling it to compete in London with Ocado and Amazon Fresh.

New apps are also constantly being developed under the 'uberisation' banner and along the lines of 'Just Eat', enabling consumers to order groceries from independent retail outlets for delivery. There are also other 'weak signals' from a number of apps providing, in particular, interventions designed to reduce food waste across the supply chain and which are increasingly consumer-facing. Apps such as Olio, which connects neighbours with each other and local shops to reduce food waste, Food Cloud which connects local businesses to local charities, or Winnow which measures and records food waste, all offer the potential to interact with smarter and just-in-time systems to create networks focused on using perfectly good food, circumventing excessive packaging and preventing food waste. In the USA, the Shipt app allows customers to place an order and have their shopping done and delivered within the hour by a 'local community of reliable shoppers'.

These examples are the tip of the iceberg. The IGD issued²⁰ its five year forecast in June 2016, with predictions for the shape and growth of the grocery sector to 2021. It predicts that "online will remain the fastest growing grocery channel as new players continue to provide shoppers with different choices," with the channel growing by more than 68% over the five year period. By contrast, it predicts a near-zero growth in supermarkets and hypermarkets, with an increase in bringing concessions into large format stores, such as Argos outlets in Sainsbury's stores, and more foodservice options. Overall, across the grocery sector 10% growth is predicted, taking the sector from the current £169 billion to an overall value of £197 billion by 2021.

“The established and highly evolved retail system is in the process of being revolutionised and this has profound implications for waste and resource management in the future. The hoped-for consequence of the impact of technology on consumers and consumption is less waste, both in terms of food and packaging.”

Smartification, servicisation and automation

2016 is being touted as the year that smart products came of age and the 'Internet of Things' (IoT) became a reality in our everyday lives. With so many developments, it is hard to keep up, but the key themes include smart products and increasingly connected homes, autonomous vehicle technology and, particularly relevant to the resource management sector in the near-term, servicisation of products including returnable or refillable packaging. Of course, all of this is driven by 'big data' and the drive towards connected communities and cities. It also requires a great deal of trust between consumer, regulator and supplier.

In addition to smart communications, other forms of smart technology are entering and changing the home and our experience as consumers at a rapid pace. Some of these developments are designed to 'do things for us', such as control and monitor the home environment or aspects of it – Samsung's SmartThings, for example, or Hive. Smart appliances, meanwhile, enable us to do things better and make smarter choices.

Samsung's Family Hub smart fridge, for example, promises to let you "manage your groceries, connect with your family and entertain like never before." It's still a fridge, but the integrated screen enables:

- View Inside: app that pulls up pictures of the interior and lets you track expiry dates using drag-and-drop countdown timers
- Club des Chefs: app with recipes and instructional cooking videos
- InstaCart: apps for ordering groceries for home delivery

What it doesn't do (or doesn't say it will do yet) is to integrate what you have bought with what you've got left, and expiry date information is manually input by the user, but it is only a matter of time before these functions are likely to appear.

Smart laundry is on the way too. Miele has taken a step towards servicisation with the refillable 'TwinDos' system in their range of ultra-efficient W1 washing machines which come with a free 10-year guarantee and a year's free detergent. Whilst this particular range is not 'smart' or connected, it does demonstrate the shift towards brand-to-consumer direct relationships, and a focus on refillable automatic cassette-style dispenser that ensures the correct dose of detergent is used.

Extending the brand-to-consumer relationship more radically, Amazon launched its





Amazon Dash 'smart button' in August 2016, enabling consumers to order a product at the touch of strategically located buttons around the house, such as near the bathroom to order toilet rolls. A month later, the company went one further with the voice-controlled system Echo and its personal assistant Alexa. The system can be integrated with other smart home devices and can be used to order from Amazon. Google and Apple are now touted to be working on their own versions.

Meanwhile, packaging is also smartening up. Three types of smarter packaging have evolved and are now in use to greater or lesser extents. Smart labels that give an indication of the state of the contents, for example nanoparticles which change colour when food starts to go off - still rely on the consumer or retailer to spot and react to the colour change but nevertheless provide important information that potentially reduces wastage. Potentially much more significant, however, are the opportunities in the area of smart interactive labels on packaging, where data can be exchanged between a product and a connected device.

Near Field Communication (NFC) technology, for example, can now be printed onto labels with printed electronic pathways acting as antennae, enabling products to engage with consumers and other devices via apps²¹. This engagement can be in the form of additional information or content such as recipes and health or nutritional information.

Evidence is also emerging that consumers are prepared to passively share purchase and usage data on everyday items if they get something of value in return. Research carried out by Mindshare in association with SharpEnd²² shows that almost two thirds (64%) of UK consumers are interested in the idea of everyday objects being connected to the internet, and 62% agree that connected products can collect data if they get something in return. More than a third (39%) would "consider a service contract with a brand where it automatically reorders and delivers products for me".

This concept of IoT-enabled packaging is already being harnessed and South Korea is leading the way on a number of fronts when it comes to consumer tech. This year it announced the roll-out of an Internet of Things network²³, allowing consumer products to talk and to interact, and to start doing some really smart, system-integrated stuff. Major Korean retailer Homeplus, established by Tesco in 1999 and sold last year, implemented on-the-go shopping systems²⁴ in 2011 which allow commuters to scan items on a virtual supermarket shelf and add them to their online basket. Items are then delivered to the customer's home the same day, if they are ordered before 1pm - the customer chooses the time for delivery. The virtual shelf is a display on a large advertising hoarding made to look like supermarket shelves. There are now over 20 virtual stores across the country, and Homeplus is the number one online retailer in the country.

Servicisation (or servitization), meanwhile, is no longer a radically new concept. Rolls-Royce's 'Power-by-the-Hour' approach celebrated its 50th anniversary in 2012 and Philips Lighting selling pay-per-lux lighting service is well established. For consumers, car leasing is another example, or HP's Instant Ink service, where customers are charged a set amount each month for a specified number of prints, depending on the plan selected²⁵. Combining the potential for improved product stewardship and material resource efficiency with the growing trend for Millennials and the generations coming up behind them to place experience and service over ownership, these models are proliferating rapidly.

In an article on technology innovation and how smart technologies can create a sustainability revolution²⁶, Paul Huggins, Associate Director of Carbon Trust Programmes, observes: "Digital lives and the experience economy are driving the development of smart technologies. For many years, innovation focused on physical products. Today, thanks to immense improvements in technology, connectivity and logistics there is a move towards innovating an economy based around sharing products, providing managed services, and selling experiences. In urban areas everything from cars to power tools can now be conveniently hired by the hour. Books, music, and movies no longer need to be provided in physical formats and can be accessed on demand."

Menuisation is another form of servicisation – and a highly disruptive activity that make use of several of the trends and innovations already discussed to allow customers to purchase a meal service rather than just food.

Hello Fresh boasts famous chefs and promises to deliver recipes (and the pre-measured, seasonal ingredients) to





your door each week, from £4.99 per meal. Gousto offers a very similar service - "you choose, we deliver, you cook" and Riverford has expanded from veg boxes to meal boxes with its Organic Recipe Boxes. There are plenty of other companies offering similar services, from local co-operatives focusing on small geographic locations to larger organisations targeting largely metropolitan areas.

This is food servicisation for a generation that values the wellbeing benefits associated with home cooked, nutritious food but is also time poor. Combined with uberisation, smart technology in the home and smart use of sales data, this has the potential to become, as one of the expert panellists for this report observed, "the 'Just Eat At Home' solution that brings just-in-time meals and ingredients direct to your kitchen, making the most of the food you buy, minimising consumer packaging and food waste in the home, and using more refillable and returnable packaging."

Smart delivery logistics and automation, whether that is the uberisation of the 'last mile' for a range of services or the current race to develop autonomous/driverless vehicles, will change the market dynamics further in time. They not only provide a real opportunity to significantly reduce the last-mile cost of delivering on-demand goods (and services) to customers, but also the opportunity to cost-effectively collect recyclables, returnable or refillable packaging, and other valuable waste streams (e.g. batteries) from the householder.

Driverless technology may not be that far away either, with fierce competition between Ford, Volvo, Tesla, Uber, Google, Apple and others for the prize²⁷. And it doesn't stop there. Uber is also working on driverless freight and cargo solutions²⁸, and Ocado, increasingly viewed as a budding tech company outside of the UK, is also developing humanoid engineering: Artificial Intelligence (AI) to predict food orders, swarming bots to manage delivery, and even

robotic hands that mimic the human grip²⁹. Ocado feeds its AI 'robot' huge amounts of customer data. Joining up the dots via autonomous delivery vehicles, connected home appliances and smart packaging, it says it will create a "smart grocery pipe delivering the right groceries at the right time without the customer having to order..."

This shows how critical data is to the smartification of systems and homes, and how essential it is that this data is shared at least with the customer generating it in order to interact with smarter ordering systems. Also, as food retailers have noted, with or without smartification a food retailer can deliver non-food goods, but it is trickier for a parcel delivery company to cope with the demands of delivering fresh food requiring different temperature regimes and ensuring delicate produce arrives undamaged.

Refillables, returnables and deposits

Although peripheral, there are a number of initiatives in play which provide weak signals that both corporate responsibility and access to resources are sparking a renewed focus on more sustainable packaging systems that could be supported by the innovations already discussed in this chapter/section, notably last mile costs and servicisation.

Modern, mainstream examples of refillable/returnable packaging are relatively few and far between at present, and have either been the domain of brands with an overt sustainability-related USP, or have been introduced to counteract the perceptions of disposability and wastefulness related to a particular type of packaging.

Single use coffee pods are a good example of this, having attracted a significant amount of negative media attention and even been banned by German local government officials³⁰ in Hamburg. The main brands claim to be working towards increasing recycling of their capsules and Nescafe, who make the Dolce Gusto and Nespresso, offers an exchange service for single-use coffee pods, which can be collected when new pods are ordered and delivered, or dropped off at a range of locations.

At cosmetics company, Lush, around half of their products require no packaging at all, and the company reports avoiding approximately 6 million plastic containers annually across its operations from selling shampoo bars alone. They also encourage the return³¹ of the black plastic PP pots used for many of the products sold which do require packaging (and provide an incentive for doing so); the pots end up back at the



company's 'green hub' near its headquarters, and are chipped, washed and dried before being sent back to the manufacturer to be turned back into pots.

In the grocery sector, there are a number of successful refill models, where less packaging is used already in a product designed to refill an existing, longer lasting container, such as coffee in pouches. However, these are not widespread and as they are neither ubiquitous nor required, their effectiveness, uptake and impact is limited. Radical change is happening – such as German supermarket Original Unverpackt³² (Original Unpackaged) which has taken unpackaging to another level, with everything loose or in dispensers – but is as yet far from becoming mainstream.

“ Across the board, retailers and brands have been working hard to reduce the amount of packaging used in branded and own label products through lightweighting, tackling food waste, and increasing recyclability. ”

At the smaller end of the scale, there are a number of local producer co-operatives that promote refillable/returnable packaging, although many have struggled with the home delivery aspect or are yet to offer this option. Examples include SESI in Oxfordshire and various Food Assemblies³³ across the UK (and beyond) which present local, seasonal produce for sale using shared online platforms.

Against this backdrop, the debate about the mainstream viability of refillables, returnables and deposits rumbles on. WRAP's 2008 refillables study³⁴ concluded that “there is a large potential market in the UK where refillable packaging could be used.” It said that refillables could divert thousands of tonnes from landfill each year, whilst providing significant savings for the retailer and added customer value.

However, trials of in-store refills by UK retailers³⁵ over the last few years have proved to be unsuccessful, in particular a 2010/11 trial conducted by Asda and supported by WRAP which was described by the retailer's head of sustainability as “disappointing”³⁶. Aside from poor uptake, it is understood that one of the problem was with spillage and wastage of product when refilling containers, which was messy for customers and less profitable for retailers. However, pioneering brand Ecover is persevering with refillable options and supports a network of 'refill stations' in non-high street shops across the UK.

More recently, Zero Waste Scotland has reignited the debate over the potential for deposit return schemes on drinks containers, with research published in 2015

modelling what a Scottish system could look like, based on a comprehensive comparison of other systems operated across the globe³⁷. The research modelled a deposit of between 10p and 20p per item, and covered all drinks and containers, including bottles, cans and cartons.

The report considers existing schemes, costs and possible effects of a deposit levied at 10-20p per item, focused on one-way packaging (i.e. non-refillable), and recommending a 'return to retail' system. It notes: “One clear concern of beverage companies and retailers is the effect of deposits on sales, both in terms of an overall depression in sales and a switch from deposit to non-deposit bearing beverages. There is no clear evidence regarding these effects in the public domain, however.” Hence the focus is on improved capture rates motivated by recouping the deposit, and reducing the impact and cost of litter, valued at around £200m.

Environmental NGOs are also on the case; Surfers Against Sewage, for example, is currently lobbying³⁸ hard for a deposit return scheme to be introduced, primarily aimed at reducing marine litter and focusing on the prevalence of plastic bottles, noting that “each day we use a shocking 38.5 million plastic bottles and 59 million cans in the UK”. The Marine Conservation Society's 2015 Beachwatch survey³⁹ identified 159 plastic bottles for every mile of beach surveyed across the UK.

The environmental wins and losses

All of the developments discussed above have had an impact on packaging and are reflected in the five key trends currently shaping consumer packaging – sustainability, healthy living, convenience, authenticity and trust, and cost-effective shopping – identified by global packaging experts Smithers Pira⁴⁰. The jury is still out on the true environmental cost of these new consumption models, however.

On the downside, e-commerce companies are among the fastest-growing users of cardboard packaging and there is growing awareness of the packaging overload that accompanies an online shopping spree⁴¹. Anecdotal evidence, meanwhile, suggests that local authorities are experiencing a rise in the percentage of cardboard in household recycling streams but it is not clear whether this is at the expense of other forms of packaging.

Emissions from increasingly 'personalised' delivery services are another area of debate. A 2010 report from the Institution of Engineering & Technology⁴² suggests that online shopping could be increasing carbon emissions rather than helping to reduce them. The study found that environmental savings can only be



achieved if online shopping replaces 3.5 traditional shopping trips, or if 25 orders are delivered at the same time, or, if the distance travelled to where the purchase is made is more than 50km. Other research has also highlighted the 'rebound effect' where gains in efficiency in one area merely stimulate new consumption in another.

In terms of material resource efficiency, one area where 'on demand' consumption and smart technology may have real potential is menuisation, which could mean reduced or simplified packaging at the consumer point of use, better portion control and reduced food waste due to poor food inventory management or overbuying by the householder.

This is not to say that there have been no innovations in this space; in fact quite the opposite. Collectively, through WRAP's Courtauld Commitment, UK retailers have delivered major reductions in packaging and food waste ending up in domestic bins since its inception in 2005⁴³.

The first iteration prevented packaging and food waste to the tune of 1.2 million tonnes over a five year period, achievements including an increase in recycled content in plastic bottles and lightweighting of glass. Courtauld 2 covered 2010-2012 and prevented 1.7 million tonnes of waste through increasing shelf-life and cutting production waste. Courtauld 3, which ran until December 2015, was successful in delivering a reduction in food and packaging waste in retail and manufacturing of 3% and reducing the carbon impact of packaging through design and recyclability.

Courtauld 2025, launched earlier this year⁴⁴ is the most ambitious commitment yet, promising to "cut the waste and greenhouse gas emissions associated with food and drink by at least one-fifth per person in ten years and improve water stewardship, with cumulative savings of around £20 billion."

Across the board, retailers and brands have been working hard to reduce the amount of packaging used in branded and own label products through lightweighting, tackling food waste, and increasing recyclability. Co-op's total primary packaging for own-brand and branded products, for example, has reduced by 13% since 2011, and 38% since 2006⁴⁵ and in a major recent announcement⁴⁶, the company has made a commitment to ensuring that 80% of its own brand **packaging** is easily **recyclable** by 2020. It has already taken steps in this area, switching the packaging used for onions from polypropylene to polythene⁴⁷.

Materials innovation and substitution has also played a part: tuna, pet food, soups, children's food, sauces,



coffee and non-foods such as fabric conditioner have all made a partial move towards laminated pouches, either intended as a refill, single serving or as a direct replacement for a tin or glass jar.

There has also been investment in smart packaging and labelling as discussed earlier, in the use of a growing number of social media channels and apps to communicate recycling and waste prevention messages, and in transit packaging innovation, with the use of plastic returnable transit packaging for food in particular on the rise.

Efforts to reduce food waste have also ramped up, and WRAP has again provided invaluable data and impetus in this area too. In its 2014 report 'Household Food and Drink Waste: a product focus'⁴⁸, WRAP estimated that the amount of avoidable household food waste was 4.2 million tonnes per year, equivalent to six meals every week for the average UK household. With just under half of this household food waste discarded – often whole or in unopened packaging – because it is not 'used in time', WRAP made a series of recommendations which industry has already begun to act on, notably in relation to different pack sizes and improved communication of what 'use by' and 'best before' mean.

Tesco, for example, has been tackling portion control through the introduction of individual portion sleeves within packaging, so that less food is wasted. The portion-sized packs have been created by Linpac following consumer-based research carried out by Tesco, which identified specific issues around poultry portion sizes⁴⁹.

Meanwhile, Sainsbury has committed to an ambitious programme to help its customers cut food waste. The 'Modern Life is Rubbish' report⁵⁰ aims to lift the lid on food waste habits, whilst the retailer's 'Waste Less Save More' initiative⁵¹ looks to work with communities to reduce food waste, both by focusing on storage and weighing/portion control and measuring waste, and on demonstrating how leftovers can be used. Together with Google, Sainsbury has also developed a food rescue tool for leftovers.



Summary

There is no doubt that the trends discussed above are here to stay and will continue to change the way we consume. Much of the innovation to date, however, has still been conceived and delivered in the context of established, traditional shopping and consumption patterns. What we have yet to see is how brands and packaging designers get their heads around an almost entirely different relationship with the consumer, where product and service are intrinsically linked, where convenience and environmental impact have to be much more carefully balanced and where branding and packaging formats designed to work on the shelf are replaced with solutions that create a more personal 'in-home' relationship with the online shopper.

The established and highly evolved retail system is in the process of being revolutionised and this has profound implications for waste and resource management in the future. The hoped-for consequence of the impact of technology on consumers and consumption is less waste, both in terms of food and packaging. However, in the short term it will be essential to monitor the impacts of a shift to increased on-demand product and service delivery in terms of damaged products, wastage and spillage, over-packaging and value-for-money as new entrants grapple to replicate the in-store retail efficiency, practicality and safety measures which have been honed by the major supermarket chains over the past four decades.



4. The changing policy and business landscape

Consumer and technology trends are only part of the picture, and there are other equally powerful political and commercial drivers shaping society's approach to consumption, resource efficiency, and waste. From a UK perspective, however, this is a particularly difficult area to map at present, as we grapple with the implications (or opportunities) arising from Brexit, uncertainty regarding the shape of future trade agreements and the outlook for current ones on the table such as the Transatlantic Trade and Investment Partnership (TTIP), and the lack of a clear picture of what UK environmental legislation might look like in the future.

However, it is possible to have regard to the direction of travel evident not just at a European but also at a global level. There is a raft of legislation and initiatives already in the pipeline that will have an impact on product design and manufacture and wider material resource efficiency in one way or another over the coming years. In the context of this report, the rise of the circular economy concept and growing concern about food waste are two of the most important.

The political agenda

Circular economy thinking is spreading across the globe, with major manufacturing economies including China implementing formal policies and legislation, and financial organisations including the World Bank recognising the concept as an increasingly important business agenda.

In Europe, a major shake-up of environmental legislation in this area is underway with the continuing development of the EU's Circular Economy package⁵². The package aims "to stimulate Europe's transition towards a circular economy which will boost global competitiveness, foster sustainable economic growth and generate new jobs". The proposals set clear targets for the reduction of waste together with a "credible long-term path for waste management and recycling."

Broadly, the package comprises an EU Action Plan for the Circular Economy and an accompanying timetable and a number of legislative proposals revising the EU directives on waste, packaging waste, landfill and electrical and electronic waste. These legislative proposals put forward a number of new targets and provisions, including:

- simplified definitions and harmonised calculation methods for recycling rates throughout the EU;
- increasing economic incentives for better product design through Extended Producer Responsibility (EPR) schemes;
- increasing the preparing for re-use and recycling

target for municipal waste to 60% by weight by 2025 and 65% by weight by 2030;

- a gradual limitation of the landfilling of municipal waste to 10% by 2030 and a ban on landfilling separately collected waste;
- increasing the preparing for reuse and recycling targets for all packaging waste to 65% by 2025 and 75% by 2030 (with individual targets for specific packaging materials such as plastic, wood, glass, paper and cardboard); and
- the separate collection of bio-waste (including biodegradable garden and park waste, food and kitchen waste from households, restaurants, caterers and retail premises) where it is technically, environmentally and economically practicable and appropriate.

The CE Action Plan, meanwhile, extends the Commission's thinking beyond specific waste measures into other areas that need to be tackled to promote circular economy models. It is also intended to contribute to meeting the United Nations Sustainable Development Goals⁵³ adopted in 2015, in particular Goal 12 on sustainable consumption and production. The proposed actions are targeted across the supply chain, with those of particular note in the context of this report being:

- improving product design to promote reparability, durability and possibilities for upgrading, reuse and recycling of products through the Ecodesign Directive and EPR schemes;
- developing a testing programme for, and exploring the issues around, planned obsolescence;
- influencing consumer behaviour through improved eco-labelling and encouraging innovative forms of consumption such as the 'sharing economy' and choosing services rather than products;
- stimulating EU-level green public procurement;
- creating markets for secondary raw materials by setting quality standards for materials recovered from waste; and
- promoting circular economy innovation and skills through existing programmes including the Horizon 2020 research framework.

In addition, the plan identifies five priority sectors, including plastics and food waste. On plastics, the plan notes that less than 25% of collected plastic waste is recycled, around 50% goes to landfill, and significant amounts become marine litter. To address



this, in addition to proposing higher targets for plastic packaging recycling in future, the Commission is proposing to draw up a strategy to address “the challenges posed by plastics throughout the value chain and taking into account their entire life-cycle”

On food waste, the Action Plan reiterates the Commission’s commitment to the 2030 target set in the Sustainable Development Goals to “halve per capita global food waste at the retail and consumer levels”. It goes on to propose the development of a common methodology to measure food waste, clearer EU legislation on waste, food and feed to avoid food waste being generated as an unintended consequence, and the creation of a food waste ‘platform’ to bring all the stakeholders in the food chain together. The EU Platform on Food Losses and Food Waste⁵⁴ aims to halve food waste from retail and consumers by 2030 and also reduce food loss along the production and supply chain.

Food availability and wastage is a big issue that is not confined within EU borders and other major global programmes are gaining momentum. SAVE FOOD⁵⁵, for example, is a joint initiative between the UN Food and Agriculture Organization, the UN Environment Programme, Messe Düsseldorf, the food packaging industry and others) to develop and implement a global programme on food loss and waste reduction.

Taken as a whole, these developments highlight the potential for a step change in resource stewardship at every stage of the product/food lifecycle, strengthening the obligations on producers, manufacturers and brands not only to ‘design in’ resource efficiency but also to take more financial and environmental responsibility at end-of-life. The caveat is, of course, that it is not yet clear to what extent the UK’s environmental aspirations will continue to track those of the EU and other global efforts, and what trade-offs might occur in the scramble to secure future trade deals.

The business agenda

Circular economics, better resource efficiency and waste prevention (food and other) are not just becoming shared political goals, they are also increasingly on the boardroom agenda. Major commitments have been and continue to be made, particularly by large multi-national corporations through a series of global and domestic initiatives, with pioneering voices and projects emerging. Examples include Ellen MacArthur Foundation’s leadership programme (and specifically in

this context its work on the New Plastics Economy⁵⁶) and REBus⁵⁷, an EU Life+ funded partnership project set up to develop and test a methodology that enables companies to transform their strategies to profitable, resilient and more resource efficient business models. Technology is playing its part too, with considerable research and feasibility work ongoing in a wide range of fields, from smart materials to remanufacturing opportunities and harnessing the resource efficiency potential of innovations such as 3D printing.

In the consumer goods sector, some of the progress is driven by prescient companies who can see that there is more legislation to come in this area and see the benefits of leading from the front. For others, it has become an integral part of the brand ethos. Ikea, for example, appears to be mainstreaming circular economy thinking, with the retailer’s UK Head of Sustainability recently stating that we’ve “hit peak stuff” and outlining the company’s focus on “building a circular Ikea where you can repair and recycle products”⁵⁸.

Competitiveness and bottom line benefits have driven change in some instances; thanks to the collaborative REALCAR (Recycled Aluminium CAR) project⁵⁹, Jaguar Land Rover is using up to 50% recycled aluminium in new cars, delivering both environmental, brand and cost benefits. In other cases, different approaches are being explored because a waste stream has become problematic or has been associated with negative media coverage or adverse political attention; brands linked to food waste, coffee cups and plastic water bottles have all had their challenging share of the limelight recently.

If there is welcome progress on many fronts, however, what has yet to be achieved to any significant degree is a reconciliation of the consumption opportunities being opened up by digital technology, the expectations of consumers, and the policy, science and business rationales for better resource efficiency.

Consumers remain essentially disengaged from these rationales; in general we are much more excited by the prospect of more time, convenience and wellbeing and only tend to pay real attention to the environmental impact of our behaviour when iconic brands catch our attention. Apple’s launch of its recycling robot Liam is a good example⁶⁰. The real challenge, therefore, as resource availability and productivity continue to move up the agenda will be marrying up and aligning the different motivations that lie behind all the trends discussed here in this report.



5. Impact on UK packaging recovery and recycling

In assessing the overall approach to packaging waste reduction and recycling in the UK, efforts so far have been particularly focused on lightweighting, with some steps also being taken towards packaging simplification, material substitution and recyclability, supported by the on-pack labelling initiative. In parallel, local authorities have extended the range of products and materials that they accept in domestic recycling collection services. The recently published WRAP 'Framework for Greater Consistency in Household Recycling for England'⁶¹ seeks to address recycling barriers at three key stages by increasing the recyclability of packaging, reducing consumer confusion over what can and can't be recycled, and working with local authorities to standardise the range of core materials that will be collected in future. This is likely to increase the collection of plastic pots, tubs and trays, and aerosols.

Valpak, as the UK's largest compliance scheme, monitor packaging recycling levels, trends in packaging placed onto the market, and performance against various UK and EU targets. This work is supported by their in-house consulting team Valpak Consulting who pull together relevant research which helps track performance and forecast future trends and challenges. The following data has been provided Valpak to help underpin the findings and recommendations of this report.

UK packaging performance to date

To date, the UK has met all the EU packaging and recycling targets and the Eurostat data⁶² below shows the UK's position in terms of packaging placed onto the market compared to recycling performance based on 2013 data. In addition to comparing favourably with other EU Member States overall, the data suggests that the UK generates less packaging per capita than countries such as Germany, Luxembourg, Italy, Ireland, France, Denmark and the Netherlands. It must be remembered, however, that different Member States calculate packaging placed on the market in different ways, as well as using different methodologies for calculating the recycling rate. As a result it is difficult to make accurate comparisons.

Changes to waste packaging flows

Drilling down into UK performance over time, Valpak Consulting has carried out a number of 'material flow' reports in conjunction with WRAP and others over the past five years to provide an insight into the flows of various packaging material types both onto and off the market. The following section highlights some of the key findings of those projects.

Cardboard/paper

Cardboard/paper packaging placed on the UK market is forecast to remain flat at 4.7million tonnes until 2020.

There has been a growth in cardboard due to the increase in secondary packaging from internet sales, with purchases delivered to home often packaged in cardboard. There are good markets for clean, baled cardboard as cardboard boxes are a key end market globally for recycled paper/card packaging. This is balanced by a decline in newsprint due to the increase in digital media. People tend to read more news in a digital format now than through purchasing a paper from a shop. Newsprint is a key end market for recycled paper/card packaging (particularly in the UK). From an end market perspective, the UK is at a disadvantage because it proportionally produces more newsprint and less paper/card packaging than the rest of the world.

Plastic

Plastic packaging placed on the market is forecast to remain flat at 2.3 million tonnes until 2020. Growth in mixed polymer complex packaging and mixed material laminates are challenging for recyclers and will increase in the waste stream if recycling solutions are not found. The total volumes of this type of material remains small in comparison to the more traditional plastic packaging formats of PET and HDPE plastic bottles, Polypropylene (PP) pots and tubs and other formats of plastic packaging. Switching has occurred from glass bottles and metal drinks cans into PET/HDPE bottles which are cheaper, lighter and resealable.

Waste plastics that are recycled are typically used in packaging, construction and automotive industries. Over half of UK recycled plastics are sold into packaging, a market which proved resilient to the credit crunch and due to innovation, light-weighting and switching from other materials represents a good opportunity for recycled plastics.

Glass

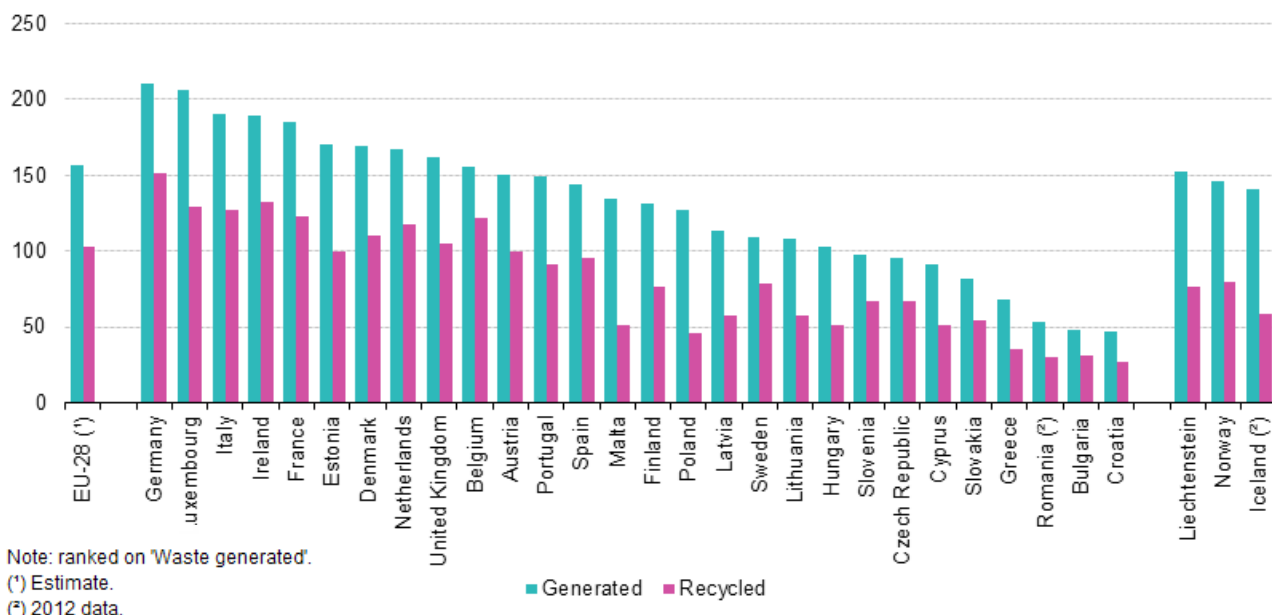
Glass packaging placed on the market is forecast to remain flat at 2.4 million tonnes until 2020. Around three quarters of waste glass packaging is bottles and the rest is mainly jars/pots. The greatest use of glass bottles is predominantly for alcoholic drinks. The challenge facing glass recycling is the quality of collected material – mixed colour and mixed materials can be uncompetitive with cleaner foreign material. The largest end market for waste glass bottles and jars is back into packaging – re-melted back into bottles and jars. The next biggest markets for glass bottles and jars are aggregates (e.g. gravels and sands) and then fibre (e.g. fibreglass).

Metal

Metal packaging placed on the market is forecast to decrease slowly (~5%) to 0.7million tonnes in 2020.



Volume of overall packaging waste generated and recycled per inhabitant (kgs per inhabitant) 2013

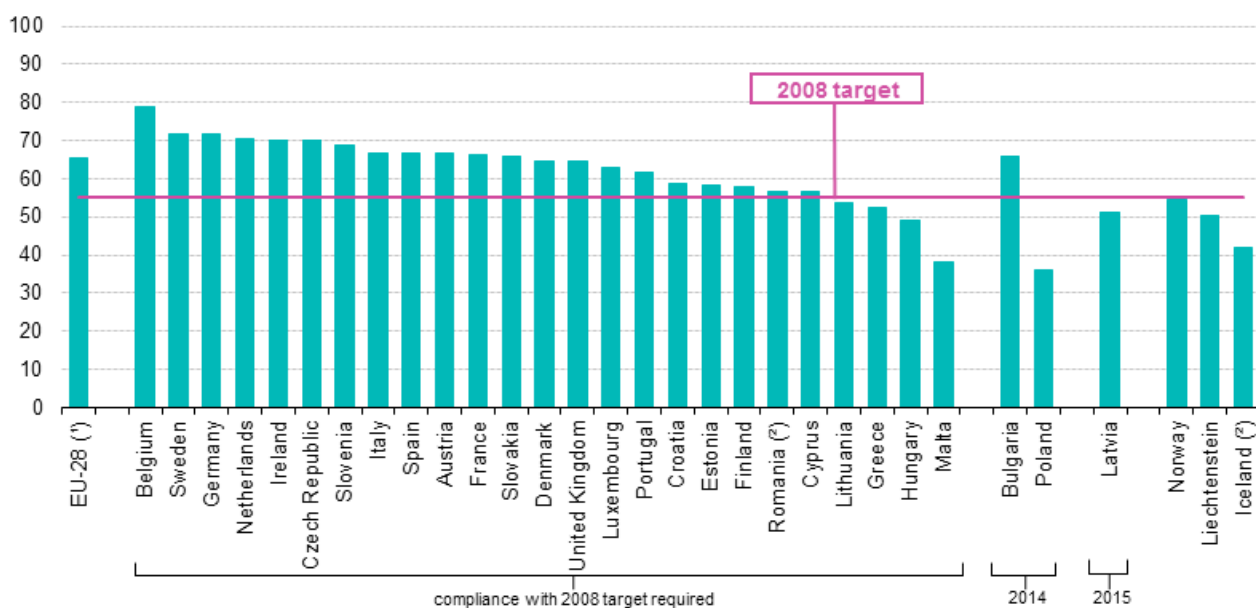


The majority of steel packaging in the UK waste stream/recycled is cans (food and drink). Recycled steel in the UK is used for construction, general engineering, automotive and other metal goods.

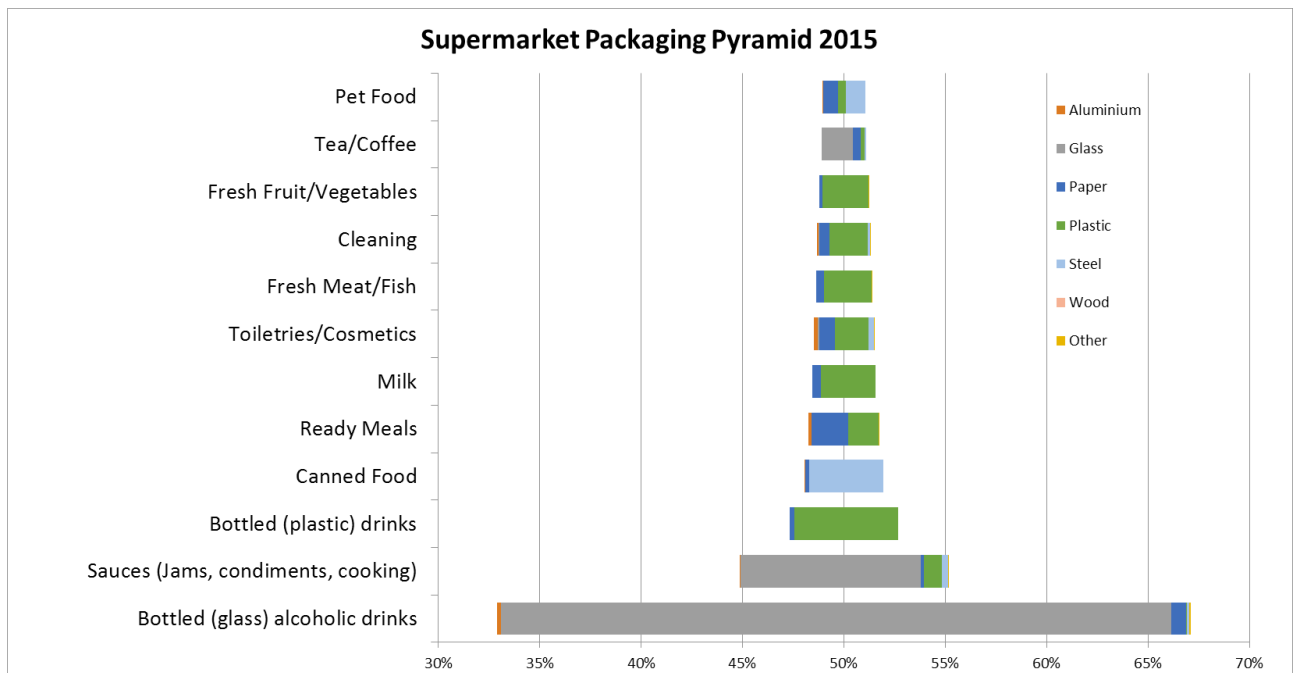
The majority of aluminium packaging in the UK waste stream/recycled is beverage cans, but also aerosol, pet food trays, lids and tins (for confectionary). Recycled aluminium is used in transport, construction, packaging and electrical goods.

The data also shows that the volumes and formats of packaging have remained relatively constant in the period 2010 to 2015, but there is some movement. In order to map the picture more clearly and track change over time, Valpak has taken packaging format weights and sales volumes data and organised it in a pyramid to show the materials and formats which make up the top 12 supermarket categories. [NB: the packaging analysis carried out for CIWM in 2016 was undertaken on supermarket data only. The 2010

Recycling rate for all packaging, 2013



(*) Estimate.
 (†) 2012 data.



and 2015 data sets were normalised to enable comparison.]

This pyramid illustrates that glass bottles associated with bottled alcoholic drinks remain by far the largest single category by weight of packaging consumed. It is 30% larger than the next nearest category. A considerable amount of light weighting has taken place across these product packaging lines and therefore the totals may also reflect higher sales volumes.

The second largest category is Sauces (jams, condiments, cooking.) There is a slight overall weight reduction in the data from 2010 compared to 2015.

Plastic drinks bottles have moved from fourth to third place in the pyramid. This is due to a slight increase in the proportion of total weight of plastic bottles and a slight decrease in the proportion of total weight of food cans. The proportion of plastic material in plastic bottles has increased slightly where paper has reduced, potentially suggesting a shift from paper to plastic labels.

Canned food has dropped from third to fourth place. This is due to a slight decrease in the proportion of total weight of food cans and a slight increase in the proportion of total weight of plastic bottles.

Ready Meals category remains in fifth place accounting for approximately the same proportion of packaging weight as it did in 2010. There appears to be a higher proportion of cardboard in ready meals packaging and a smaller proportion of plastic in 2015.

The weight of milk packaging as a proportion of total packaging remains the same. The vast majority of material used is plastic, with some paper used in labelling and small amounts of aluminium used as seals.

The weight of toiletries/cosmetic packaging as a proportion of total packaging remains the same with plastics and paper/card as the dominant materials.

Fresh Meat/Fish has moved from tenth to eighth position in terms of the proportion of weight of all packaging, ahead of packaging around cleaning products and tea/coffee. The proportion of plastic to paper packaging has increased.

Cleaning remains the ninth heaviest packaging category, but represents a slightly smaller proportion of overall packaging. The proportion of plastic to paper packaging has increased.

Fresh Fruit/Vegetables moves up one place from eleven, fresh fruit and vegetable packaging represents approximately the same proportion of packaging. As in 2010, the vast majority of material used is plastic (90%+), with most of the remainder being paper used in labelling and trays.

Tea and coffee packaging has decreased as a proportion of overall packaging, falling below fresh meat/fish, cleaning and fresh fruit/veg packaging. There appears to have been some switching in packaging material with less glass, but more paper, plastic and steel packaging.

Pet Food remains the twelfth heaviest packaging category, but represents a slightly smaller proportion of overall packaging. There appears to have been some switching in packaging material with less steel and paper, but more plastic packaging.

The table overleaf summarises the changes in category positions.



The future

The data discussed here, which is collected as a requirement for the packaging regulations, is key to understanding packaging trends over time and understanding where current and potential future opportunities lie for improving resource efficiency. It has been used to help reporting under WRAP's Courtauld Commitments and also to inform the changes manufacturers and retailers make to consistency work (packing products in more uniform types of packaging), lightweighting scenarios and other ways to reduce any negative impacts of packaging.

In assessing current and future trends, the multiple functions of packaging needs to be acknowledged. Packaging contains, protects, preserves, and promotes products, and carries an increasing amount of information for consumers, much of which is required by law. It must meet a range of product specific requirements, such as being easy to open and re-close, tamper-evident, child resistant, or able to dispense product in a certain way. It also plays an increasingly important role in reducing food waste, which has a much larger environmental impact. Consumers are often unaware of these various roles and of the ongoing efforts of the industry to try to ensure that packaging is minimised, fit for purpose and resource efficient.

The changes in consumer behaviour, attitudes and technology discussed in this report will open up both challenges and opportunities in terms of packaging design and functionality, and branding strategies. Key

2010		2015	
1	Bottled (glass) alcoholic drinks	1	Bottled (glass) alcoholic drinks
2	Sauces (Jams, condiments, cooking)	2	Sauces (Jams, condiments, cooking)
3	Canned Food	3	Bottled (plastic) drinks
4	Bottled (plastic) drinks	4	Canned Food
5	Ready Meals	5	Ready Meals
6	Milk	6	Milk
7	Toiletries/Cosmetics	7	Toiletries/Cosmetics
8	Tea/Coffee	8	Fresh Meat/Fish
9	Cleaning	9	Cleaning
10	Fresh Meat/Fish	10	Fresh Fruit/Vegetables
11	Fresh Fruit/Vegetables	11	Tea/Coffee
12	Pet Food	12	Pet Food

priorities for the packaging industry have been and will continue to be to:

- increase efforts to design product and packaging systems that minimise the use of materials, energy and water and minimise environmental impact throughout the product lifecycle;
- provide food and other goods in a wide range of portion sizes to suit the needs of different lifestyles, shopping channels and preferences;
- design all packaging to be resource-efficient;
- design for recycling if an infrastructure is in place to collect, sort and clean the packaging in a way that will yield a net gain in resources; and
- provide clear, reliable information to consumers and other stakeholders.

Summary

- Overall packaging volumes and material formats have remained relatively constant.
- All packaging materials placed onto the market are projected to have flat growth forecasts until 2020.
- Glass bottles and jars remain by far the largest volume of packaging and are directly associated with alcoholic drinks.
- Cardboard secondary packaging has grown due to home delivery from internet sales which has grown as a sales channel over recent years.
- Changing sales patterns create challenges and opportunities for business.
- Packaging's main purpose is to transport, protect, preserve and store goods from manufacturing to consumption, and carry brand, marketing and product information.
- The Circular Economy will drive even more effort to design products and packaging systems that minimise the use of materials, energy and water and minimise the environmental impact throughout the product lifecycle.
- Good packaging is packaging that protects products throughout their journey from farm or factory to the final end user with minimum environmental impact and minimum waste from product and used packaging.



6. Future scenarios: expert and consumer views

Following discussion by the Steering Group, three scenarios were developed for testing and commentary, and used to inform the opinion research questions. The scenarios are not attempting to predict the retail environment or model the impact of macro-economic or geopolitical changes; they serve as a method of discussing changes already in train and identified, and the potential intentional consequences and impacts on material resource efficiency.

Scenarios are based on trends that are already developing, including:

- uptake and adoption of smartphones and their use for online shopping;
- increase in convenient click & collect and home delivery;
- adoption of automated services in-store by retailers and consumers;
- changes to waste/packaging arisings and flows, e.g. newsprint/card packaging; and
- introduction and early adoption of 'last mile' providers (Uber, Deliveroo).

The fundamental premise is that technology is being adopted rapidly by UK consumers who realise the convenience benefits, freeing up more of their time. This brings significant potential opportunities to reduce the amount of waste (and cost) through a revised customer relationship which is increasingly on-the-doorstep or even in the kitchen.

The scenarios were partly guided by previous work carried out to predict the future direction and, to some extent, impact of retail, together with its impacts on consumption. Two sources in particular were cross-referenced:

Forum for the Future's Retail Futures 2022 and Consumer Futures 2020

The Forum for the Future scenarios^{63, 64} have similarities to those developed here. Published in 2008, the report sets out four scenarios: 'my way', 'sell it to me', 'from me to you', and 'I'm in your hands'. The major influences considered in those scenarios are macro-economic and geopolitical uncertainties, and ideological differences, with the scenarios plotted across two axes - prosperity and self-reliance. There are many complementary aspects between these scenarios and the scenario progression in our own research.

In Retail Futures, the authors note: "In a parallel 2022, people have stopped shopping altogether – at least for everyday staples. Instead, milk, bread, pasta, washing powder and toilet tissue simply turn up in their porch whenever they are needed, triggered by messages sent automatically to the retailer direct from their cupboards and fridges."

The scenario commentary also reflects that there are "strong trends that suggest consumers want more power to do things for themselves: the demand for more information about products, the desire for a personal link with the products they consume, or a willingness to trade with peers on the internet."

EU SPREAD project

SPREAD Sustainable Lifestyles 2050⁶⁵ is a European social platform project which was completed in December 2012. The project provides a deep dive into underlying influences and trends, and by its very nature has had to cope with and cater for trans-continental variables. It is inherently top-down and policy driver-oriented, although it recognises the role of technology in creating more sustainable places, services and lifestyles. The infographic⁶⁶ is a good reference for some of the baseline data underpinning EU society and metrics for measuring performance and progress.

There are also outlier scenario provocateurs and those challenging systems and prompting inward analysis, such as Forum for the Future's #theBIGshift⁶⁷ and Frey & Osborne⁶⁸ who predicted 47% of US jobs could be automated by 2050. However, we have stopped short of automisation, driverless vehicles and robots in our scenarios; this is work that should be pursued separately as it relates more broadly to the industry and society.

Scenario 1: Grocery home delivery with top-up shopping locally predominates

- Competition in the home delivery market heats up and moves out of cities and large towns to smaller towns and villages near arterial roads;
- A majority of households move to home delivery based on convenience and value, in part due to fuel costs/pollution taxes and congestion;
- Retailers move away from the current 'hybrid' system of using stores and front-of-house staff picking to warehouse style back-of-house picking or smaller local stores.



Scenario 2: Internet of things ramps up

- Connected households and smart technology combine with improved online services provided by retailers, enabling automated ordering of goods and services;
- Delivery efficiency improves through increased route density and 'uberisation' of the last mile, new partnerships & greater competition, significantly reducing costs;
- Food waste is significantly reduced and retailers/brands play a part through menuising food purchases and interacting with the nation's smart fridges.

- retailers move away from the current 'hybrid' system of using stores and front-of-house staff picking to warehouse style back-of-house picking or smaller local stores.

This scenario is, in effect, already in transition and many of the aspects referenced have been trialled, tested or are in use by smaller or specialist retailers/local co-operatives. The main constraint on its expansion is that online shopping and click & collect/home delivery is currently a 'hybrid' and doesn't quite work (in terms of making a profit) because it is making use of existing infrastructure while waiting for a clear signal to invest. Equally, existing products and packaging are designed to be on a shelf, in the back of a car or carried home on a bus or a train. It is not yet clear what packaging innovations will follow in the wake of the shift towards online shopping/home delivery.

Scenario 3: Servicisation of groceries and packaging

- Post-Brexit brave-new-world producer responsibility regulations incentivise prevention/take-back and 'ownership' of packaging and end-of-life products;
- New market entrants 'utilise' and 'servicise' the relationship with householders for a basket of needs which could include energy, water, waste and basic goods;
- Servicisation revolutionises how food and drink are delivered, with dispensers used to top-up long-lasting refillable containers and doorstep exchange services.

What is clear is that the rate of change is likely to be speeded up by new market entrants (such as Amazon Fresh/Amazon Dash) who are unencumbered by edge-of-town or high street assets in the form of shops requiring staff, deliveries and footfall. Indeed, we are already seeing mainstream players react by gearing up their 'offering' towards home delivery: Sainsbury's are investing heavily in click & collect points, for example, and there are now Argos outlets in some Homebase stores.

The main changes that might be expected are that:

- delivery vehicles evolve with dedicated separate space for returned non-food products and end-of-life returnable materials such as batteries/containers;
- edge-of-town superstores shrink their front-of-house space and expand warehouse space for direct picking/packing & space for processing returned non-food goods;
- retailers experiment with broader services including refillable/returnable non-food packaging, such as washing-up liquid, shower gel and fabric conditioner;
- larger 'value for money' bulk-buy items are promoted through home delivery, such as non-food goods like washing powder, and long-life non-fresh foods; and
- more 'pouches' and other lightweight laminated packaging products are used and find their way into the domestic waste stream.

Despite convenience being a driver, environmentally conscious customers are seeking to dispose of or reuse their packaging in a responsible way and there are examples of refillables/take-back systems in operation by high street retailers, as noted in the desk research. However, the direction and pace of any change in this aspect of consumer and supply chain behaviour is less clear.

Part 1: Expert commentary on the scenarios

The expert panel members discussed the three scenarios. There was broad support for the scenarios and an acceptance that Scenario 1 – and indeed, aspects of Scenarios 2 and 3 – is broadly in transition already and that the hybridised 'make-do' and asset-sweating elements will evolve rapidly.

Scenario 1

Grocery home delivery with top-up shopping locally predominates, and:

- competition in the home delivery market heats up and moves out of cities and large towns to smaller towns and villages near arterial roads;
- a majority of households move to home delivery based on convenience and value, in part due to fuel costs/pollution taxes and congestion; and



Expert commentary on Scenario 1

Whilst it was broadly accepted that scenario 1 is already in play, there was a clear split between retailers and innovators on how (and how fast) it will evolve.

“Retailers are moving away from hybrid systems.”

“Technology will become more prompting, telling you that you’re missing something or even that you don’t need something.”

“Need to be thinking more about the art of the impossible and tomorrow’s problems.”

Online and convenience shopping is increasing at the expense of out-of-town stores, and the hybridised model (where online ordered shopping is effectively picked from the shelves for delivery by the retailer) is changing, with dedicated and semi-automated ‘dark stores’ (warehouses with no public access/front of house) coming online.

There was excitement and trepidation in equal measure when it came to new market entrants such as Amazon and last mile providers such as Uber and Deliveroo, but there was a realisation that this presented a driver for change, particularly in how and what was delivered (and collected).

“The Amazon button is a way of bringing in technology, an engagement tool.”

“The shelf should be doing the hard work, not the packaging.”

“Shopping methods are changing. Food boxes with recipes and ingredients are more popular for convenience; ready meals may leave less food waste but need more complex packaging.”

Current regulations and common sense said that there would need to be very careful segregation of food from non-food returned goods/materials.

“Collecting recycling materials when you deliver food has an array of health and safety issues; you’re relying on low-paid workers to make the right choices.”

“Long term it is not impossible, but vehicles/fleets will need redesigning.”

All accepted that the current hybrid system is a temporary state, and all the signs are pointing to more home delivery.

“This scenario is ‘IT-lite’; click and collect/internet shopping, using the shop as a warehouse. The next gen stuff happening is really exciting and will turn it on its head.”

Returnable, refillable packaging and deposit return schemes presented the greatest division, but for good reasons - retailers have clear concerns over the protection of goods, prevention of food wastage, and cost to the consumer.

“It’s easy to adopt a metropolitan viewpoint; the cost of taking back empty drinks containers from the Highlands would be around £5m per year, for people already paying for their bins to be emptied.”

“The WRAP and Asda in-store detergent refill trial, and the Sainsbury’s milk pouch trial, showed that consumers don’t like mess... the buy-in wasn’t there from the consumer.”

“Refillables pouches need to save money, be simple and not messy for the customer, and retailers need to make their margin; they are very popular in Canada.”

“You still need a kerbside collection scheme.”

There is also clear recognition of the need to act on complex packaging and plastic films in order to offer recycling options.

“Moving to pouches means you lose a valuable material from the waste stream - currently it becomes a rubbish problem rather than a recycling problem; research shows that a coffee pouch is still a better environmental solution than a glass jar. But consumers like recycling! We really need a recycling solution for pouches.”

“What is the target - weight reduction, food waste prevention or increased recyclability?”

Brands are seen as needing to play a major role in the transition through and beyond scenario 1, in terms of consumer awareness and customer engagement - not to mention the servicisation of products.

“A brand is a promise that a company makes. It needs to fulfil that promise.”

“Brands need to meet the demands of millennials, otherwise they could collapse.”

“Amazon’s frustration-free packaging is an interesting concept - a lot of packaging is about attracting attention in a shop, but if you’re buying it online it can be simplified.”



Scenario 2

The 'Internet of Things' ramps up and:

- connected households and smart technology combine with improved online services provided by retailers, enabling automated ordering of goods and services;
- delivery efficiency improves through increased route density and 'uberisation' of the last mile, new partnerships and greater competition, significantly reducing costs; and
- food waste is significantly reduced and retailers/brands play a part through menuising food purchases and interacting with the nation's smart fridges.

We are a connected nation and our uptake of online shopping in all its forms is second to none globally; and yet we are perceived as a nation and a people that is averse to change. However, the next generation of householders is demonstrating an even greater appetite for online retail and smart technology, as it enables them to save time for more experiences. Additionally, it is a generation with a tacit concern for the environment in terms of the values it believes business should promote and work towards⁸.

Smart fridges have made a fairly sizeable leap forward in 2016 with the introduction of the Samsung family hub. Whilst there are concerns over the security, level/duration of software support and updates and 'gimmick' status, there is no doubting that connected appliances and smart homes are on their way, with major energy savings promised.

Retailers are also offering vast amounts of information, recipes and 'menuisation' for customers, with the ability to order the ingredients. Whilst currently the interface is dumb, it is only a short step to make the process smart - knowledge of what a customer buys when, and best before/use by data already exists but is not yet widely exploited to prompt purchases or menu ideas.

Uberisation of food delivery is gathering momentum, with the ability to order from almost any local takeaway using the 'Eat' app or Deliveroo service. The Uber effect - the ability to service delivery (or collection) of almost any product - significantly reduces the last mile cost, whilst also substantially increasing route density and service frequency. This enables local businesses to uberise their customer relationships and offer menu, top-up and specialist products 24/7. It also enables a much closer and 'local' relationship with their customers, enhancing take-back and refillable opportunities.

However, the major focus of scenario 2 is on the reduction and prevention of food waste. Additionally, there are the cumulative benefits of scenario 1 and packaging benefits of less food waste (ie. less food

sold/more of what is bought being consumed rather than wasted).

Main changes that can be anticipated are:

- food waste tonnages collected by local authorities reduce, as potentially does contamination of dry recycling by food;
- commercial and industrial food waste tonnages increase as more food preparation moves from the household to the supply chain but may be rapidly addressed as a bottom line issue;
- fresh food is able to be delivered more frequently through uberisation and competition bringing costs down/route density increasing passing frequency;
- local shops, specialist stores and co-operatives 'deliveroo' their offering to provide home delivery for shoppers choosing quality/artisan products or meals; and
- smart businesses work with smart fridges to offer, order and deliver the missing contents for meals to make use of the food in fridges/freezers, reducing waste.

Here we start to see some very significant potential impacts on waste in all its forms, including food waste, dry recyclables (both the nature of the materials and levels of food contamination), transit packaging and the opportunity for refillable/returnable packaging.

Expert commentary on Scenario 2

There is a healthy scepticism of the Internet of Things by both retailers and innovators. Consumer choice and a degree of personal engagement are both strong human traits, and no amount of tech is currently viewed as overcoming this basic human need.

"A smart fridge, is still smart-dumb - it needs more data, and smart cupboards."

"Retailers could help with smarter shopping lists instead of just smarter fridges; smarter interaction with customers through online recipes."

There are concerns at least over the short-term negative impact of technology on efficiency.

"The Internet of Things won't drive packaging reduction; it will be more about the aim to increase shelf-life."

"The Amazon button could become a bad thing, leading to more and more deliveries of smaller and smaller amounts, with more delivery vehicles on the roads."



But commentators could see integrated tech - much more than just a fridge with a screen on it - playing an ever more important role and potentially changing the way we live in terms of meal planning and even the amount of space needed for kitchens/storage.

"I can see smart fridges and cupboards getting smaller, combined with on-demand ingredients delivery - this will liberate more space for living, less space for storing."

"The smart fridge has real potential to tell you what to make and what to use up."

"The full monty IoT integrates smart cupboards and allows the user to work out what they've got/need for a meal of their choosing, and order what's missing 'just in time'. This is the real revolution. A scenario 2+."

The role of shopping and shops as a leisure activity and a chance to gain advice were also seen as important factors to consider in this scenario.

"Shopping online may limit the choice that people have and some will go back to shopping locally, farmers markets and the like - a rich and rewarding experience for fresh food."

"Out-of-town shopping centres will become a destination, with more choice to pull in customers. Coffee shops, cooking demonstrations, drive-through, dog walking, picnic areas."

"Shopping is still a leisure activity and most only shop online for a specific reason - children, time pressures."

"Look at Morrisons Market Place concept - slim front end, bespoke/advice/local; larger warehousing element. 'Showroom' model, think PC World/Argos."

"I can see the Internet of Things turning out-of-town centres into collection points."

"It's the language that isn't smart - we need to move to creating menus."

Turning to packaging and food waste, there was a clear difference of opinion between retail and innovator perspectives. Retailers were firmly of the view that packaging would become more complex, in order to extend shelf-life and provide portion control in order to reduce food waste.

"There will be extra laminates to keep food fresher for longer - packaging will be more complex but food will last for longer. Chicken portion packs are a good example - they weigh a few grams more but

compartments mean less food is wasted. Bread and dairy are big food waste issues."

"The WRAP reports showed this - people throw food away because they are not eating it in time."

"Aiming for one polymer for plastic packaging is a bit of a pipe dream."

Innovators felt there was a need for greater challenge in order to drive innovation, and that the drivers for change needed to come from a regulator/regulation.

"Food waste is a bit of a current cash-cow for some local authorities with AD systems."

"If you set an aim like that (one polymer), you can innovate around it."

"I'm not convinced that industry will lead. USEPA and the automotive industry is a good example. They had to run their own engine R&D programme. We need an independent body to set standards to link innovation and infrastructure."

There is a clear role for local authorities and consumers, too.

"Consistency of what is collected is essential."

"The consumer doesn't ask for extra packaging. They would think more if they had two bills (shopping bill and PAYT bill) - 'Why do we have this packaging?' If producers are challenged, then they will think more carefully."

Some of the discussion around innovation and sustainability centred on the fact that they are not integrated and don't understand each other; sustainability is viewed more as a risk than an innovation. Additionally, there are concerns that plastic is being demonised.

"Plastics are a relatively new material - 60 years old but with a 400+ year life. The product has a short life but the packaging lasts so much longer. We are still learning..."

"Packaging sits in a really interesting position: it is demonised but is a superhero, massively lengthening the life of food."

The last mile element is particularly interesting, as the scenario plays out and evolves. Some challenged whether the scenario went far enough, in particular in relation to grow-your-own and the local focus; others again were concerned over the consequences.



"The Deliveroo aspect - there needs to be some focus on takeaway containers. This area is increasing and so is the packaging. There are people like me with drawers full of containers! If they are microwaveable they are difficult to recycle."

"Farm boxes are reaching us far more as the last mile is becoming cheaper. They need to rebrand themselves to target the right people."

However, there are other more mainstream elements that came to the fore. Competition in home delivery is clearly shaking up the sector, as well as opening up opportunities for smaller and more local suppliers to compete for customers.

"Amazon developing refrigerated transport... they will become the main service provider."

"Uberisation really helps with convenience for small/artisan suppliers, insofar as they have the ability to service and compete; 'Just Eat At Home' - another revolutionary change that we are right on the cusp of."

All agreed that data is key to smartification. Innovators had an eye firmly on deliverability, and not whether but how rapidly this scenario might evolve.

"The challenge is 'the shock of the new' - it's not what we can make tech do, that's relatively easy; it's what we can make the public accept. Phillips or Google connected home projects can easily integrate use by/meal suggestions... but getting the public to accept it is the bigger task."

"We are a very long way from 'consumption to wellbeing' as a service, an expanded scenario 2. Insurance companies are already rewarding good citizenship, i.e. careful driving, healthier lifestyle. That's a really interesting fifteen year scenario."

Scenario 3

Greater focus on producer responsibility and further servicisation of groceries and packaging, with impacts including:

- post-Brexit producer responsibility regulations incentivise prevention/take-back and 'ownership' of packaging and end-of-life products;
- new market entrants 'utilise' and 'servicise' the relationship with householders for a basket of needs which could include energy, water, waste and basic goods; and
- servicisation revolutionises how food and drink are delivered, with dispensers used to top-up long-lasting refillable containers and doorstep exchange services.

To some extent, this scenario includes 'back to the future' elements, with a return to in-home reusable/refillable branded containers. The added benefit to brands is a constant presence in the homes of customers, and the opportunity to market their credentials as high quality and environmentally and socially conscious companies.

Doorstep exchange/top-up services enable dried food and non-food items to be delivered at any time, potentially even if householders are out, providing extra convenience over standard home delivery systems or click & collect.

Post-Brexit Britain could see producer responsibility racked up several notches as part of a home-grown initiative to tackle litter and the cost of waste management in public places, supported by international trade agreements and border tariffs favouring organisations that 'leave no trace' - incorporating end-of-life responsibilities and enabling the country's economy to benefit from the secondary resources derived from imported goods.

Driven through ultra-convenient options introduced by new market entrants, businesses offering 'servicised' options would continue to gain a stronger foothold, expanding on the veg box market and building on the local shops/Deliveroo aspects in Scenario 2. Changes to food and packaging volumes and types will be part of the mix but are more difficult to assess in this 'brave new world' scenario.

Some of the main changes under this scenario might be:

- dried foods and non-food products move to a refillable, doorstep exchange service model, significantly reducing single-use packaging, specifically plastics;
- meal services providing the ingredients needed for planned meals, picked and packed as part of a service agreement, reduce storage, packaging and food waste;
- brands encourage customers to take their top-up services by offering high quality, branded containers/dispensers that are displayed rather than hidden, e.g. olive oil;
- branded containers/dispensers further reduce packaging, specifically plastic bottles, cardboard boxes, plastic film bags and single use glass; and
- single-use/disposable options become less common as a result of the greater emphasis on product stewardship.

Expert commentary on Scenario 3

Commentators viewed this as an extension of scenario 1, with weak signals already indicating the potential



direction of travel. There was considerable discussion around refillables, returnables and deposits. While some felt that returning items to a supermarket could feel like a backward step, others believe that the idea could be much more attractive in the context of home delivery:

"How are you going to force customers to take things back? Refillables/DRS won't replace kerbside as we are not starting from scratch."

"Refills are a fascinating area, but it doesn't feel like we have set up systems to crack that at any scale, certainly not for food and personal care products. Tinkering around the edges; it still feels like a backward step, the inconvenience of taking stuff back."

"From a retailer perspective, we need behaviour change for refillables; food or household products won't move quickly enough without a push."

There was also a broader conversation around consumption and attitudes.

"We definitely need a 'consumption without bounds' culture change."

"Yes, it's okay to sell single use items, because the customer wants them - it's a consumer behaviour issue. UK surveys show the worst litter is chewing gum and cigarettes, yet in Berlin there is very little chewing gum on the ground."

"You can buy a tent for £6 - this is clearly a disposable tent. This is an important part of producer responsibility for me."

Even though the scenario skirted around the issue of specific legislation, levies and fiscal instruments, our experts were very keen to talk about these aspects, in particular given the positive impact the carrier bag levy has had, the current debate around coffee cups, and mounting pressure for deposit-return schemes. Discussion centred on levies, Producer Responsibility and the role of brands.

"I can see a 'disposable' products levy being introduced and impacting positively."

"It's been common sense and market forces so far, but we do need fiscal instruments."

"The debate around EPR is ongoing - who is the producer? Legislators and the public like big brands to take responsibility."

"I don't think a 5p charge on a cup of coffee will change behaviour because of the daily commute. Maybe improving infrastructure would improve things. And a discount for bringing your own cup would help with culture."

"The carton world is a good example - industry funding reinvented the system and drove up recycling again. Finance should go to setting up recycling centres."

"Brands put the onus on the consumer. Complexity, for example colour, comes from the marketing brief and it's those guys that control the brand and make the product unrecyclable. Needs a labour/energy/material supply chain focus."

One area where all the experts agreed was that change is coming, often as a result of outside influence as well as supply chain innovation, bringing with it a world of opportunity for innovation in service, packaging and customer relationships.

"It will split even more into types of shopping. Utility shopping online and then inspired shopping and cooking using the local butcher and knowing the provenance, for example. The brand relationship is important in both. In person, in a shop, you do buy more."

"A disruptive app that could scan food in a shop and tell you if you need it. Supermarkets wouldn't develop an app like this. The Ethical Choice app designed last year which shows you the credentials of the product - something like that."

"The aggregator (online interface) allows you to buy different things from different suppliers. Need to decode it and help consumers through this process."

"People need to engage with the consequences of their actions. We need to push on with the message that resources are limited but without scaring people."

Some of our experts felt this scenario could develop much further, and that the future would be driven by revolutionary models fully servicing food. All agreed that packaging and where waste is generated would shift further up the supply chain and away from the household.

"Internet of Things - not convinced. Maybe sell-by dates; I can't see automated ordering being needed, almost a solution looking for a problem... but I can see it when a retailer says 'give us £300 a month and we'll deliver what you need'. That's really interesting."

"Urban farming, food production and even manufacturing is likely to localise more, reducing loops, a more local supply chain. Production has the potential to go in a similar direction - making, buying and even returning, 3D printers and so on. These networks are growing in large cities like London and Barcelona."



“As a consumer, you conceive your basket of food as meals, the movement is towards a kit of parts, what you need rather than a bag of this or a packet of that. Implications are ‘no waste’ - what it means for the supply chain behind the scenes is very different - wastage is displaced and the 15:1:15% (pre-retail:in-retail:at-home) will shift back up the chain to distribution where it can be better managed and priced.”

“Just in time eating - a lot of the transit/storage packaging disappears, and reduces ‘special packaging’ requirements (simplification). Transit packaging may get smarter/more complex, but this will save the ultimate packaging/preservation/individual wrapping requirement at the householder end, dramatically reducing waste in the typical domestic bin.”

Commentators’ final thoughts

In summing up, the expert panellists were asked for their final thoughts and suggestions.

Vision:

“Continued hybrid mix of retail, shops won’t be going anywhere and we need continued collaboration and simplification for packaging waste.”

“Local authorities versus retailers and who pays - this has been going on for too long. Recognition of the role packaging plays to help reduce food waste is getting better.”

“Significant intervention in monetary consequences through a raw material tax and a harm tax. Start with big producers.”

“The design brief needs to be relevant to the product - add this sentence to all briefs: ‘this product should be designed for a second and third life’.”

“Who pays? Producer responsibility, taxation - need to map this space better to understand where responsibility lies from design to collection.”

Reality check:

“Check what we really want as the final outcome.”

“We need careful fiscal instruments to be implemented.”

“Packaging will get more complicated before it gets simpler and will impact recycling rates if we don’t act.”

“Harmonisation of materials and recycling systems is important and we should be setting these areas so innovation can happen.”

“Social value - if you Uberise everything, you lose the interaction, the wellbeing value.”

“New ways of consuming may be environmental, but it’s essential to do things that also make you happy!”

“At the heart of this is the consumer and the customer - the householder. They have to come along on the journey.”



Final thought:

"What will happen won't be what we expected."

"Incentivise retailers to put more recycled content into packaging to drive the industry - an example of a careful fiscal instrument."

"Major reductions in the packaging weight as a proportion of product has reduced significantly since 2007, now 26% lower. This has been driven by retailers challenging themselves."

"Optimism: pockets of innovation and some resistance in certain categories; needs a political will to succeed."

"Where there's a will there's a way. Long term vision required, policy is needed to shape the landscape and implement the vision, and make it a reality."

"We currently have no long term vision for these issues (scenarios)."

"Change has to be sponsored by someone at the top."

Part 2: Consumer views

Alongside the expert panel sessions, we also surveyed consumers on aspects of the scenarios in order to gauge the level of interest in trialling resource efficiency measures as part of an online consumer survey conducted by Icaro with 2,436 UK adults aged 18+, from 22-28 September 2016.

The sample is representative of the UK population in terms of age, gender, region and ethnicity. Base sizes vary by question – and are stated in brackets throughout. Where percentages do not add to 100% this is due to computer rounding of the raw data or multiple response questions. An asterisk (*) denotes a value greater than zero but less than 1%.

The survey demonstrates that around a third shop online at least monthly and over half shop online at least a few times a year. This is similar to Ofcom data¹.

Furthermore, of those who shop online for food, two thirds always have home delivery. This is highly significant, demonstrating that this option is becoming a default option due to convenience and recent improvements through offering narrower time slots and cheaper 'off-peak' slots during the day/week.

Equally, it is important to reflect that 44% of those surveyed have never shopped online for groceries.

Almost a half of those surveyed who had scope to increase online food purchases said that free delivery would encourage them to use home delivery more frequently. Cheaper offers were favoured by one quarter (28%) of respondents.

Having established shopping habits and respondents' propensity to shop online, we then asked which of a series of measures our prospective shoppers would be prepared to trial.

The results here are again significant. For each option, four fifths of respondents were very or fairly interested in taking part in a trial. The measures included returnable packaging, refillable containers and the collection of recyclables that are picked up when their food waste delivered - this being the option with the greatest support at 86%.

This demonstrates that in all likelihood there will be a sizeable, willing and positive audience prepared to trial different options with the aim of providing an improved service and significant reductions in the volume of packaging remaining for collection in the typical householder's bin.

This could have a significant impact on the way in which near-future producer responsibility regulations are drawn up; importantly, it could be and should be used to ensure



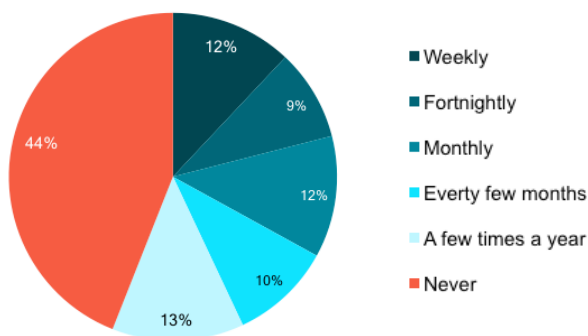
future regulations are fit for purpose and quantifiable in terms of their effectiveness in delivering further reductions to the amount of packaging waste generated at the householder level, and the potential for ensuring solutions for smart, returnable or refillable packaging.

Looking further ahead, the results of this survey provide an array of opportunities for innovators, entrepreneurs and

disruptors to step into the fray with potentially revolutionary solutions and an entirely new relationship with consumers.

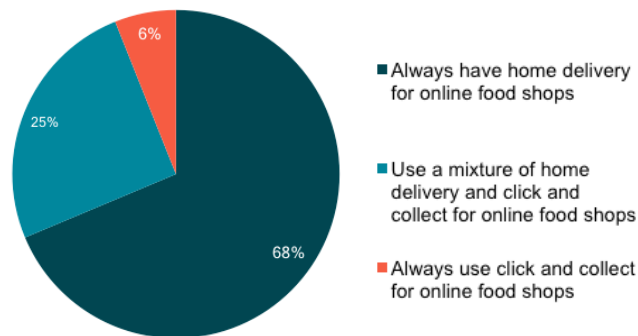
The results are important for local authorities and private sector collectors, who could face a future with fewer recyclables in the average domestic bin and new competitors who want to get their hands on the materials, or literally own the containers.

Q. How often do you shop online?



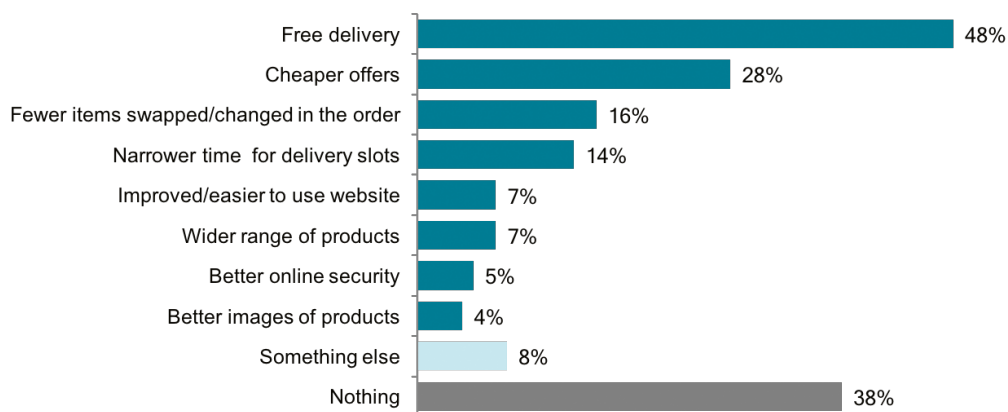
Base: 2,436 GB adults aged 18+, September 2016

Q. When you shop for food online, do you typically use home delivery or 'click and collect'?



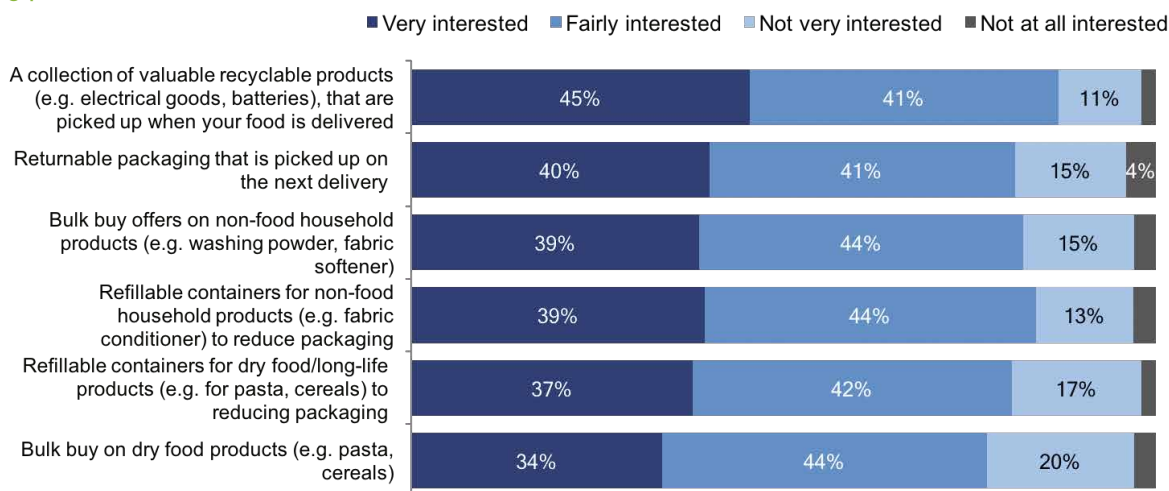
Base: Those who shop online for food at least every few months (1,055), September 2016

Q. What, if anything would encourage you to use home delivery more frequently?



Base: Those who have scope to increase online food purchases (1,535), September 2016

Q. If your grocery home delivery provider(s) were to offer a trial of the following, how interested would you be in taking part in the trial?



Base: Those who use home delivery for online food shopping (987)



7. Summary

We must be ready for change. Over the next 30 years, what we consume, how we consume it – both where and when – and what resources are used and wasted will continue to change, just as they have done over the last 30 years. These changes are being driven by a number of factors, but most powerfully by consumer preferences and technology trends.

Looking back, we can see the significant impact that supermarkets, hypermarkets and malls, and out-of-town shopping complexes had on the way we buy goods. They altered the shape of the high street and our lifestyles, as the daily shop has given way to weekly or even monthly cycles, and the products we buy and how they are packaged have changed accordingly. These developments may look trivial, however, in the light of those to come, as the digital age and the radically different expectations and aspirations of the Millennial generation reshape the relationship between consumers, products and the retail supply chain.

This could have an equally profound impact on resource use and waste and as we recognise the importance of a more resource efficient – and resource secure – future, strategic planning becomes imperative. At present in the UK, the National Infrastructure Assessment currently underway will look ahead at least 30 years and waste is one of the six priority areas that is covered. Just as transport plans will have to consider fuel changes, trends in vehicle ownership, and even autonomous vehicles, planning for resource access and consumption, and related waste reprocessing and treatment capacity, will have to be based on realistic forecasts about future materials types, flows and volumes. We cannot plan for this future by looking backwards or by assuming that resource consumption and wastage are somehow ‘fixed’.

Forecasting is notoriously difficult but we can already see, as this report highlights, signals over the short term pointing to likely longer term shifts in consumption and wastage patterns.

- There is a significant shift towards online shopping and the UK public has been the fastest in the world to take this up – not just the early-adopter Millennials but also the ‘over 55s’. In our increasingly digital world, the ‘Internet of Things’ and smart homes are also influencing shopping patterns.
- Home delivery has grown rapidly – starting with electrical items, music and books, but soon expanding into groceries. The expectation of on-demand delivery has taken root and retailers have adapted their offering in response, increasingly moving towards rapid and just-in-time logistics, distribution centres rather than

conventional shopping space, and same or next day delivery services. So called ‘last mile’ services like Deliveroo are also helping some consumers to enjoy the convenience of on-demand doorstep delivery.

- Consumers are responding to these developments and innovations; the results of the consumer survey demonstrate that the public is largely willing to trial new approaches to resource management, including returnable and refillable packaging.
- Servicisation – selling an outcome rather than a product – is also growing, changing previous ownership models (and end-of-life impacts) for everything from cars to tools. This concept is now also moving into the grocery sphere. With fewer people than ever cooking meals from scratch, ready meals have come into their own, but this concept is now moving one stage further with ‘menuisation’ offering the opportunity to have the ingredients needed for a specific meal bought, collected and/or delivered on the day – or even the table-ready meal itself. This trend will shift a proportion of the food waste currently generated by householders back into the food supply chain – but the full extent of this shift is as yet difficult to predict.
- Reverse logistics from consumers may also become more important, expanding beyond the current focus on electrical goods and other bulky items such as carpets and sofas to food packaging. This could have profound implications for the way in which residents engage with local authority delivered household wastes services and could see recycled materials diverted directly back into the product supply chain rather than the waste management sector. This potential shift in responsibility would most likely lead, in the course of time, to a stronger interest in resource efficiency and design for recyclability by brands and manufacturers. An unknown quantity in this context is deposit and return schemes, which move up the policy agenda every so often only to disappear again.
- While some consumption and lifestyle changes will be widely adopted and will have a noticeable effect on resource use and waste patterns, others are likely to remain niche. Farm shops and local co-operative schemes, while fulfilling the desire of some consumers to support local food growers and be confident of the

“ We cannot plan for this future by looking backwards or by assuming that resource consumption and wastage are somehow ‘fixed’. ”



provenance and quality of the produce, are unlikely to have a significant impact in waste and resource terms. Likewise refillable models will continue but are unlikely to become a mainstream option.

- The adoption of modern materials for 'smart' packaging will continue to better protect and extend the shelf life of products, as will other packaging innovations such as lightweighting and recyclable transit packaging. Material simplification and rationalisation, for example the Co-op's recent commitment to 80% 'readily recyclable' packaging, will help post-consumer recycling performance but will not negate the need for new ways of dealing with other changes such as the growth in composite materials. This area of innovation highlights the need to understand where the main environmental impacts lie in product supply chains; for example, is it better to have easily recyclable packaging or is there a greater carbon and resource gain to be had from using non-recyclable 'smart' materials that keep food products fresh for longer?

The analysis provided by Valpak looks at packaging material trends over the last 5 years and projections forward to 2020. Whilst they forecast 'flat' arisings over that period for some materials, they have also already noted a shift away from paper and greater use of card, and predict that this trend will continue. Their input shows the power of reliable resource information, and it must be acknowledged that the waste and resource management industry has been slow to engage with the opportunities offered by 'big data'. Its important underpinning role in the planning and delivery of future infrastructure and services, however, can no longer be ignored and we will need data not just on material types, but also on the impacts of changing product design trends and consumption patterns.

Brands, manufacturers and retailers are also facing new opportunities and responsibilities. The current model of post-consumer waste and resource management by local authorities and their contractors is likely to shift. Austerity is already leading to a simplification, and in some cases a reduction, in the services that councils can provide. At the same time, there is a growing focus across Europe and beyond on strengthening and 'extending' the application of the Producer Responsibility concept – both in a policy context and as a result of societal pressure in emotive areas such as food waste and coffee cups.

The CSR agenda and customer expectations are also shaping how the supply chain views and responds to waste and resource issues; hardly a day goes by without some announcement on the latest food waste initiative, new and more flexible delivery options, and 'smart' shopping apps. All these factors, and most particularly Extended Producer Responsibility (EPR), will influence who takes responsibility for post-consumer waste in the future, where the materials go and what processing infrastructure is put in place, and ultimately who pays for it.

Ultimately, we will need more data, more co-operation, and more intelligence sharing across the product and resource supply chain if we are to successfully anticipate the inevitable changes in consumption patterns, resource use and waste in the future. This 'new' conversation must include everyone from the product designers to the engineers who build the reprocessing kit – technology is both the driver and the solution here and needs to be harnessed to ensure the optimum environmental and economic resource outcomes.

Our recommendations for further work to help improve data, understanding and communication in this complex area are presented overleaf.



8. Conclusions

Principal conclusions:

- Consumer behaviours and expectations are on course to change significantly, supported by technological and digital innovation
- The next decade and beyond is likely to see a shift in responsibility for, and influence on, wastes and resources towards manufacturers, suppliers and brands
- Both of these trends will influence the types and volumes of waste for which the public and private sector waste industry has to plan, change supply chain relationships and present new opportunities to improve resource efficiency

Responding effectively to these developments will require action in a number of areas:

1. Data & forecasting: If data and digital technology are the two of the main drivers behind these changes, they are also part of the solution. To date, with the exception of household waste collected by local authorities, UK waste and resource flow data has been poor. Better frameworks for capturing and analysing data, more sophisticated ways of interrogating the data, and a move towards an 'open data' approach, would support evidence-based policy making and will be essential to underpin the planning and delivery of appropriate future resource management and recovery infrastructure and services.

End-of-pipe data will not be sufficient; the potential of 'big data' from the production, retail and

consumption parts of the resource cycle needs to be further explored for the contribution it can make to improved future waste and resource modelling and forecasting. There is significant opportunity to use sales and other resource flow data to predict future material consumption, retention and waste flows, as well as to underpin future policy-related KPIs such as sectoral reduction and material efficiency targets.

2. Future policy development: With better data and trend analysis, smart policy interventions can be designed to capitalise on the changes in both consumer expectations and supply chain engagement on sustainability. Producer responsibility policy, for example, should look to influence and incentivise the design and production stages of products to minimise whole life cycle costs, support the use of rigorous and reproducible LCA for the purposes of monitoring and product labelling, and encourage disruptive business models and innovation to be framed within the context of improved resource efficiency. Potential interventions to steer more sustainable consumer choices will need to reflect and exploit emerging behavioural trends, such as the shift from products to services, and experience rather than ownership.
3. Supply chain relationships: Moving towards an 'open data' approach could also encourage stakeholders around the materials cycle to monitor and share information on design and technology developments and their potential waste and resource impacts, as well as supporting further research on consumer preferences and behaviours. This would promote more 'collective responsibility' throughout the supply chain.



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