FASHION FOR GOOD

# POLYBAGS IN THE FASHION INDUSTRY: EVALUATING THE OPTIONS

FASHION FOR GOOD IN COLLABORATION WITH
THE SUSTAINABLE PACKAGING COALITION.

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## EXECUTIVE SUMMARY

Polybags are the ubiquitous packaging of the fashion industry – something that unites brands small and large, from sportswear to luxury, to fast fashion retailers. This is the clear plastic bag which covers every garment from manufacturing to retail stores or consumer homes. In some cases, it is removed before it gets to a consumer, but polybags are still present 'behind the scenes'. Our report does not focus on other sources of plastic, including retail shopping bags or ecommerce mailers, which have been covered in other publications.

### POLYBAGS ARE SEEN AS PROBLEM – ALTHOUGH THE IMPACT IS NOT HUGE.

There is a growing consumer focus on the reduction of plastics, especially single-use plastic packaging. Hundreds of billions of polybags are estimated to be produced for the fashion industry every year, although it is not precisely known what the scale of the packaging footprint is. However, it forms only a very small part of the overall impact of a garment lifecycle. The treatment of waste at the end of its use is a key issue. Even though the plastic currently used – LDPE (low density polyethylene) is technically recyclable, the recycling rate could be much better, and contaminants such as ink and paper limit the use of the recycled material in many products.

If that wasn't enough, incoming policy changes may encourage brands to move towards packaging that is recyclable or contains recycled content.

Due to the changing consumer sentiment, brands are now focusing on finding solutions and alternatives to polybags. Brands say their sustainability priorities for polybag packaging are the end of use management (and recyclability) of the waste, a reduction in the amount of plastics used and the lowering of its carbon impact.

### SOME BRANDS ARE ACTING, BUT WE STILL HAVE A LONG WAY TO GO

Our data shows that many small brands are being left behind in most packaging impact initiatives. Larger retailers for example have a head start on recycling programmes. Recycling of polybags, reducing the amount of plastic material and incorporating recycled content are the most popular initiatives overall that are being pursued. However, only a minority of brands are pursuing even these initiatives.

### A FEW DIFFERENT MATERIALS CAN BE USED – BUT NOT ALL ARE EQUAL

There are five key material choices to look at when considering polybags – or equivalent packaging. These are LDPE (Polyethylene), recycled LDPE, bio-based LDPE, compostable plastic blends, paper and polyvinylalcohol (PVA). Each of these materials comes with specific trade-offs and their own unique qualities. The environmental impact of these materials differs, with recycled and bio-based LDPE being the lowest in greenhouse gas emissions, whilst materials such as PVA and paper fare less well. Compostable plastics are more difficult to assess due to the blends of bio-based and petroleum-based plastics used – but are generally quite good – more so if they have a high bio-based content.

## FOCUS ON THE SYSTEM AS WELL AS THE MATERIAL

Brands should consider not only the materials used but consider the wider system used with the packaging – for example, how will it be collected and recovered at all points where waste is generated? Is there scope for eliminating the plastic at source, or using alternative methods such as larger master polybags for shipping? Reusable systems can also be explored, taking inspiration from ecommerce shipping innovators.

The wider waste management infrastructure is also important. Compostable materials are interesting for many brands but the infrastructure to actually collect and then compost these materials is currently lacking in most places. Paper is widely collected from the kerbside, more so than plastic film – but alternative options for polybags based on paper are still limited.

Based on the current landscape, we suggest **5 key things** that brands and retailers can work on right now to reach a more sustainable polybag future.

### 1 - Brands should look for opportunities to reduce the total amount of material in polybags

Brands and retailers should focus on reducing the total amount of material used in their polybags.

### 2 - Brands should work together to make a closed loop system a reality

We suggest three levers to accomplish this closed loop system:

1. The first is to focus on the recyclability of current polybags – addressing design characteristics such as inks, adhesives and labels.

2. The second is to focus on innovative systems for collection at all points where polybag waste is generated, including distribution centres, retail locations and residences.

3. The third is to focus upon innovation in recycling itself – looking at improved ways for current mechanical recycling processes and alternative recycling processes, including chemical recycling. Technology is improving, but it needs support from the whole value chain.

**3 - Brands should source currently used plastics from bio-based drop-ins and/or recycled content, where appropriate**

Incorporating recycled content is feasible and getting more feasible. Doing this will support the recycling value chain, and replace virgin, fossil based LDPE with a lower carbon alternative. Bio-based LDPE can also be included which has a lower footprint than its fossil-based counterpart.

**4 - Brands should keep an eye on the compostable packaging landscape**

Options are developing in this space but are not quite ready for large scale roll out. There may be opportunities for smaller brands, especially if the waste is collected and recovered from brands commercial facilities.

**5 - Brands should explore the potential for reusable packaging**

Few options exist in this space, but potential innovative solutions may be out there.

## WHAT ARE POLYBAGS AND WHY SHOULD WE BE FOCUSING ON THEM?

In the fashion industry, there are a few different sources of plastics. By far the largest usage is polyethylene terephthalate (PET) as fibres, but there are also buttons, hangars (made from polypropylene – PP, or Polystyrene – PS), as well as packaging, including garment polybags, ecommerce mailing bags and various filler materials (mostly made of polyethylene - PE).

In this report, we will focus on a very specific problem: that of the garment polybag – the ubiquitous plastic transit packaging that is used by virtually the entire fashion industry supply chain. Polybags are used in some form by nearly all brands and retailers, even if they are not seen by the consumer. However, as opposed to other industries, such as fast-moving consumer goods and grocery retailing – the packaging is not quite as integral to the product. This is not to say that it doesn't perform an important function – it does. It enables complex supply chains to operate by protecting the garment in transit from dirt, moisture and damage. As a part of the whole fashion industry value chain, the carbon impact assigned to packaging and distribution generally is relatively small[1], perhaps even less than 5%[2] of the total carbon emissions of a garment lifecycle. So why focus on this?

There is growing consumer focus on plastic, specifically packaging and single use-plastics. Images of plastic contaminating the marine environment and causing harm to wildlife and the ecosphere are embedded in the public consciousness. There is an increasing sense of urgency from all sectors of society to focus on this issue, in addition to focusing on climate change. If virtually every garment is shipped in a polybag, there could be more than 150 billion polybags produced per year[3]. Customers and staff complain of the amount of plastic packaging that garments often come with – especially with ecommerce retail customers, where the packaging is one of the first things encountered. It is often perceived as superfluous and unnecessary. Fashion and apparel companies setting 'zero waste' goals may also find that a significant proportion of their waste is composed of plastic film as polybags.

However, despite its ubiquity and its apparent simplicity, it is a fairly complex system to overhaul. Building a fully circular system for polybags, for any kind of material – including alternatives to plastic – where everything is collected, recovered and turned into something useful, is an ideal to strive for – but seems like a daunting task. Brands are clamouring for alternatives due to this pressure – but there is a lack of information available about choices that can be made and action that can be taken.

# WHAT ARE POLYBAGS AND WHY SHOULD WE BE FOCUSING ON THEM?

## WHAT DO WE MEAN BY 'POLYBAG'?

**Definition: A Polybag**
A clear, typically low-density polyethylene (LDPE) based plastic bag which protects a garment, during transit from manufacturing sites to distribution centres and onwards to retail stores and consumers' homes (through ecommerce). These bags may have specific closures such as adhesives or plastic strips and are often printed with inks displaying warning labels and branding. Often, paper-based stickers are placed on the bags displaying product information and bar codes.

**What is not included in this definition:**
Any other kind of plastic packaging, such as ecommerce mailing bags and retail shopping bags. These are also important things to concentrate on – but the polybag is something that unites most fashion brands and retailers.

Figure 1 - What is in the scope of this report? Polybags are the clear, thin bags protecting garments (left). Plastic shopping bags (middle) and e-commerce mailers (right)are not covered in this report.

Despite growing interest from brands to find sustainable options for polybags there is a lack of clarity and consensus on the best available materials and system improvements that deliver the same performance but with decreased environmental impact.

So how do we define reduced environmental impact? It's commonly assumed that a reduction in virgin plastic usage would be a good thing – but what are the alternatives? Are they really better? There are often trade-offs and decisions to be made – is it appropriate to go with the option that causes the least environmental carbon emissions, uses the least water in its production, or minimises landfilled waste? Sometimes it is not easy to define what the most sustainable option is – it also depends upon your company's priorities and targets.
In this report, we explain how change can be made for the better: how some brands are tackling their polybag usage, what system improvements and alternative materials are out there and the case for continued innovation and collaboration.

# WHAT ARE POLYBAGS AND WHY SHOULD WE BE FOCUSING ON THEM?

## WHERE IN THE SUPPLY CHAIN ARE POLYBAGS USED?

The major location where polybags first enter the supply chain is at garment manufacturing location. A garment will be placed in a bag to protect it during the subsequent stages of transport and shipping. Once the garment arrives at a distribution centre, it will typically be routed to either retail stores, wholesale channels or to ecommerce customers. Retail stores will remove polybags at the back-of-store for disposal or recycling before selling the garments to customers.

From ecommerce, a certain number of products will be returned to a distribution centre. Return rates depending highly on the country and brand. From our own interviews, industry returns rates can be anywhere from around 30-50%[4]. Garments will typically be inspected and, if of good quality, packed in a new polybag and the old polybags discarded. These repacking operations generate a significant waste stream at distribution centres, especially those of pure ecommerce players and those with high product return rates.

Polybags which are removed by customers from ecommerce orders are disposed of in the local waste stream or recycled – depending on the consumer's behaviour and the local infrastructure within their country, region or city.

Treatment of polybags for ecommerce orders is not always consistent across different brand segments – for example, luxury brands will often remove polybags before sending to the customer through their ecommerce channel.

## HOW IS A POLYBAG MADE?

The majority of polybags are made from low density polyethylene (LDPE). Polyethylene (PE) is a polymer formed from ethylene building blocks, which is mostly sourced from the refining and cracking of petroleum or natural gas. The production of polyethylene is dominated by a few global petrochemical companies worldwide. They extrude molten polyethylene into pellets to various specifications which are exported all over the globe to converters – manufacturers of products made from plastic.

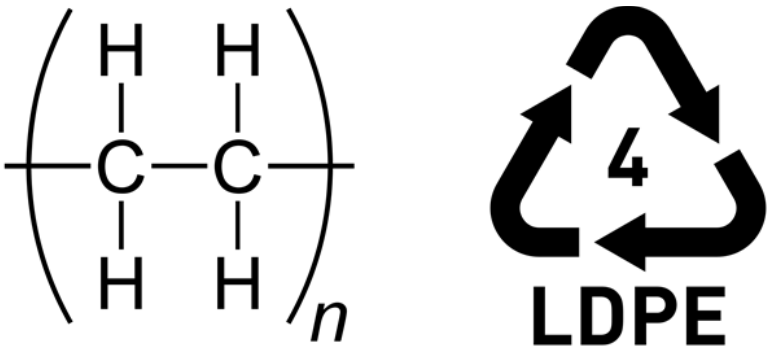



Figure 2: Chemical structure of Polyethylene and Recycling Code to identify LDPE (4)

# WHAT ARE POLYBAGS AND WHY SHOULD WE BE FOCUSING ON THEM?

## WHAT IS CURRENTLY DONE WITH POLYBAG WASTE?

The three main end destinations for polybags are retail stores (either directly owned or other retailers via wholesale channels), consumers' homes via ecommerce and distribution centres due to ecommerce returns and repacking operations.

For polybags arriving at customers through ecommerce, the local recycling infrastructure is important; however, the end of use waste management infrastructure is not uniform, even amongst different regions and cities within the same country. It is difficult with current data to say the precise end-of-use pathway for garment polybags but looking at general data for packaging, and more specifically film, will give us an indication. In Europe, the majority of plastic packaging waste is sent to landfill or incinerated (energy recovery), with recycling rates of around 41%[5]. Within Europe, film recycling capacity is still developing, with around 20% of film being recycled – the majority of which is commercial waste, with only a small portion of this fraction (13%) coming from household waste[6]. In the USA, the recycling rate of PE film from municipal waste (as of 2017) was 12.5%.[7] Generally, consumers should always check locally to see if their local authority accepts plastic film packaging in their recycling bin. In the USA, it is generally not accepted at the kerbside but consumers have the option to deposit packaging in store drop-off locations[8]. In Europe, Germany, Netherlands, Finland, Iceland, Italy, Norway, Portugal, Spain and Sweden collect all types of plastic packaging including film at the kerbside (from consumers), whilst in some countries, such as the UK, it depends on the local authority[9].

For the waste in commercial locations (especially distribution centres), brands and retailers often contract with some form of waste collection service that collects clear film waste, including pallet shrink wrap and polybags from distributions centres. Generally, recycling rates from commercial collection are much higher than from household collection[6].

If collected, plastic film typically finds use in applications, for example, where it is recycled into trash bags or incorporated into hard products such as plastic lumber.

# WHAT ARE POLYBAGS AND WHY SHOULD WE BE FOCUSING ON THEM?

## HOW INCOMING POLICIES WILL FORCE BRANDS TO TAKE ACTION

Changes in the policy landscape will generally aim to encourage companies to only put on the market packaging that is recyclable and may even incentivise the inclusion of recycled content in packaging, through expanded 'Extended Producer Responsibility' (EPR) schemes. For example, proposals made in the UK government may tax packaging without at least 30% recycled content[10]. In the European Commission circular economy package[11], the aim is that packaging placed on the market in the EU should be either reusable or recyclable by 2030. In the new VerpackG[12,13], packaging laws in Germany, incentives will be given for recyclable and more sustainable packaging. In the USA, many states are pursuing legislation including EPR, single-use plastic bans, and waste reduction targets, and there is similar activity at the federal level as well.

Generally, brands could expect to pay higher costs for packaging in some markets, especially in Europe, as they bear more of the cost for their collection and disposal. These costs can be mitigated in some markets by taking proactive steps to reduce the amount of packaging, designing packaging to be easily recyclable or reusable and incorporating recycled content into their packaging.

## WHAT ARE THE KEY REQUIREMENTS OF A POLYBAG?

It is important to first set out exactly what functions a polybag must perform and what requirements any replacement must meet to perform the equivalent function in the supply chain so that we can evaluate the options.

Fashion for Good, in collaboration with the Sustainable Packaging Coalition, European Outdoor Group, and The Retail Industry Leaders Association questioned their brand members and partners to determine the most commonly accepted answers to this question (see footnote[14] for more info). Below we analyse the top-rated requirements of a polybag or equivalent packaging.

## WHAT ARE POLYBAGS AND WHY SHOULD WE BE FOCUSING ON THEM?

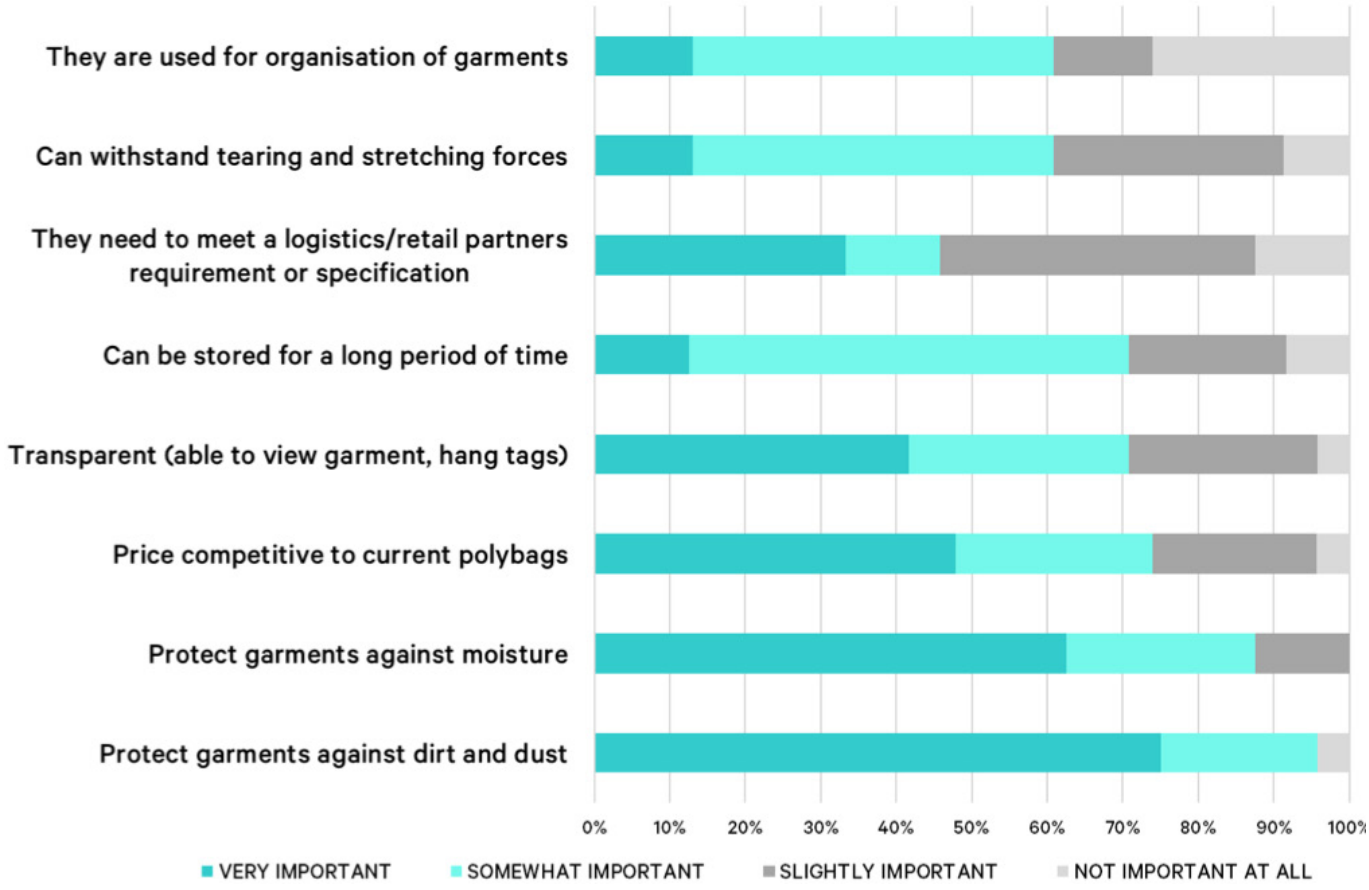



Figure 3: Important Characteristics of Polybag Packaging

Generally, the protective aspects of polybag packaging are the most important – protection from dirt, dust and moisture being key aspects. Price sensitivity was also mentioned as one of the top factors, meaning that the majority of brands do not want to pay more for their packaging. Transparency – being able to view the garment and its hang-tags was considered very to somewhat important by most companies. Being able to store garments for a long period of time, however, was mostly only considered somewhat to slightly important, and very few rated this as a top priority – as were their organisational purpose and resistance to tearing and stretching forces. The only option that was not important for most companies was the requirement to meet a logistics or retail partners specification – although a handful did describe this as very to somewhat important.

# WHAT ARE POLYBAGS AND WHY SHOULD WE BE FOCUSING ON THEM?

## WHAT DO WE MEAN BY SUSTAINABLE PACKAGING?

Some brands and retailers have made a variety of goals and commitments aimed at more sustainable packaging[15]. But what does sustainable mean – which criteria are the most important to define a brand or retailer's packaging as sustainable?

Some brands and retailers such as H&M[16], Stella McCartney[16] and Bestseller[17] have committed to make all plastic packaging reusable, recyclable or compostable. This mirrors the commitments outlined by the UK plastics pact[18] which encourages its signatories to achieve this goal by 2025, alongside cutting out problematic or unnecessary single-use plastic packaging, recycling or composting 70% of all plastic packaging, and including an average of 30% recycled content across plastic packaging.

The Sustainable Packaging Coalition has put forth a definition of sustainable packaging[19]. According to this definition, sustainable packaging:

A. Is beneficial, safe and healthy for individuals and communities throughout its lifecycle

B. Meets market criteria for performance and cost

C. Is sourced, manufactured, transported and recycled using renewable energy

D. Optimises the use of renewable or recycled source materials

E. Is manufactured using clean production technologies and best practices

F. Is made from materials healthy throughout the lifecycle

G. Is physically designed to optimise materials and energy

H. Is effectively recovered and utilised in biological and/or industrial closed loop cycles

The Sustainable Packaging Coalition's definition is aspirational in nature and should be considered a vision of a sustainable, circular future that we should strive for.

With this in mind, we asked brands and retailers within our networks their priorities when it comes to sustainable polybags – is it a total reduction in plastics, carbon emissions, reducing marine plastic pollution or another factor? It's important to know what your company's priorities truly are, because there is never a perfect solution.

## WHAT ARE POLYBAGS AND WHY SHOULD WE BE FOCUSING ON THEM?

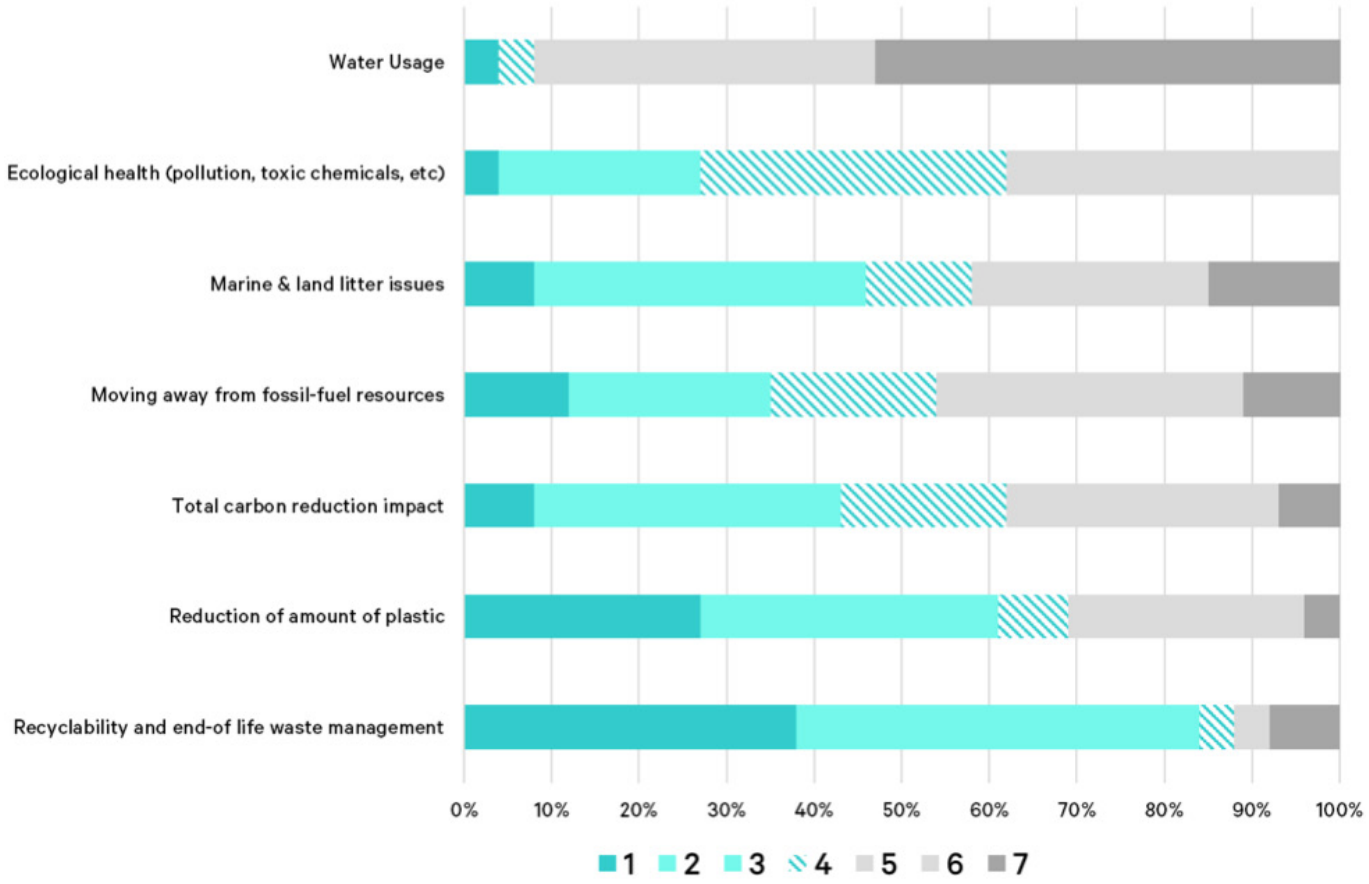



Figure 4: Most important sustainability priorities for polybag packaging, ranked in order of importance (1 – Very important, 2 – 3 important, 4 – somewhat importance, 5 – 6 slightly important, 7 – of no importance)

The most important priority was identified as the recyclability and waste management aspect of packaging – with more than 80% of brands surveyed stating this as top (1st-3rd) priority and the largest amount choosing this as their top priority. Reduction in the amount of plastic follows up as the next most important choice, which is not surprising given the current public attitudes towards plastic. Surprisingly, reducing the total amount of carbon emissions was not the top priority for the majority of brands and retailers, although it was identified as an otherwise important choice for (2nd to 3rd choice). Two issues which are often linked or secondary to plastics are the dependence on fossil resources to make them, and the presence of plastic waste in the open environment – especially the marine environment. The prioritisation of these two issues differed slightly – with more brands selecting the move from fossil resources as their first choice but more on the other hand identifying litter and marine issues as their 2nd to 3rd priority. Ecological health and water usage were identified as the least important factors, with a clear majority indicating waste usage as a factor that was the least important.

## WHAT ARE POLYBAGS AND WHY SHOULD WE BE FOCUSING ON THEM?

Consumers also have strong views on sustainability and that extends to packaging – although this may not necessarily be aligned with what packaging, sustainability or industry professionals agree on. For example, total elimination of single use plastic may be seen as an attainable goal – perhaps even if it (unknowingly) comes with other trade-offs, such as increased carbon emissions. When it comes to consumers making choices - 77% of Germans said that the environmental impact of packaging would affect their purchasing decisions[20] and 82% of people in the UK are actively trying to cut down on their packaging footprint, whilst half of people would be willing to pay more for an eco-friendly packaging option[21].

## WHAT THINGS SHOULD WE FOCUS ON?

### FRAMEWORKS FOR SUCCESS

The are many traditional models for affecting change, but the generally accepted waste hierarchy is a good place from which to start. There are many variations on this with the same core theme, which are based on lifecycle thinking. The most basic "3 R" model of "Reduce, Reuse, and Recycle" is widely known, even amongst the general population. The European Union outlines a 5-step model – Prevention, Preparation for Reuse, Recycling, Recovery (i.e. Energy Recovery) and Disposal[22], whilst Zero Waste Europe outlines an even more ambitious model[23]. Their suggested hierarchy is: Refuse/Rethink/Redesign, Reduce and Reuse, Preparation for Reuse, Recycling/Composting/Digestion, Material and Chemical Recovery, and lastly Residuals Management – with everything else being "unacceptable". The first two levels refer to the product design, whilst the latter levels address waste.

The Ellen MacArthur foundation, in their 'New Plastics Economy' report suggested a model of affecting change within the entire plastic ecosystem by creating an "effective after-use" plastics economy, reducing the leakage of plastics into natural systems, and decoupling from fossil-fuel feedstocks[24]. In the follow-up report in 2017[25], demand-pull was specified as an important factor in the development of recycling markets.

With these frameworks in mind, and our assessment of the landscape, in this report we suggest three broad areas for reducing the impact of polybags – A) reduction of material usage, B) creating a closed loop system (by collecting and recycling or composting), and C) decoupling from fossil resources.

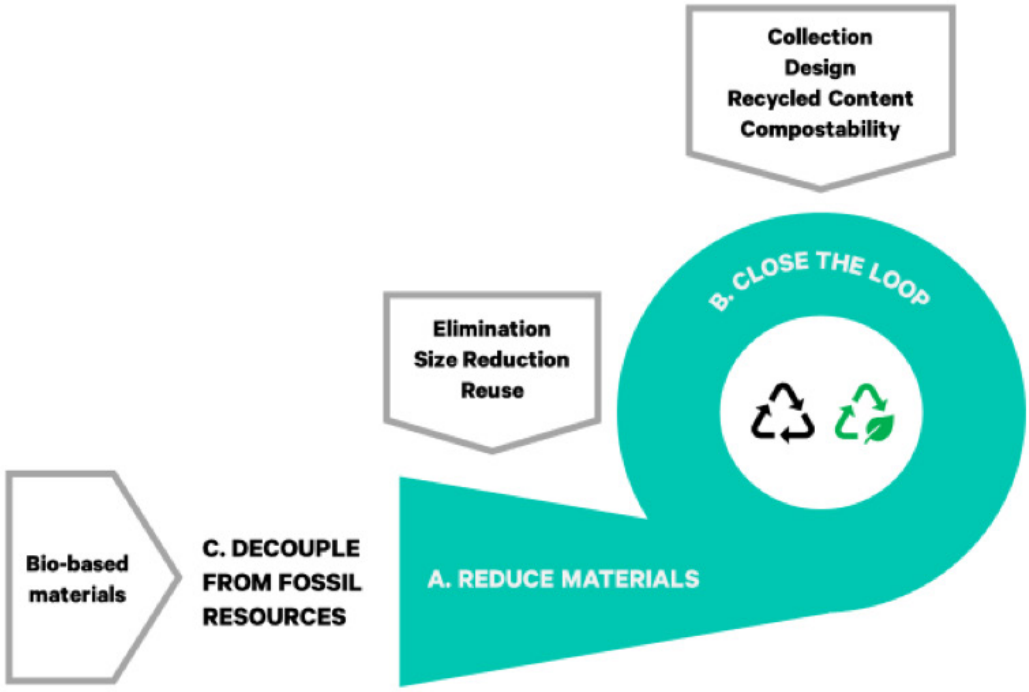



Figure 5: Framework for reduction of polybag impact.

## REDUCING THE AMOUNT OF MATERIAL USED

Reducing the overall amount of materials should be a key goal of any brand or retailer wishing to reduce their overall impact. Finding ways to remove polybags from the supply chain entirely should clearly be investigated but must be done in such a way that does not result in increased wastage of the garments they serve to protect.

### ELIMINATION AND SIZE REDUCTION

Compared to the overall environmental impact of a polyester, cotton or polycotton garment, a typical polybag will only contribute a small amount[1,2] to the overall environmental impacts – losing a garment to wastage (due to damage in transit) however, would have a significant environmental impact. It is therefore important to recognise the key role that packaging plays in an overall sustainability strategy – that of protecting the far more valuable product (in terms of environmental resources and cost) with minimal resources and environmental impact. A report by Patagonia concluded that outright removal of polybags was not feasible due to the significant increase in damage and wastage that resulted[26].

Innovative solutions to eliminate polybags outright have however been trialled by some brands. For example, the outdoor brand prAna has reduced its polybag usage by 74%[27] by folding garments and tying them with raffia twine. Reducing the size of the polybags themselves as well as innovative techniques of folding to fit the garments into smaller polybags is an approach that can be used to reduce plastic usage. Outdoor retailer REI has removed most single-use polybags in favour of polyethylene-lined shipping boxes, whilst rolling some garments and tying them with a small amount of paper. These approaches are viable so long as items can withstand dirt or damage during transit and require close cooperation with suppliers to remove polybags from their processes. Removing polybags from other brands at distribution centres before sending to ecommerce consumers was mentioned as a strategy by one retailer in our questionnaire[14]. Reducing the thickness of polybags is also one strategy that can be successful. For example, the PVH Corp. Dress Furnishings Group reduced the thickness of polybags, resulting in a reduction in 200 tonnes of plastics used.[28]

### MASTER POLYBAGS

Another useful strategy is to focus on reducing the number of polybags by using master polybags – larger polybags into which multiple garments can fit – instead of individualised polybags for each garment. This is particularly applicable for brick-and-mortar retail channels, since garments are removed from their polybag before sale and there is no outright need for individual unitisation. A few brands and retailers, especially larger format or value retailers are currently using such systems. However, if items are shipped directly to consumers through ecommerce channels, items may need to be unpacked from a master polybag and placed in another kind of packaging, whether a conventional individualised polybag or an alternative packaging system that provides proper protection.

## REDUCING THE AMOUNT OF MATERIAL USED

One brand, Everlane, trialled master polybags, with up to 50 T-shirts in one bag. However, they described problems keeping garments clean and undamaged as they unpacked them from the master polybags and shipped them to customers[29]. If master polybags are sent for unpacking at stores, this problem is avoided. The practice of removing garments from master polybags at distribution centres and repacking into other packaging can also be a significant labour cost[30].

With these strategies, is worth bearing in mind that what works for one brand may not necessarily work for another - especially due to differences in their supply chains, logistics and warehousing processes and local conditions. However, it is clear that there are some opportunities across the supply chain to reduce material usage or potentially eliminate polybags.

### REUSE

There has a been a growing focus on the potential of reusable packaging to reduce the environmental impacts associated with single-use packaging[31]. The simple idea is that a packaging that is designed to be longer-lasting and used over multiple life cycles can result in less material usage and carbon emissions compared to single-use packaging. Typically, since reusable packaging systems require more material (thicker packages, for example), there is a minimum number of cycles the package needs to be used before the benefits outweigh that of single-use.

Returnable solutions are currently available for ecommerce packaging, where a number of innovators are operating including Repack, Returnity, and LimeLoop. In these systems, a reusable pack (usually made of a plastic material, such as PP, PET or PVC) is used to ship a collection of garments (which would otherwise be shipped in polybags) to a customer, who returns the package via some channel, such as a post box, or store-drop off.

However, these models are much less applicable to garment polybags at present, and there are no returnable solutions on the market for individual garment polybags. Polybags often travel long distances from manufacturing sites, which are overwhelmingly based in east and south Asia[32], to their end destinations at distribution centres and stores around the world. This means that reusable polybags would have to be shipped back from stores and consumers homes to a centralised point, such as a distribution centre, then shipped back over large distances to the manufacturing sites. An additional difficulty comes when garments are sent directly to consumers via ecommerce channels, as it may be challenging to achieve sufficiently high return rates, even when incentive programs are implemented. A system for a mass decentralised, standardised returnable polybag could be envisaged, where every brand, manufacturing, and logistics company aligns on a unified reusable packaging system. In such a system, it is clear that overall material usage could be reduced.

## REDUCING THE AMOUNT OF MATERIAL USED

An additional barrier is the general need for the viewing of the garment and its hang-tag during transit. It is unclear over how many cycles a returnable clear bag would become dirty and what resources would be needed to keep them in operation – an alternative system with barcodes and RFID tags may be required. Reusable polybags could be potentially more useful in future situations where the manufacturing sites are located close to end markets and on-demand, local manufacturing is more widespread, due to the shorter transport distances involved.

Regardless of the barriers, the idea of returnable and reusable individual polybags for garment transit is a potential gap that has no current solution at present and could pose an interesting challenge for new innovators and forward-thinking brands.

## CLOSING THE LOOP: RECYCLING

### RECYCLED POLYBAGS

Many suppliers are now offering polybags with some degree of recycled content and polybags are now available with percentages of recycled content upwards of 100% with minimal aesthetic and performance trade-offs. Many brands have started using or announced their intention to use[30,33] recycled content polybags and this was a key initiative being explored by brands in our questionnaire[14]. The extent of trade-offs depends on the source of recycled material as well as the capabilities of the converter, which have undergone significant improvement in recent years[34] and should be expected to continue improving. There is a range of recycled feedstocks that can be used, with post-commercial stretch wrap being the most widely used owing to its availability and tendency to introduce a lesser extent of trade-offs compared to those introduced when post-consumer bags, films and wraps collected in residential recycling streams are used. Prices also tend to vary depending on the specific source of material and specific supplier and the use of recycled content is often associated with a price premium.

#### THE DIFFERENCE BETWEEN PRE-CONSUMER (POST-INDUSTRIAL), AND POST-CONSUMER WASTE

**Pre-consumer plastic waste:** Plastic which is diverted from the waste stream during a manufacturing process. This definition does not include scrap generated in a process which is reused in the same process that generated it.

**Post-consumer plastic waste:** Plastic which is generated by households, commercial, or industrial facilities as end-users of the product after it has been used (or can no-longer be used) for its intended purpose. Post-consumer can also be understood as 'post use'[35].

Polybag suppliers should specify whether or not recycled content conforms to industry definitions (e.g. ISO 14021[35]), what type of recycled content it is, and how the chain of custody has been tracked.

There are some certifications and standards that are applicable to polybags. The global recycled standard (GRS)[36] and recycled claim standard (RCS)[36] (more commonly applied to recycled fibres) can be applied to packaging, although at the time of writing, no fashion industry polybags had this certification. GreenBlue, the parent organisation of the Sustainable Packaging Coalition, is developing the Recycled Material Standard (RMS), which is aimed specifically at validating and tracking the use of recycled content in packaging. These verification systems, amongst other criteria, require a chain-of-custody via transaction notes and certificates to verify their recycled content.

The Blue Angel certification is a certification of at least 80% recycled content which is particularly popular in the German market[37]. As of writing, no garment polybags have been awarded a Blue Angel certification, although this has been applied to suppliers of opaque ecommerce mailer bags.

## CLOSED LOOP COLLECTION AND RECOVERY OF POLYBAGS

In addition to the that fact that some brands are able to source polybags with some recycled content, the use of recycled content in polybags should be accompanied with a corresponding emphasis on collecting used polybags for recycling in order to provide both supply and demand for recycling markets.

At distribution centres and retail locations, dedicated collection or takeback schemes are needed for polybag recovery. These recovery systems should be implemented regardless of the material used – bio-based and compostable plastics and paper-based alternatives should also be collected for recycling or composting. Distribution centres are ideal for collection of waste and this is the most prominent location for consolidation and collection at present. Nike, for example, runs polybag collection schemes at their distribution centres in North America, sending the used polybags to a plastic reclaimer who recycles them into branded shopping retail bags[38]. There are some examples of malls being used as consolidation points for the collection of a clear film waste-stream for retailers who rely on landlord-supplied waste services[39]. Some schemes for smaller stores have been implemented, including a back-of-store takeback and collection scheme by Terracycle for the North Face in a handful of stores.[40]

Polybag recycling would be associated with a number of environmental impact reductions, including decreased fossil resource consumption, prevention of landfilled waste and lowered carbon emissions. A key aspiration could be to make polybag material available for closed loop recycling into new packaging again which has similar specification (in terms material type – such clear LDPE) to the desired product. This has the key benefit of ensuring a supply of material for recycled polybags (and other flexible film packaging) at the same time as reducing demand on virgin fossil resources.

However, challenges remain in the recycling of PE films. Many recyclers require high-quality, pure LDPE as inputs[4]. This can be found from pre-consumer or post-industrial sources, as it comes directly (for example, as offcuts) from the plastics converting industry. Sourcing this from post-consumer household waste streams is comparatively more difficult, but commercial 'post-consumer' (used) film such as pallet shrink wrap is widely used as a feedstock. In general, there is no closed loop recycling process at present for polybags. This is because the inks (warning labels, branding), paper stickers and the fact that the waste is often mixed with other plastics, means that the material may not be optimal for film-to film mechanical recycling.

## MECHANICAL RECYCLING AND CONTAMINATION

### What is Mechanical Recycling?

Mechanical recycling is the recycling of plastic waste by physical means. The plastic is melted, separated from other impurities (typically by filtration) and re-granulated for use in other applications. Before this, the plastic will typically be sorted (by plastic type, colour, rigid or flexibles), ground, washed and dried.

The act of heating the plastic along with impurities, such as water, inks, adhesives and certain chemicals could lead to a reduction in the molecular weight of the polymer and the presence of 'gels and nibs' – small imperfections - in the final product, as well as undesirable odours. Thus, care must be taken to leave contamination of the plastic waste stream to a minimum. Newer generations of recycling machinery are better able to deal with contaminants such as paper[34]. The presence of inks and coloured plastic in the waste stream currently limits the scope of recycling of many plastics to durable goods with looser tolerances for physical and aesthetic imperfections.

## DECOUPLING FROM FOSSIL RESOURCES

### USE OF PAPER AS AN ALTERNATIVE TO PLASTIC

In our survey, some brands expressed an interest in pursuing paper-based alternatives. As we have seen, a key requirement of polybags was transparency – to enable workers to see and inspect the garment along its journey, as well as read the hang-tag barcodes through the bag. When using paper-based alternatives, this would need to be accounted for. It could be, for example, a window which allows the tag to be viewed and the garment to be inspected, or the use of thin, translucent tissue paper (such as glassine paper) which allows for the garment and hangtag to be viewed. Key requirements from our survey are the protection from moisture and dirt, and to a lesser degree, the withstanding of tearing and stretching forces. It remains to be seen how well paper-based alternatives perform for these purposes. However, many companies also mentioned that resistance to tearing or stretching was not important, so there may be flexibility on this requirement. Recently, H&M announced that it was using paper-based alternatives in India and is conducting pilots aimed at scaling this packaging[41].

However, it is important to consider the environmental impact of switching to paper-based alternatives. There may be trade-offs in some categories of environmental impacts, such as carbon emissions (see below: Impact of Material Choices). However, in most markets, paper is more widely collected at the kerbside than plastic films[42]. Responsible sourcing considerations – including the use of recycled content and the procurement of virgin fibre from responsibly-managed forests (e.g., those that are FSC or PEFC certified) – can reduce environmental impacts and mitigate the risk of trade-offs. Paper can also be (depending on coatings and laminates used) compostable.

### BIO-BASED DROP-IN PLASTICS

Bio-based plastic are plastics where the initial feedstock is a biological material, such as corn or sugarcane, rather than fossil resources. These will often be the feedstock for some sort of process, such as a fermentation or bacterial transformation, producing the small molecules needed to make new plastics. These can be the same as current plastics such as polyethylene (bio PE) which are indistinguishable from their fossil-based counterparts. These are often known as ‘drop-in’ plastics due to their ability to be a direct replacement for currently used plastic. A key provider of bio-based PE is Braskem with their “I’m Green” polyethylene. Products made with this are often marketed as “sugarcane-based bags”. It is important to note that these are chemically the same as conventional polyethylene, and recyclable with other sources of PE/LDPE. Many companies offer packaging based on this, such as Avery Dennison and Duo. Generally, it can be said that bio-based plastics have lower carbon footprints than conventional fossil-based plastics[43,44] due to the sequestration of $CO_2$ from the atmosphere by plants.

The most common point of confusion is to conflate ‘bio-based’ with ‘biodegradable’. Not everything that is bio-based is biodegradable, and not everything that is biodegradable is bio-based. It is possible to have biodegradable plastics made from fossil-based feedstocks just as it is possible to have non-biodegradable plastics made from bio-based feedstocks.

## CLOSING THE LOOP: COMPOSTING

### BIO-BASED AND FOSSIL-BASED COMPOSTABLE PLASTICS

The second point of confusion is around the meaning of biodegradable. This is a material *technically* able to be consumed by a bacterium. This definition says little about the specific conditions and time periods which are *actually required* for the material to break down, such as in the natural (land or marine) environments, industrial composters and home compost heaps. The labelling of a material as 'biodegradable' is not a useful indicator of any specific quality. The conditions required, such as heat and humidity, may not be readily available in the natural environment. Instead, the focus should be on whether the material is home compostable or industrially compostable. A lot of packaging that claims to be compostable will only be compostable in the defined conditions of an industrial composting facility and so might not degrade in a home compost heap or when disposed of into the environment. There are a number of certifications and marks which can be applied to packaging to clarify its compostable claims and its degradability in different environments (see: *certifications for compostable materials – what can I rely on?).*

Compostable bio-based plastics include PLA (polylactic acid), PHA (polyhyrdoxyalkanoates), and starch blends, whch are biodegradable under certain conditions. Generally, starch-based bags tend to be somewhat opaque and do not fit the key requirement for transparency. No vendors are currently offering polybags made of 100% PLA or PHA-based, but rather blends with other biodegradable polymers, which could be bio-based or fossil-based. These blends may be proprietary. The most prevalent fossil-based biodegradable polymer is PBAT (polybutylene adipate terephthalate - BASF Ecoflex), which is often included in compostable blend formulations.

In general, bio-based plastics, such as PLA can introduce trade-offs in terms of land use, fresh water consumption and phosphate fertiliser usage[43]. For example, the major feedstock source for PLA is currently corn[45], although NatureWorks, the main producer of PLA, assert there is little problem with competition with food prices, for example – as the whole corn is used for various purposes. Currently, there is a lack of transparency around the feedstock source for many bio-based plastics but there are a handful of certifications, such as BonSucro[46], which certifies sustainability of the input feedstock. However, there are some innovative companies such as Full Cycle Bioplastics focused on producing bioplastics from waste and non-food sources, and NatureWorks are working on the use of the greenhouse gas methane as a feedstock for PLA production[47] – so the use of food crops for their production is not necessarily essential.

## CLOSING THE LOOP: COMPOSTING

### POLYBAGS FROM COMPOSTABLE BLENDS

Most compostable polybags are based on some bend of biodegradable polymers, which can either be bio-based or fossil-based. TIPA® is one producer of compostable clear garment polybags which are certified home and industrially compostable, based on a blend of biodegradable polymers. The specific blend of polymers it proprietary and their polybag offering comprises up to 30% bio-based content. In general, fully bio-based plastics have a lower carbon footprint when compared to fossil-based plastics.[43] Natur-Tec offer home compostable polybags with a PLA-based blend or formulation. It should be noted that these bags are not fully translucent, which might be an important trade-off for many brands to consider. Due to the lack of information on the proprietary formulations, it's difficult to assess the specific carbon impact of these polybags.

Cellophane and NatureFlex film from Futamura are bio-based cellulose films which are created from an FSC certified wood-pulp feedstock[48], the latter of which is certified compostable. These materials are not widely used at present for fashion industry polybag packaging. Cellophane tends to be less flexible and more brittle than PE films, but this may not necessarily by a key requirement for all brands, as our survey has shown. However, depending on the formulation of the bag and the specific requirements of the brand, they could be a potential option for polybag replacements. Some manufacturers, such as Grabio, produce polybags based on a cellulose and PBAT blend[49,50].

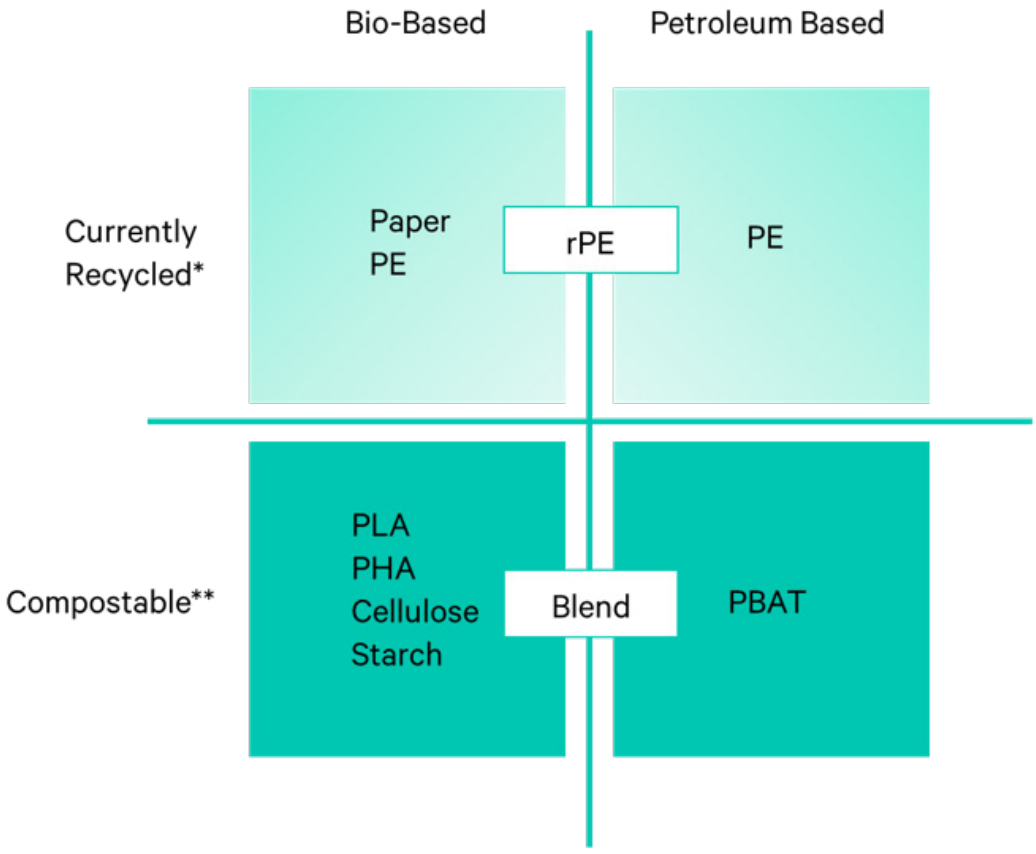



Figure 6: Bio-Based Versus Petroleum Based Material Options for Polybags and their End-Of-Use Recovery.
*Facilities exist in most markets to recycle. **Industrial compostable (see definition below)

## CLOSING THE LOOP: COMPOSTING

### ARE COMPOSTABLES A SOLUTION TO THE WASTE ISSUE?

General interest in compostable packaging is high – the idea of a biological cycle[51] seems attractive – whereby materials are degraded by natural processes and turned into new, biological materials again. There is also reasonably high interest in all things 'biological' (even though not all bio-based materials are compostable), in part due to the desire moving away from fossil resources, as we have seen from our survey. However, like all materials, there are specific things to consider before implementing a compostable packaging system.

In the vast majority of end markets, there is no specific separate collection system for compostable packaging. Certified compostable packaging will also not necessarily easily degrade in the open environment, marine or landfill conditions, and therefore may not be a specific solution to the plastic waste problem. Consumers may not recognise this fact – in the UK, one in five believed it was acceptable to drop compostable packaging to rot outside and over one third have tried and failed to compost packaging at home[52]. An additional limitation at present comes from the fact that most compostable plastics can disrupt the recycling process for conventional plastics if they incorrectly enter the recycling stream, causing additional hurdles for plastic recycling[53]. Care should be taken to provide clear, prominent messaging encouraging consumers to enter compostable plastics into accepting compostable waste streams and not into recycling streams.

Some markets, such as Germany, separately collect biowaste from households. However, inclusion of compostable plastic packaging is not allowed by law in these waste streams. A recent position paper in 2019 by German waste and bio waste management associations[54], rejects the inclusion of such plastics into composting collection streams, noting that they have no added value to their composting processes and may even adversely affect the quality of the compost. Some composters in the USA are also reportedly turning away compostable packaging from their facilities[55]. In the UK, in a recent call for evidence, the UK Government assessed that the waste management infrastructure in the country for compostable packaging was "not yet fit for purpose"[56].

The policy and infrastructure landscape is still developing and companies should be advised of the limitations and trade-offs when considering a strategy around compostable plastics.

Some waste management companies, such as First Mile in the United Kingdom, do offer commercial collection services for compostable plastic waste from businesses and events. These are collected separately from food and organic waste streams, being treated in a special facility to deal specifically with this kind of packaging. Thus, there could be options available for some brands, especially luxury players, who can collect and dispose of polybags before they arrive at consumers, albeit unlikely they would do so. However, the environmental impact of alternative compostable options should be robustly assessed before doing so, although there is currently a lack of public information on these offerings.

## CERTIFICATIONS FOR COMPOSTABLE MATERIALS – WHAT CAN I RELY ON?

**Definitions:**

**Bio-based:** A material in which the input feedstock is biological, such as food crops, organic waste, wood pulp etc. The percentage of bio-based content can be detected and certified – some products may only be a certain percentage bio-based.

**Bioplastic:** As above, but as a material that has plastic properties – being formed by deformation with heat. These bioplastics are not necessarily biodegradable or compostable.

**Biodegradable:** Biodegradation is a (bio)chemical process where microorganisms convert materials into water, carbon dioxide, and biomass. This process in dependent on a number of conditions, including temperature, moisture, its surroundings, composition and form.

**Compostable:** To be called compostable the material must also completely break down (disintegrate) as well as bio-degrade, but also not release harmful (ecotoxic) substances; in a timeframe similar to that with which known compostable materials will biodegrade under realistic composting conditions.

**Industrially Compostable:** In this process, the material is composted to forum at higher temperatures (50-60°C) in large scale specialised facilities, under controlled conditions[57]. To be called this it must meet a standard such as EN 13432, EN 14995, ASTM D6400 or ASTM D6868. In addition to breaking down and biodegrading under these conditions, it must also pass additional ecotoxicity tests to show that is does not break down into or release harmful chemicals.

**Home Compostable:** Materials suited to be composted in home compost heats (not disposed of in the natural environment) at ambient temperature, rather than high temperature. There are no current international standards but two national standards - French standard NFT 51-800 Australian standard AS 5810 by which home compostability can be assessed.

**Marine Degradable:** Currently only certified by TUV Austria to the ASTM D7081 (but technically withdrawn – there is a newer ASTM D669158 standard) standard – the material must degrade by 90% within 6 months. The lack of consistent standards to assess marine degradability is still an issue[59], especially since marine degradability is still a developing category – the trade-offs and benefits are not widely understood at present.

In general, it is difficult for a brand or consumer to navigate this landscape – but certain organisations offer certifications which can be applied if the packaging meets standards for industrial or home compostability. Use of these marks demonstrates the compostability claims of the packaging supplier and highlights whether it is home or industrially compostable.

| Certification | Body | Mark | According to Standard | Certifies |
|---|---|---|---|---|
| OK Compost Industrial | TÜV Austria | | EN 13432 | Industrial Compostable |
| Ok Compost Home | TÜV Austria | | French standard NFT 51-800 Australian standard AS 5810 | Home Compostable |
| Seedling | European Bioplastics (TÜV Austria, DIN CERTCO certifies) | | EN 13432 | Industrial Compostable |
| DIN-Geprüft Industrial Compostable | DIN CERTCO (TÜV Rheinland) | | EN 13432 | Industrial Compostable |
| DIN-Geprüft Home Compostable | DIN CERTCO (TÜV Rheinland) | | French standard NFT 51-800 Australian standard AS 5810 | Home Compostable |
| BPI Compostable (In Industrial Facilities) | Biodegradable Products Institute (DIN CERTCO certifies) | | ASTM D6400 or ASTM D6868 | Industrial Compostable |
| CMA Composter Approved | Compost Manufacturing Alliance | | ASTM D6400 or EN 13432/ BPI Cert + Field Testing | Industrial Compostable |

Figure 7: Compostability marks certifying industrial or home compostability

## WATER SOLUBLE BAGS BASED ON PVA/PVOH

Polyvinylaclohol (PVA or PVOH) is a fossil-based polymer which can dissolve in water under certain conditions. It is well known, for example, as the dissolvable film which surrounds dishwasher tablets. By formulating it in a different way, it can also be made into a film which can be durable enough for retail packaging. It should be recognised that the film is designed to be dissolvable in hot water and is not intended to be dissolvable in cold water or in the marine environment[60].

Studies showed biodegradation by specific microorganisms[61] in waste-water effluents (i.e. from certain pulp/paper plants) where PVA is present in large amounts[62] due to its use as a coating – and it appears certain bacteria can adapt to digest this kind of polymer. Generally, when looking at these options, brands should look for (home or industrial) composability and marine degradability certifications for confidence on their compostable or marine degradable properties.
It is suggested that PVA films can be accepted by anaerobic digesting facilities (perhaps becoming more acclimatised over time to this material[60]) and *could* be dissolved during a water pre-washing treatment stage at recycling plants[62]. Thus, contamination of a traditional plastic waste stream with this material *may* be less of an issue than with many current compostable plastics, although there is little public evidence to available to assess this.

There are currently not many brands or retailers using PVA based polybags, although outdoor retailer Finisterre recently announced their use of Aquapak-supplied hot-water dissolvable polybags[63].

## HOW CAN WE EVALUATE THE DIFFERENT MATERIAL OPTIONS?

As we have seen, there are a range of different material choices available when thinking about polybags (or equivalent-function replacements of polybags). When considering the options, it is key to think about the end-of-use treatment of the material, in addition to the choice of material and considerations around responsible sourcing and production. Some materials are technically recyclable, but not in practice – due to lack of infrastructure in the end market region, for example. Compostable materials are not yet collected in most countries, leading to difficulties with waste management of these materials, and contamination of other plastic recycling wastestreams. Each material can introduce trade-offs in areas like carbon impact, fossil resource usage, water usage and other environmental factors. These can also be affected by the end of life treatment pathway – some compostable materials in landfill can produce greenhouse gases, for example. Pricing will also be an important factor for many brands - novel materials also typically tend to start with a price-premium as production is scaled up. Smaller brands can often be put off due to large minimum order sizes needed to purchase more sustainable choices[64].

### IMPACT OF MATERIAL CHOICES FOR POLYBAGS

As we have explored, there are 6 key material choices for polybags or equivalent transit packaging. Of these choices, we have performed a comparative assessment of these options in terms of key environmental criteria. Portions of the assessment were based on analyses performed by COMPASS, a streamlined life cycle assessment tool that uses data from the life cycle inventory ecoinvent[65] compass. The data is predominantly based on industry-average data and is not representative of any specific supplier and shouldn't be considered representative of all suppliers

Materials were assessed on a like for like basis (assuming a 10g polybag mass) on a number of key categories, as informed by brands sustainability priorities. Fossil resource usage, GHG emissions, human and aquatic toxicity, water usage, as well as key properties like recyclability[66] and industrial compostability.

## HOW CAN WE EVALUATE THE DIFFERENT MATERIAL OPTIONS?

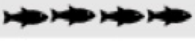
| | PE | rPE | bioPE | PVA | Paper alternative | Compostable blend |
|---|---|---|---|---|---|---|
| Current Feedstock | Fossil Resources | Waste PE | Sugar Cane **or** Corn Ethanol | Fossil resources | Wood Pulp | Fossil resources and/**or** Food Crops/Organic Waste/Wood Pulp |
| Recyclable*? | Y* | Y* | Y* | N | Y | N |
| Compostable (Industrial)? | N | N | N | N | Y** | Y** |
| Fossil resource use |  |  |  |  |  |  |
| GHG emissions |  |  |  |  |  |  |
| Water use |  |  |  |  |  |  |
| Human toxicity |  |  |  |  |  |  |
| Aquatic toxicity |  |  |  |  |  |  |

Figure 8: Relative impact of material choices for an industry standard-sized polybag. (1-5 relative scale) Units: Fossil Resource Use = MJ, GHG emissions = kg $CO_2$ equivalents. Water Use = Litres. Human Toxicity – DALYs. Aquatic Toxicity = CTUe.
*Based on the definition by Plastics Recycling Europe/Association of Plastics Recyclers[66]. Depends on specific end-market.
** Depending on specific coatings and finishes used

In terms of GHG emissions, recycled and bio-based PE have the lowest carbon impact, closely followed by compostable plastic blends (depending on their specific formulation – fully bio-based will generally be less GHG intensive). Recycled materials avoid the energy-intensive material extraction stage and bio-based materials tend to offset carbon due to the uptake of $CO_2$ from the atmosphere. Unsurprisingly, for this reason virgin PE has a greater carbon impact than recycled PE or bio-based PE. Paper alternatives and PVA based bags scored comparatively worse than recycled or bio-based in GHG emissions, although paper has less of an impact in fossil resource usage. Paper is also accepted in many end markets for recycling as a waste stream from consumer kerbside collection. PVA scores relatively worse in many of the categories assessed, including water usage, and has higher fossil resource usage and aquatic and human toxicity. However, for the former this should be kept in mind that this is a relative assessment and includes the impact during the production process – the toxicity risk of PVA as a material is still relatively low is not considered toxic to human or marine life. Likewise, harsh chemicals are used in the production of paper, but the final material poses little problem to human health. PVA is not widely recycled at present and neither are compostable plastic blends, in part because of the mixtures of materials used for the former. However, certified industrial compostable plastics as well as paper (without non-degradable contaminating finishes or layers) could be composted in industrial composting facilities, if they are first collected and accepted by a composting facility.

Polyethylene is generally recyclable, but this depends on the level of contaminants (such as paper, other plastics, inks and more) and the local infrastructure and technology in place – commercial PE film waste generally has a higher chance of being collected in most markets. See below *Guideline for the Recyclability of Polybags* for more information on how to make current polybags more recyclable.

## HOW CAN WE EVALUATE THE DIFFERENT MATERIAL OPTIONS?

### WHICH OF THESE INITIATIVES ARE BEING CURRENTLY BEING PURSUED BY THE INDUSTRY?

With the options thoroughly evaluated, we took the pulse of the industry to determine the key trends and explore which initiatives are currently being implemented, as well as which initiatives have been actively pursued or considered.

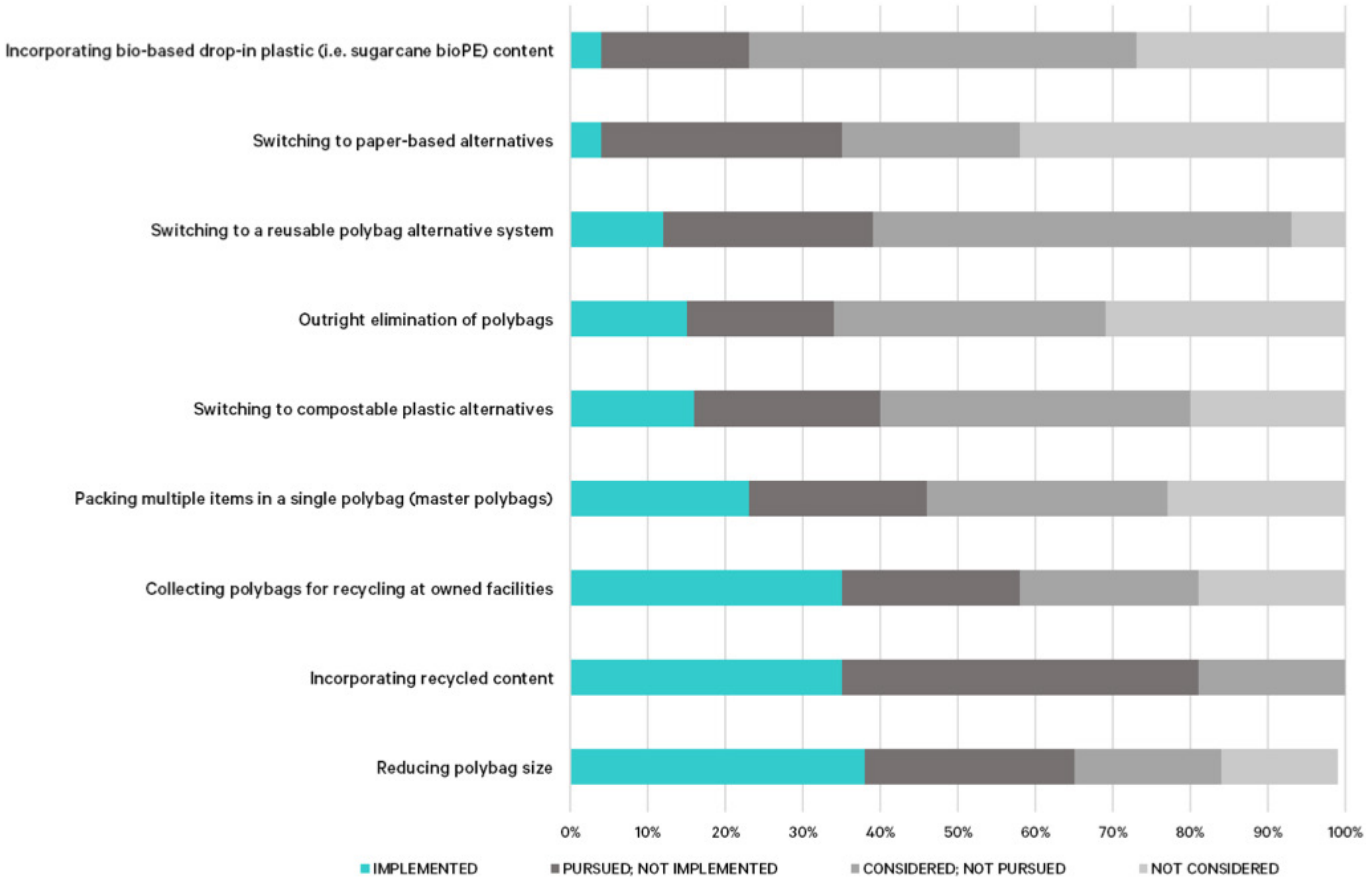



Figure 9: Comparison of initiatives by status: implemented; pursued, not implemented; considered, not pursued; and not considered. **Pursued** = more detail conversations, analysis, initial testing or business plans drawn up. **Considered** = considered as part of a range of options, but not taken any further

## HOW CAN WE EVALUATE THE DIFFERENT MATERIAL OPTIONS?

Reducing the size (dimensions or thickness) of the polybags is one of the lower hanging fruits of initiatives that can be pursued, and was explored by many brands, with 38% of brands already implementing this. However, whilst incorporating recycled content was also a widely supported initiative, the majority of respondents in this category said they had seriously pursued this and ended up not implementing it – much more than any other option. This could be due to the variance in price and quality of recycled film in some markets and key requirements for transparency as noted in the earlier survey question. Breaking down the results even further, more brands indicating Europe as their primary market were able to incorporate recycled content as opposed to brand identifying North America as their primary market, which reflects the differences in film recycling infrastructure. Elimination of polybags entirely appears to be a viable option for a handful of brands although the majority did not seriously pursue this any further – this is highly dependent on the specific supply chain of the brand. Collecting polybags for recycling was also implemented by many and was especially popular option amongst self-identified 'Retailers', with more than 70% of saying they have implemented this initiative. Use of master polybags was also fairly popular, with a significant skew towards 'Value' retailers.

Bio-based drop-in plastics (bioPE) were not mentioned by many brands an option they had implemented, with a large proportion considering it, but not pursuing it any further. Compostable plastics had been implemented by a few but not taken further by a majority – with some citing the difficulty in collection infrastructure as a reason. Paper replacements were also not a popular option – the majority of brands have not considered this as an option, with the rest perhaps considering and pursuing it further, but ultimately not implementing it on a wide scale – perhaps because paper-based alternatives are only just becoming available.

Price was previously identified as an important factor in the choice of polybag material, and currently bio-based drop-in plastics, compostable plastics and paper alternatives all have the potential to be more expensive – so this is important to consider as a key reasoning behind the lack of implementation of some of these options.

## HOW CAN WE EVALUATE THE DIFFERENT MATERIAL OPTIONS?

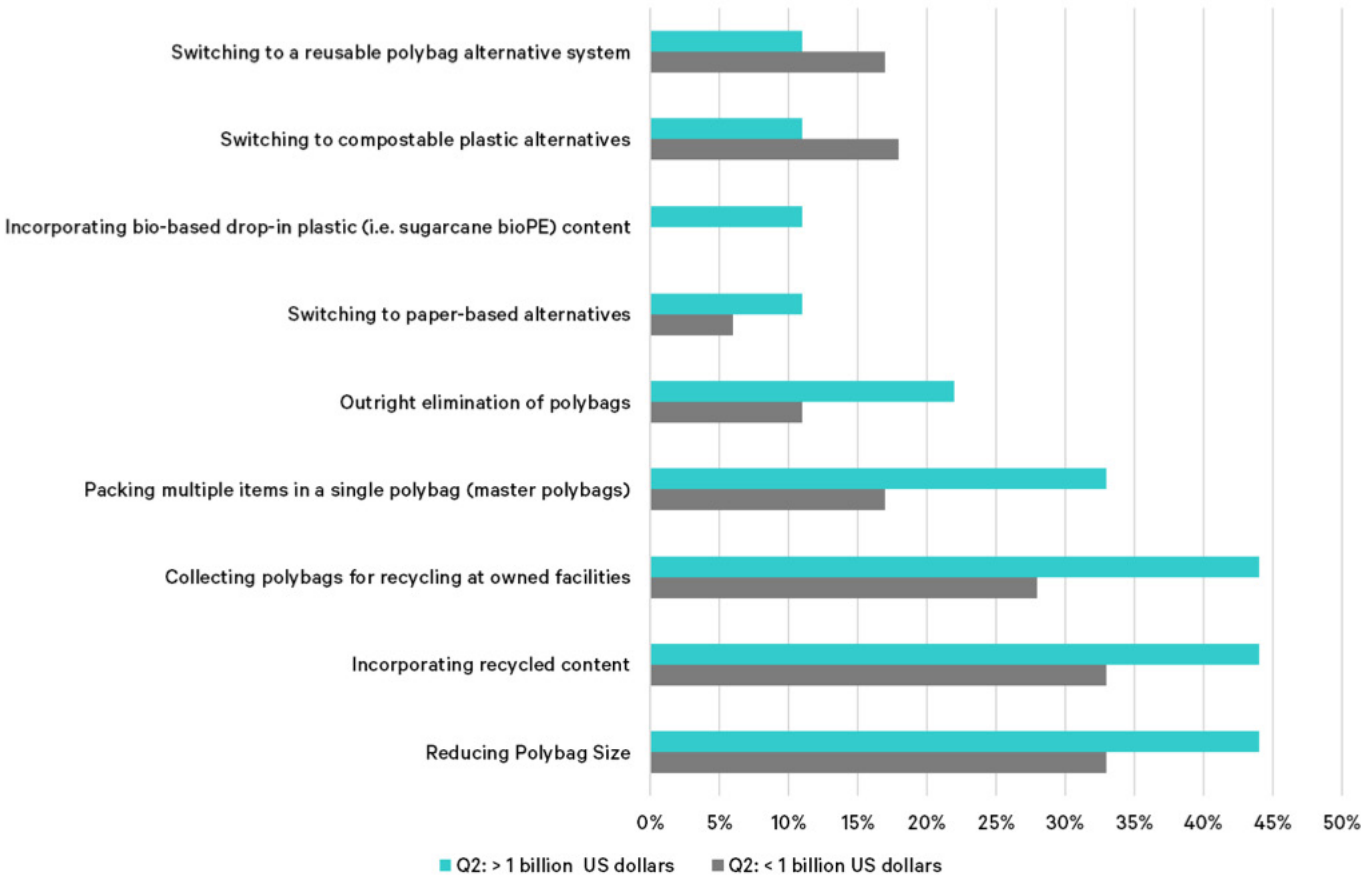



Figure 10: Breakdown of implemented schemes by large or small brand status, sorted by implementation level

### TRENDS IN IMPLEMENTATION: SMALLER BRANDS ARE BEING LEFT BEHIND

Our analysis also shows that larger brands (with an annual revenue greater than 1 billion) have a significant lead in the implementation of many initiatives, particularly; collection of polybags for recycling, incorporating recycled content, reducing polybags sizes, eliminating polybags and using master polybags. Larger brands generally have a greater capacity to influence and leverage their value chain, for example, by utilising existing reverse logistics capacity to consolidate material for recycling and negotiating beneficial deals with suppliers. In contrast, smaller brands may not have reverse logistical capabilities and depend fully on their shopping centre landlords to supply waste collection services – most of which do not currently offer film recycling. Although only a relatively small number of brands have implemented compostable packaging, there is a slight dominance of smaller brands over larger brands when it comes to this kind of initiative.

The results also give an indication of the relative ease of implementation – reusable systems, compostable plastics and paper alternatives all scored low, and reflects the current difficulty – and lack of information – around implementing these options. Incorporation of bio-based PE is a key gap that has not been explored or taken further with many brands. It is clear that initiatives around recycling, included using recycled polybags, is seen as a key option for many brands today.

## WHAT SHOULD BE DONE? OUR FIVE KEY SUGGESTIONS

It is clear the landscape of options around the simple garment polybag is nuanced. Every option introduces trade-offs and pathways to change will need cross-industry collaboration to have a wider impact. The whole life cycle of the polybag needs to be considered – and simple one-for-one substitution with novel material without this consideration could have unintended consequences. In general, every angle should be explored, with the greatest consideration given to improving the current system whilst exploring all possibilities for alternatives. With this in mind, what are the best things that can be done right now to find alternatives to the current system? What schemes, initiatives and materials should be looked at? We can distil the learnings from this investigation into five key suggestions. The outlined suggestions can be used as a framework for implementing change in your organisation.

### 1 – LOOK FOR OPPORTUNITIES TO REDUCE THE TOTAL AMOUNT OF MATERIAL IN POLYBAGS

As long as this does not lead to knock-on effects in terms of carbon emissions from increased damage or spoilage – in general, focus on using the minimal amount of material possible, or eliminating polybags where viable. We have seen examples that suggest smaller and thinner polybags may be possible – and some retailers have removed individual polybags in some situations. Schemes with master polybags are being implemented by many retailers, which could lead to noticeable reduction in total material usage.

### 2 – WORK TOGETHER TO MAKE A CLOSED LOOP SYSTEM A REALITY

Even with a scheme to reduce polybag usage, it is clear that LDPE polybags will still be here for some time to come, and while this is the case, the LDPE in polybag waste should be seen as valuable resource with which to make new products again. Even if an alternative plastic (including compostable plastics) comes to replace LDPE, a closed loop system where the material is effectively collected and recovered to create new material feedstocks will be necessary[67]. Reports have suggested that the energy (and thus overall emissions) that are saved by recycling products rather than incinerating of landfilling them is significant. Even though reuse typically sits above recycling in the 'waste hierarchy'[23], due to current lack of options and potential issues around reusable polybags – the application of circular economy principles should be a key focus of brands looking to make a difference.

A key aspirational aim should be a 'closed-loop' system, where polybags are turned into new polybags (or more broadly – flexible packaging to flexible packaging), and by doing this, brands can start to take ownership of their own waste and provide the market pull needed to develop recycling infrastructure and new and innovative technologies.

## WHAT SHOULD BE DONE? OUR FIVE KEY SUGGESTIONS

Despite the current challenges to recycling polybags, what could be done to make a circular economy, or more specifically – closed loop collection and recycling of polybags – a reality?

The path forward can be distilled into three levers for making a circular system a reality.

**Three key levers to making a closed loop system a reality:**

1. The first is to focus on the recyclability of current polybags – addressing design characteristics such as inks, adhesives, and labels.

2. The second, is to focus on innovative systems for collection at all points where polybag waste is generated, including distribution centres, retail locations, and residences.

3. The third is to focus upon innovation in recycling itself – look at improved ways for current mechanical recycling processes and alternative recycling processes, including chemical recycling.

**Lever 1 - Improve the recyclability of polybags**

Guidelines exist to encourage the recyclability of products based on PE films[68], such as the ReycClass protocol and the Association of Plastic Recyclers' APR Design® Guide[69,70]. We can adapt these guidelines and present the following general rules for designing recyclable polybags:

**Guideline for the recyclability of polybags**

- Avoid the use of paper-adhesive stickers. If possible, they can be substituted with clear, PE stickers
- Ensure polybag design is as close to 100% LDPE as possible
- Use minimal to no ink, wherever possible. Direct laser marking is preferred.
- Any adhesives used must be water soluble below 60°C
- Source polybags that conform to commonly accepted restricted substance lists (RSLs)[71,72].

Labelling for recyclability is another important design consideration, particularly for polybags that are likely to be sent to residential consumers. The Sustainable Packaging Coalition's 'How2Recycle' programme is the predominant recyclability labelling system in North America, where it is especially beneficial for polybags in providing instructions for polybags to be recycled at special store drop-off receptacles rather than kerbside receptacles, as film is a common disruptor in North American recycling systems fed by kerbside collection. Similarly, in the UK the 'On Pack Recycling Label'[73] aims to provide simple, clear and useful guidelines for consumers to recycle their packaging. However, there is no one worldwide standard for such labelling.

**Lever 2 – Implement collection and takeback schemes**

- **Where possible, utilise reverse logistics capacity to consolidate store waste at DCs**

Some brand and retailers may work closely with logistics partners or control their own logistics operations whereby excess capacity in return journeys from stores to distribution centres can be used to bring back polybag waste to be baled and sent to a recycler. The advantage of such a system is that the larger volume of items arriving (and being unpacked and repacked, often) leads to a concentrated waste stream and a convenient consolidation point for the stores, who often do not have a large amount of storage space. Retailers may even use this point in the supply chain to consider removing polybags from individual items and use alternate methods to ship to consumers. Due to the larger size of distribution centres, balers can be operated which compact the waste down, reducing onward logistics costs. Often revenue can be generated from a baled, clean plastic film waste stream, depending on the level of contamination (paper, other plastics).

One such example is a scheme currently running in Hong Kong supported by retailer Lane Crawford[41], which is also open to other brands to participate locally.

- **When reverse logistics and aggregation at distribution centres is not possible, work with partners to consolidate polybag waste with other retail locations for collection by a recycling partner**

Many retailers do not have the capability to effectively utilise excess reverse logistics capacity to consolidate their waste at a distribution centre. In this case, collaboration with other retail stores will be key method to reach a sufficient volume of waste for collection. Demonstrating the demand from retailers for this service and the value of the waste that is picked up (for recycling into new products) is key for the viability of this service for a waste management partner.

**Lever 3 – Support innovation in recycling**

**Innovation in mechanical recycling of plastics**

There is scope to innovate current mechanical recycling processes to improve the quality of the recycled plastic pellet output. One key issue is the presence of inks in the plastic which lead to a lower value end product and can lead to greyness or cloudiness – which is especially challenging in applications where transparency is a key consideration. Another key issue is the contamination of plastics from the consumer waste stream by dirt and food. Recently, many investments are being made, especially in Europe, to improve the capacity and quality of plastic film recycling[74–76] which makes recycling plastics coming from consumer homes more viable. Some of these new plants include pre-washing steps which enable dirt and other contaminants to be removed.

To a degree, more modern generations of equipment such as those by equipment manufacturer Erema[34] can deal with impurities such as paper and particulate matter better than in the past. However, inks can still be a problem. One start-up company, Cadel Deinking aims to address this topic with an innovative water and surfactant-based wash process that removes inks prior to the mechanical recycling. Overall, this means that recent advances in equipment and process technology mean that the capability for recycling of clear polybags (with their associated contaminants of ink and paper) to high quality, clear LDPE pellet for use in polybags is steadily improving.

**Innovation in Chemical Recycling of Plastics**

An alternative to 'traditional' mechanical recycling is chemical recycling, which is an umbrella term for a number of recycling technologies which leverage thermal and/or chemical processes to transform plastics into new industrial feedstocks.

For PE (a polyolefin) there are two main pathways of interest. The first is solvent-based chemical recycling, where a solvent is used to 'extract' the polymer of interest such as the Creacycle or APK Newcycling processes. This could either be from a matrix of mixed plastics or non-recyclable waste (such as multi-layer packaging materials) or a mono-material waste stream. The second is pyrolysis or gasification, where plastics are, in the presence of catalysts, heat, and other reactants turned into a mixture of volatile, small molecule hydrocarbons, such as the processes by ReNew ELP or Recycling Technologies. These hydrocarbon streams can be refined further into pure monomers for use in the manufacture of plastics or other compounds and materials.

Such technologies are still under development with many still at pilot-scale stages – or are focusing on valorising low-value materials first, such as mixtures of different plastic or complex multi-layer plastic materials. Implementation of these technologies could be a good solution for plastics which are recovered from mixed plastic consumer waste streams (including discarded polybags), where the plastic may be too contaminated otherwise to recycle mechanically.

To make a circular economy with current or future technologies a reality, close collaboration with the entire value chain both within and between organisations is needed. Brands need to work together to demonstrate support of new innovations and enable the market pull needed for these companies to scale up their technologies. In addition to this, brands need to work to ensure that their waste is collected and verifiably recycled, and not landfilled or incinerated.

### 3 – WHERE APPROPRIATE, SOURCE CURRENTLY USED PLASTICS FROM BIO-BASED DROP-INS AND/OR RECYCLED CONTENT

Along with considering the end-of-life impact, brands currently have options to source current LDPE polybags from either bio-based PE (from sugarcane) or recycled PE. These could either be entirely recycled or entirely based on bio-based PE, or some blend of the two.

Ideally, a commitment should be made to source polybags which also included a degree of post-consumer recycled content in addition to pre-consumer/industrial recycled content. This ensures there is an increased demand for the waste that is generated from the use of polybags, as well as practically diverting waste that otherwise would have gone to landfill or incineration.

### 4 – KEEP AN EYE ON THE COMPOSTABLE PACKAGING LANDSCAPE

More infrastructure, research and consumer education are needed before compostable polybags are ready to be implemented on a wide scale.

However, this should not stop innovative brands from trialling such polybags in their internal systems – there is potential scope for initial piloting and testing specifically where the material is collected and diverted to the appropriate industrial composting facility and where the polybags are not sent to the consumer (i.e. from retail stores and distribution centres only). Developments in the local infrastructure need to be closely monitored and only when there is sufficient coverage of composting facilities and compostable waste collection should these be rolled out.

### 5 – EXPLORE THE POTENTIAL FOR REUSABLE PACKAGING

Reusable packaging in the context of polybags is tricky, but potential solutions may exist. It is currently more viable to consider reusable packaging for ecommerce mailing, especially for brands with circular business models.

## WHAT ARE WE DOING TO ENCOURAGE MORE SUSTAINABLE PACKAGING?

The scale of the challenge is not insurmountable, especially if the industry collaborates to test and scale alternative solutions. To this end, the authors of this report are engaging in activities with their partners and member to tackle plastic packaging in their value chains, to accelerate and catalyse this change.

### FASHION FOR GOOD

Fashion for Good is a global initiative with the mission to support the needed systemic change of the fashion industry; by fostering impactful innovations and acting as a convener for change. It is designed as an industry-wide initiative that aims to collaborate with all brands, retailers, suppliers, innovators and other actors in the apparel sector. Fashion for Good was launched in March 2017 with C&A Foundation as a founding partner with William McDonough as co-founder; its programmes are supported by corporate partners adidas, C&A, CHANEL, BESTSELLER, Galeries Lafayette Group, Kering, Otto Group, PVH Corp., Stella McCartney, Target and Zalando and affiliate partners Arvind, Norrøna and Welspun.

#### What We Are Doing

The Fashion for Good Plastic Packaging Programme tackles initiatives to reduce the use and impact of plastic packaging in the fashion industry supply chain. To this end, we are first exploring the potential to fully close the loop on polybag packaging with a number of individual pilots and projects. The first is a collaborative, multi-brand pilot looking at closed-loop recycling of polybags by focusing on innovation in current mechanical recycling. The second concerns the collection of polybag collection from retails stores as key element of a future circular system and the third, is the facilitation of this current report as a documentation of the landscape and framework for future change for the whole industry.

### SUSTAINABLE PACKAGING COALITION

The Sustainable Packaging Coalition is a membership-based collaborative led by an independent non-profit that believes in the power of industry to make packaging more sustainable. Using an objective lifecycle-based approach, we work in a constructive atmosphere to provide thought leadership and bring our members together to strengthen and advance the business case for more sustainable packaging.

#### What We Are Doing

The Sustainable Packaging Coalition engages in a number of activities relevant to improvements in polybags, including its Design for Recycled Content Guide, How2Recycle programme, Industry Leadership Committee on Next Markets, Recycled Material Standard and a variety of workshops and informational sessions at SPC events.
For more information, visit http://sustainablepackaging.org.

## WHAT ARE WE DOING TO ENCOURAGE MORE SUSTAINABLE PACKAGING?

### EUROPEAN OUTDOOR GROUP

The European Outdoor Group (EOG) is an association representing the common interests of the European outdoor industry. Comprised of brands, technology brands, retailers and national associations from every part of Europe, the EOG focuses on three main pillars of work: Doing business the right way; conserving nature; and getting Europe active outdoors. Directed by the association's board and members, the executive team delivers a wide portfolio of projects including the Single Use Plastics Project.

**What we are doing:**

The Single Use Plastics Project, an initiative by the EOG, is a collaborative effort focused on making a significant impact to the single use plastic packaging problem. The project consists of over 35 brands and retailers from the outdoor industry along with a select group of external partners from adjacent industries, and we are all working collectively to test larger scale solutions. So far, we have researched our own industry, sourced a broad spectrum of potential alternatives, and then commenced testing a small set of those options. We are currently measuring the ecological impact of our tests, but also the operational, financial, legal/legislative, and customer experience impacts.

Our goal is to put into operation a better system that scales inside/outside of our industry and is inclusive of multi-national brands and independent retailers alike. We openly acknowledge the complexity and evolving nature of this issue and also the gaps in our understanding. By working together and with similarly focused groups like FFG, the SPC, or RILA, we believe we can do better, and push back against the single use plastic problem.

### RETAIL INDUSTRY LEADERS ASSOCIATION

The Retail Industry Leaders Association (RILA) is the US trade association for retailers that have earned leadership status by virtue of their sales volume, innovation or aspiration. We convene decision-makers to collaborate and gain from each others experience. We advance the industry through public-policy advocacy and promote operational excellence and innovation. And through research and thought leadership, we propel developments that foster both economic growth and sustainability. Our aim is bold but simple: to elevate a dynamic industry by transforming the environment in which retailers operate.

**What we are doing:**

RILA convenes benchmarking conversations around polybag sustainability as a subtopic of its Zero Waste Committee, a community of retail waste management professionals who convene to advance materials management throughout their supply chains to improve diversion and explore collaboration. RILA and the United States Green Business Council (USGBC) True Zero Waste Program are exploring opportunities to pilot improved or new polybag collection models that overcome the most persistent logistical recycling barriers that retailers face across a variety of materials not accepted by standard.

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