



# SUSTAINABILITY IN THE PLASTICS SUPPLY CHAIN

The British Plastics Federation (BPF) is the trade association representing the entire plastics supply chain in the UK, from polymer producers and distributors, converters, equipment suppliers and recyclers. The BPF works in close collaboration with its member companies and liaises closely with government departments, as well as a broad range of non-governmental stakeholders such as charities, brands and retailers.

The plastics industry is one of the UK manufacturing sector's biggest strengths, comprising around 6,200 companies and directly employing 180,000 people.

This report has been written and coordinated by British Plastics Federation Sustainability Executive Adela Putinelu. The BPF would like to thank all reviewers who have provided valuable comments and feedback during the production of this report.

This report does not necessarily reflect the views of individual companies mentioned in this report and the case studies covered in this report do not necessarily reflect the views of the British Plastics Federation.

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First published January 2021  
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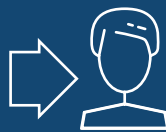
AT A GLANCE

# The UK plastics industry



**3.3**

**million tonnes**  
Plastic materials  
processed



**182,000**

People directly  
employed



**500,000+**

Employment including  
indirect jobs



**1.8**

**million tonnes**  
Plastic materials  
produced



**£27**  
**billion**

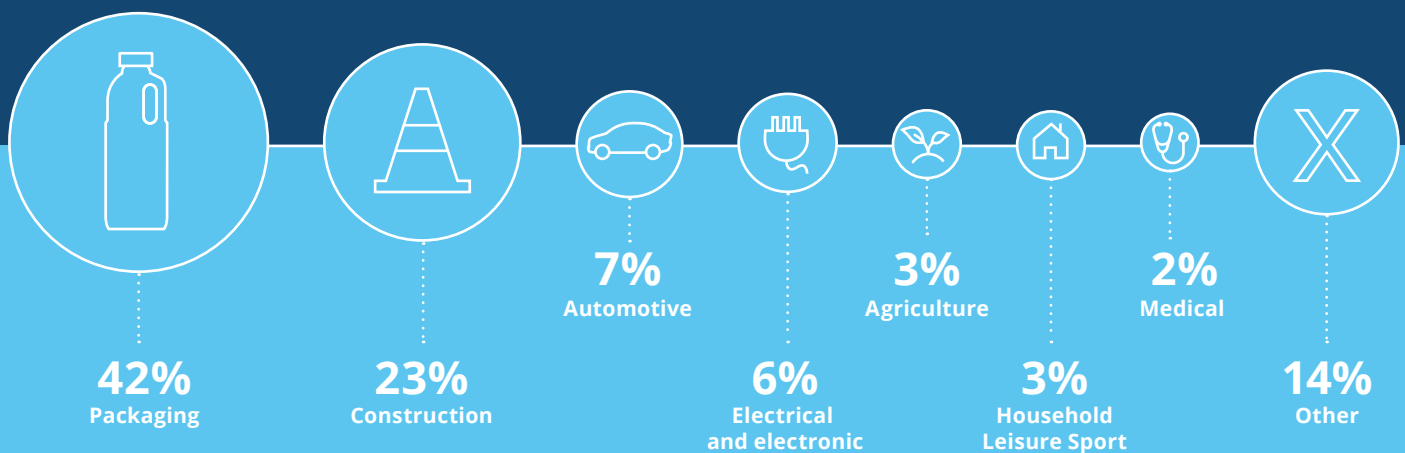
Plastic industry  
turnover



**6,200**

Companies in the  
plastics industry

Plastics consumption by application markets (%) in the UK in 2018



Source: Based on data from PlasticsEurope on plastic conversion sectors in Europe

# Forewords



## Martin Althorpe, BPF President

### **Technical Director, Epwin Fenestration Division**

It is my pleasure to introduce the British Plastics Federation's *Sustainability in the Plastics Supply Chain*. This is the first of a series of biannual sustainability publications for the plastics supply chain. It follows on from our earlier 2018 publication, *Plastics: A Vision for a Circular Economy*, and examines in depth the areas where the BPF and its members are best positioned to influence sustainability outcomes throughout our customer chain, as far as the consumer.

The review highlights some of the challenges and opportunities for the plastics industry, details the responses of the industry to date and demonstrates our contribution to a true circular economy.

I feel very encouraged by the enormous efforts of companies along the supply chain to contribute significantly to strengthening the market for secondary plastics materials, decreasing energy use in plastics processing and setting new international standards such as that preventing plastic pellet loss. The industry is determined to drive through its sustainability agenda despite the detrimental effects of the ongoing COVID-19 crisis.

The progress of the BPF's Operation Clean Sweep pellet loss prevention programme is a key priority for the industry. More recently, the BPF has been working with the British Standards Institute (BSI) and other stakeholders to standardise requirements on pellet loss prevention for the supply chain.

Operation Clean Sweep reached an important milestone in 2020 as the 200th company signed up to the programme. The BPF strongly encourages any company along the supply chain that is handling plastic pellets as part of its operations, including transport and logistics companies, to commit to zero pellet loss by signing up to Operation Clean Sweep and implementing pellet loss prevention systems. Furthermore, those who do not directly handle pellets can still become advocates and supporters of Operation Clean Sweep by highlighting the importance of achieving zero pellet loss.



## Phillip Law BPF Director-General

This year has seen tremendous stresses on the plastics industry, particularly from COVID-19 and the uncertainties of Brexit, but we have been determined to relentlessly pursue our sustainability goals and publish this, the first BPF publication of its kind, *Sustainability in the Plastics Supply Chain*.

With the second consultation on the UK government's plastic packaging tax, the BPF has highlighted, mostly importantly, that the funds raised through the new tax need to be used where the biggest need resides right now: the development of our national recycling infrastructure. It is hugely important for the government to help grow the capacity for sorting and recycling within the UK itself and supplant an earlier reliance on exporting waste by a thriving domestic recycling culture.

This review portrays the journey to higher levels of energy efficiency in production, the growth in use of recycled plastics, the design of plastic products for a circular economy as well as a breakdown of the sectoral contributions from industry to date. You will see that we report the advances in plastic recovery rates and highlight the efforts to innovate in both mechanical and chemical recycling.

The UK plastics industry itself is prepared to pay its fair share in minimising the environmental impact of plastics. It needs the cooperation of all players along the line right up to the consumer, including, crucially, the government. In 2019, jointly with WRAP, we held an investment seminar in the City of London. This pointed out the opportunities provided by the focus on the UK plastics recycling sector and drew an audience of around 90 representatives of major financial institutions.

It needs to be recognised that the UK plastics industry is a national economic strength and is itself a remarkable story of sustainability, having been founded here in 1862. Now employing 180,000 people, it is the second largest manufacturing sector by employment. All UK manufacturing and distributive sectors depend on plastics to a greater or lesser degree – retail, automotive, aerospace, construction and healthcare, just to cite a few. They live or die by their ability to compete. Plastics provide them with an essential tool in improving their competitiveness and ability to innovate. Gains in the sustainability of plastics are gains for these businesses and for the UK economy and environment as a whole in an increasingly difficult global marketplace.



## Dr. Jason Leadbitter, Chairman BPF Sustainability Committee

### **Sustainability & Corporate Social Responsibility Manager, Inovyn**

As the Chairman of BPF's Sustainability Committee I am delighted to introduce this publication which clearly shows the industry's dedication to embedding sustainability principles at all stages of the supply chain.

And what a tremendous sustainability story plastic has! They represent tremendous resource efficiency due to being lightweight and durable and the design freedom they facilitate. It is well established by now, although this doesn't get as much credit as it deserves, that if you replace plastics by alternatives, the amount of energy expended in production and the quantity of waste generated could massively increase. There could be a major increase in greenhouse gases. In terms of mitigating the effects of climate change, plastics are in the frontline of humanity's defence.

The story doesn't end there – look at how plastics packaging prevents food waste. Again, the lightweighting of cars and aircraft with plastics is creating a new generation of vehicles with increased ranges, improved fuel consumption and much less pollution. Plastics will contribute strongly to the thriving electric vehicles market.

The BPF is insistent that the issue of plastic waste and its ultimate fate on land and sea must be resolved and the BPF and government are at one on this objective. But we should also emphasise that a material so prevalent in our daily lives with so many benefits, such as plastics, should not be defined solely based on end of life management issues.

In its work, the BPF has made visible the international importance of the United Nations Sustainable Development Goals and the crucial role the global plastics industry has in helping to achieve these goals, from helping to provide clean water and sanitation solutions to supporting life-saving innovations in medical devices and the pharmaceutical industry.

Because the plastics industry has been under such public scrutiny it has a far greater understanding of what 'sustainability' means for an industrial material than any other sector. It has taken voluntary initiatives, which have gone way beyond regulatory requirements. As an example, VinylPlus, a voluntary Europe-wide scheme addressing the sustainability of PVC building products such as windows, pipe systems and roofing, has been praised as a model of its kind. For the BPF and the plastics industry, sustainability is a very well-trodden path.



# Executive summary

Plastics bring numerous benefits to our everyday lives, enabling many cutting-edge technologies across different sectors and minimising climate change impacts through their lightweight and resource-efficient properties.

Almost every major industry sector including construction, aerospace, electronics, automotive, furniture, medical, food, drink, sports, education, leisure and agriculture is reliant upon plastics to enable trade and economic development.

The BPF, through its industry member groups and expert committees, as well as through a range of different stakeholder partnerships, works actively to help the UK achieve a circular plastics economy and reduce leakage of plastic waste to the environment.

Moreover, by working to achieve a circular plastics economy, the BPF champions several sustainability initiatives at different stages of the supply chain from manufacturing and design to end of life management.

A circular plastics economy requires less reliance on virgin materials and an increased capacity within the national recycling infrastructure. Businesses across the supply chain are already demonstrating a strong willingness to explore and adopt new business models that are in line with the circular economy.

Plastic waste pollution is widely recognised as a global environmental issue of utmost importance. The highly durable and persistent nature of plastics requires an urgent and collaborative approach to further reduce negative environmental impacts while preserving plastics' benefits.

In response to these challenges, governments, businesses and organisations worldwide are implementing solutions to prevent plastic leakage to the environment, to increase recycling and to minimise the need for resource extraction to achieve a truly circular economy.

This report aims to address some of the key sustainability issues in the plastics industry and to provide concrete examples and case studies highlighting the industry's contribution towards sustainability.



# 1. Sustainable plastics manufacturing

## What role does the BPF play in addressing sustainability?

The BPF facilitates and supports industry's efforts to address sustainability and reduce environmental impacts at all stages of production, from product design to manufacturing and end of life management.

## How can companies operating in the plastics industry embed sustainability across the supply chain?

All companies in the plastics supply chain have a responsibility to take action to drive sustainability across their operations, services and product ranges.

From working to reduce the carbon footprint of both downstream and upstream activities (production and operations) to training employees on sustainability and the environmental impacts of plastics, there is a range of different actions that the industry is pursuing in its drive to strengthen its sustainability credentials.

The BPF strongly encourages all companies in the plastics supply chain to appoint a Sustainability Champion to demonstrate their commitment on sustainability as well as elevating sustainability at board level through specific sustainability-related KPIs.

## Recommendations for sustainable plastics manufacturing

- Invest in energy-efficient technologies to lower greenhouse gas (GHG) emissions
- Use resources efficiently and reduce material, water and process waste
- Adhere to sustainable design principles and guidelines
- Maximise the use of recycled content wherever possible
- Eliminate plastic pellet loss

The BPF has released an online communications campaign related to the Sustainable Development Goals that form part of the current United Nations 2030 Agenda. The online [resource](#) highlights the contribution of the plastics industry in supporting the global Sustainable Development Goals.<sup>1</sup>

**FIGURE 1: The global goals for sustainable development**

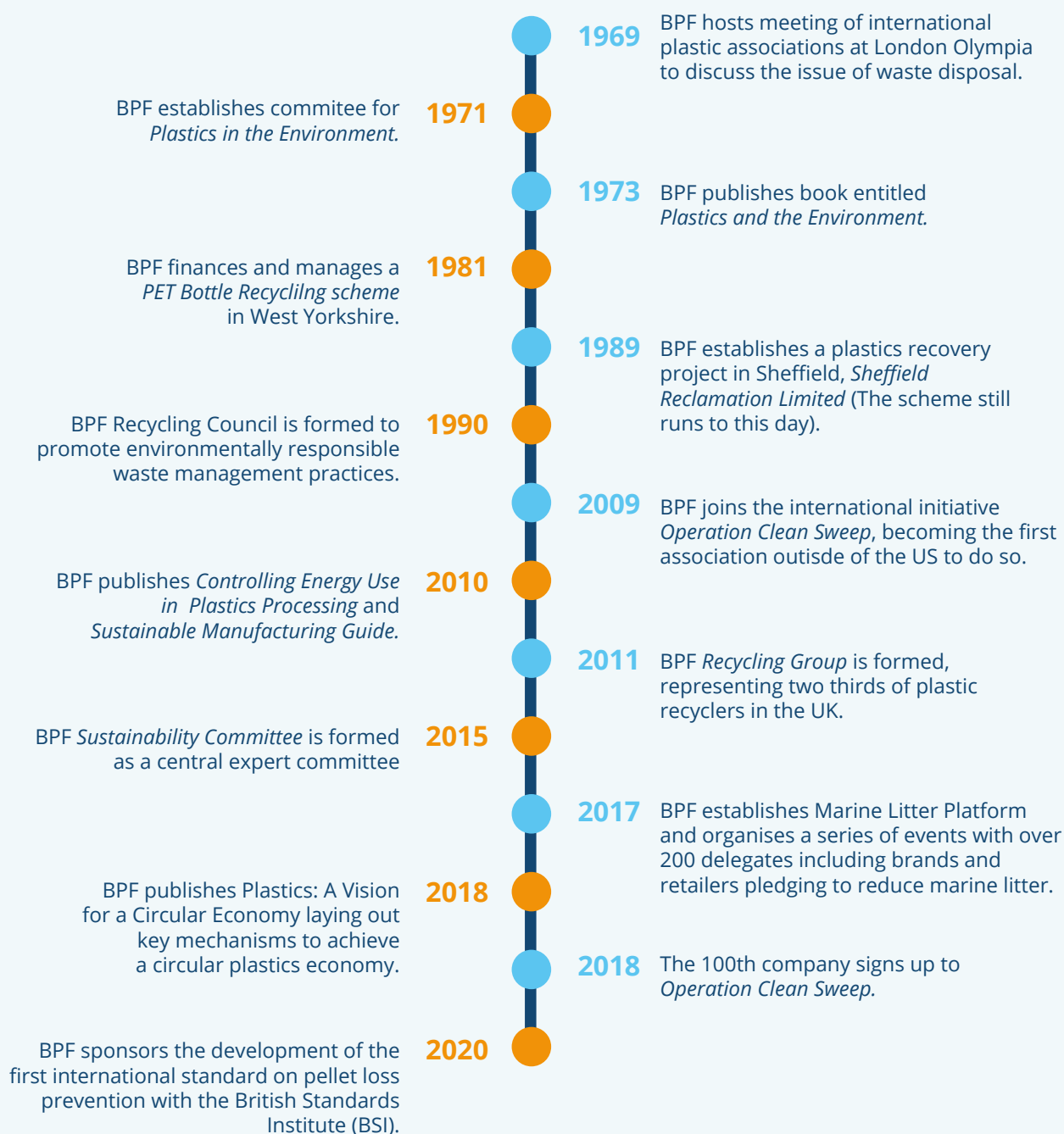


SUSTAINABLE DEVELOPMENT GOALS

## Sustainability and the BPF

Sustainability has always been one of the main issues being addressed as part of the numerous annual seminars organised by the BPF. Moreover, an annual BPF Sustainability seminar takes place to take stock of the progress on key sustainability issues in the plastics industry and to enable companies from across the supply chain to share best practice.<sup>2</sup>

**FIGURE 2: The BPF and sustainability timeline<sup>3</sup>**



## Transitioning to a circular economy

The circular economy model has, as a core principle, the aim of maintaining the value of products, materials and resources for as long as possible by returning them into the product cycle at the end of their use, while minimising the generation of GHG emissions and waste. It aims to provide an alternative model to the current 'linear' economy by emphasising smart product design and sustainable production to save resources and create new business and employment opportunities.<sup>4</sup>

For the plastics sector, this translates into a more efficient use of virgin material by incorporating recycled content where possible, increasing recycling, reuse and minimising waste generation.

A circular economy can also significantly contribute to tackling climate change by offering a systemic and cost-effective approach to reducing GHG emissions. Recycling plastics saves a significant amount of GHG emissions ranging from 30% to as much as 80% of the emissions from plastics manufacturing and processing.<sup>5</sup>

Establishing a high-value market for secondary plastic materials is one of the pre-conditions of achieving a circular plastics economy.

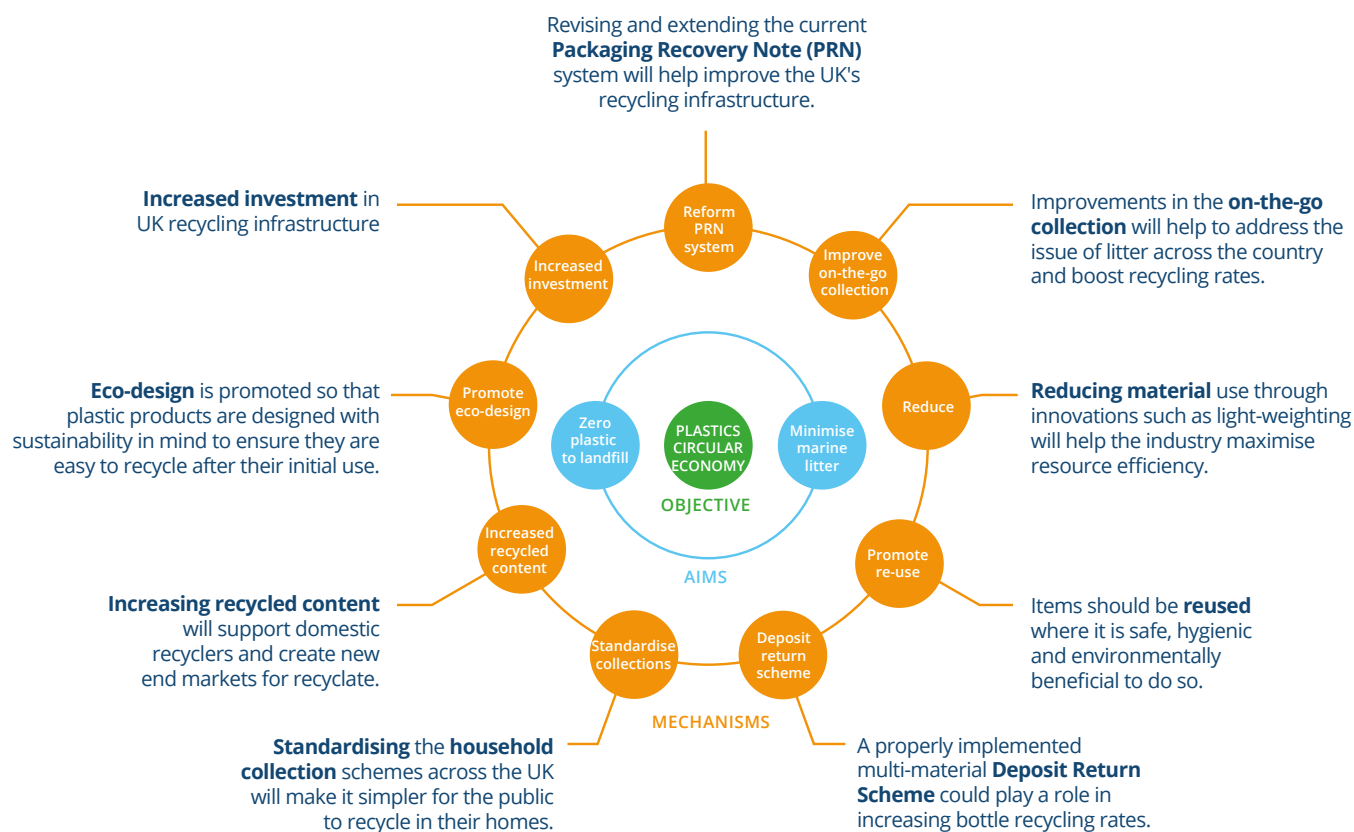
## How is the plastics industry contributing to the circular economy?

The plastics industry is being proactive in addressing sustainability and ensuring plastics will play an important role in the circular economy.

Some of the workstreams that the BPF is championing to address sustainability across the plastics supply chain and achieve a circular plastics economy are as follows:

- Eco-design initiatives and training
- Driving the expansion of UK mechanical and chemical recycling capacity
- Maximising the uptake of recycled content
- Improving energy and resource efficiency in plastics manufacturing
- Reducing reliance on plastic waste exports
- Eliminating plastic pellet loss across the supply chain
- Supporting NGOs and charities working on anti-littering campaigns and marine litter.

**FIGURE 3: Mechanisms needed to achieve a circular plastics economy<sup>6</sup>**



## The UK's net-zero emissions target

The UK was the first country globally to legislate the commitment to achieve a net zero target by 2050. This means that, by 2050, the entire country's GHG emissions need to be zero while the remainder of any emissions resulting from industrial sectors that might not have the technological capabilities to achieve climate neutrality will be offset either through carbon offsetting or by deploying carbon capture technology.

In 2018, the highest volume of GHG emissions in the UK was from the transport sector – 28% of overall GHG emissions, followed by energy supply (23%), business sector (18%), residential sector (15%) and agriculture (10%).

Recognising the urgency of addressing climate change, other countries around the world have also taken strong steps to become carbon neutral. The European Union (EU) has recently launched the Green Deal strategy, which aims to deliver the goal of climate neutrality by 2050 across the EU. The strategy brings together the green energy transition, the circular economy and research and innovation into one framework to provide cohesion and better integrate previous policy areas to achieve climate-neutrality goals.

Using plastics more sustainably needs to be realised in conjunction with the goal of reducing GHG emissions. However, unintended consequences arising from transitioning to alternative materials which are often heavier, use more resources to produce and have different environmental impacts need to be carefully considered.

Plastics contribute significantly to keeping down GHG emissions throughout their life cycles. Key plastic products used for thermal insulation and renewable energy generation enable climate mitigation strategies that play a key role in reducing GHG emissions. In the transport sector, motor vehicles and aircraft are much lighter and

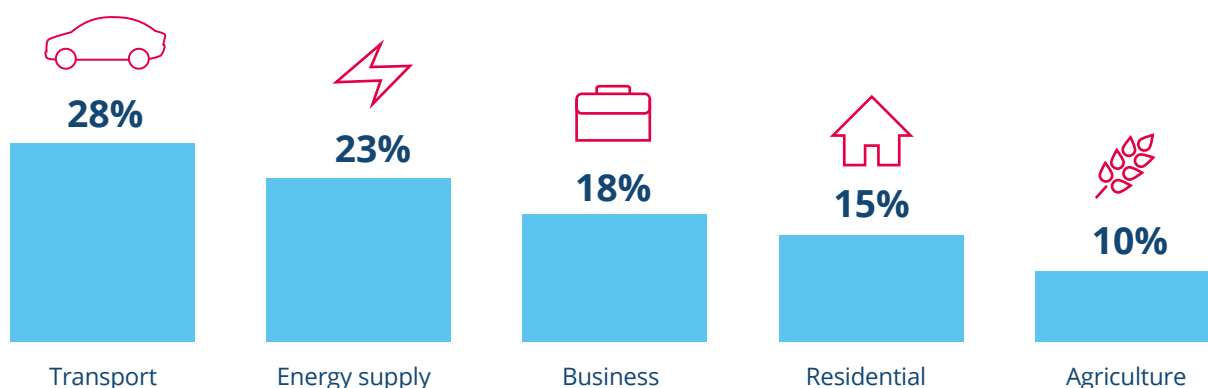


more fuel efficient as a direct result of the amount of plastics incorporated in their design and production. Moreover, recycled plastics are now commonly used in car manufacturing. Plastic packaging preserves and extends the shelf life of food and drives down emissions as a result of reducing food waste.

There are a multitude of applications where no other material can fulfil the same functions with an equal or lower GHG emission footprint than plastics.

Scientists now fear that if the entire life cycle performance and environmental footprint of plastics is not carefully assessed in order to make informed decisions about their sustainability, we might run the risk of increasing GHG emissions by switching to alternatives.<sup>7</sup>

GHG emissions in the UK by sector in 2018



Source: National statistics, BEIS

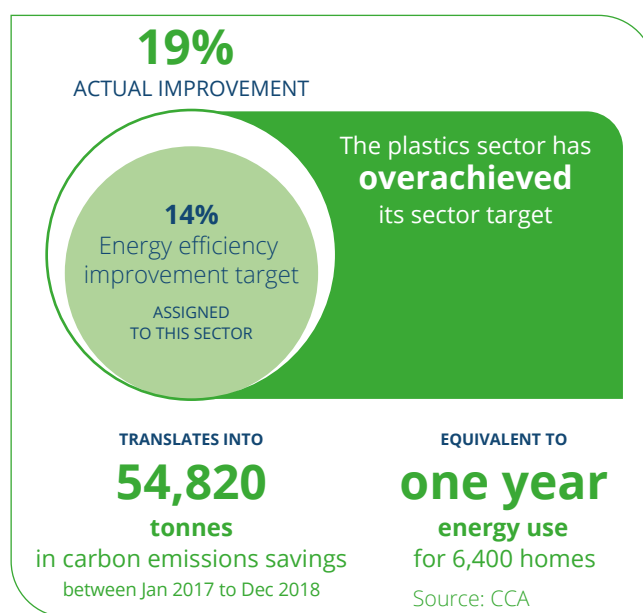
## 1.1 Energy efficiency in plastics manufacturing

In 2008, the BPF created the Climate Change Agreement (CCA) for the plastics sector in the UK. CCAs are voluntary agreements made between industry and the government. The Environment Agency administers the scheme on behalf of the Department for Business, Energy and Industrial Strategy (BEIS) for the whole of the UK.

The Agreement sets energy-efficiency targets for businesses and helps manage the costs of the climate change levy. Operators who commit to achieving the scheme's targets are entitled to a discount on the climate change levy. The scheme has been extended until 2022 with the climate change levy relief guaranteed until 2025.<sup>8</sup>

The CCA has achieved considerable reductions in energy use, helping to reduce emissions from plastics manufacturing. The plastics sector has overachieved its sector target, reaching an energy-efficiency improvement of around 19% compared to the initial target of 14% assigned to this sector. This translates into a carbon emissions savings of 54,820 tonnes during the third target period running from January 2017 to December 2018. The carbon savings are equivalent to one year's energy use for around 6,400 homes.

Emissions targets encourage businesses to adopt more energy efficient technologies and processes, lowering



costs and energy demand. Energy-efficiency improvements in manufacturing achieve cheaper unit production costs resulting in higher productivity. The energy needed to produce one kilogram of plastics has reduced dramatically for UK plastics processors.

### CASE STUDY

#### McLaren Plastics invest in energy-efficient Sumitomo (SHI) Demag moulding technology

McLaren Plastics invested in two all-electric high-specification machines to replace the hydraulic moulding machines.

Tests performed showed an improvement in energy efficiency of 58% and 62% respectively for two processes in automotive and packaging applications with tight processing tolerances. Based upon the energy-monitoring results and team feedback, the company is already considering further investment in all-electric technology.

Other improvements in energy-efficiency include replacing high-sodium lighting and installing a closed-circuit water-cooling system that utilises Scotland's natural climate. The company is also considering upgrading to a larger tonnage and fast cycling packaging machine from the moulding fleet.

The increasing adoption of clean and renewable energy solutions, especially by the manufacturing community, is an encouraging step forward. Having access to commercial evidence is a real step change for moulders and stakeholders, providing proof that manufacturers are taking steps to reduce their environmental footprint and contribute to more energy-efficient manufacturing.



**58% and 62%**  
improvement in energy efficiency, using all-electric machines to replace hydraulic moulding machines

#### CASE STUDY

### A decade of solar power at the Berry M&H Ellough site

In 2011, Berry M&H Ellough site installed what was at the time the biggest solar rooftop in Britain. The solar PV installation has a capacity of 1.65MW comprising over 7,000 solar panels, approximately the size of two and a half football pitches.

Since being commissioned in July 2011, the system has produced 11.6 GWh. During summertime, production can reach 14% of total energy used on site. Berry M&H seek to continue to explore renewables and sustainable solutions across their network of operations in line with the targets of the Berry Impact 2025 sustainability strategy.

In early 2020, the site also installed new electric vehicle (EV) charging points and aims to only purchase EVs going forward to help reduce the overall carbon footprint of the company.

Among other sustainability strategies already implemented, the site has already achieved zero waste to landfill and has reduced water consumption and electricity usage.

The solar PV installation has a capacity of **1.65MW** with over **7,000 solar panels**, the size of two and a half football pitches.



#### PLANT GENERATES

**75%**

electricity consumed on-site.

CHP improves environmental performance by capturing and utilising the heat that is a by-product of the electricity generation process. As a result, transmission and distribution losses are reduced and operators significantly improve their carbon footprint.

#### CASE STUDY

### Innovia Films combined heat and power (CHP) plant

Innovia Films continually strives to enhance sustainability programmes through both process initiatives and product developments. Sustainability initiatives at Innovia Films focus on reducing energy and water usage, improving waste management, preventing pollution and reducing GHG emissions.

Innovia Films have an on-site combined heat and power (CHP) plant which ensures less reliance on electricity from National Grid and reduces GHG emissions. Where electricity is purchased from the grid this is, wherever possible, supplied from renewable energy sources.

The CHP plant currently generates 75% of the electricity consumed on-site. However, in terms of total energy demand, the percentage of energy utilised from the CHP plant is much higher as the steam generated in the CHP plant is utilised as well.

## 1.2 Monitoring the use of recycled polymers



To create a more sustainable economy for plastics in the EU, the plastics industry has to become more circular.

One of the key ways the industry will achieve this is increasing the volumes of recycled polymers used in new products placed on the market. Making plastics more circular is a common objective of the entire polymer value chain.

Maximising the use of recycled content is highly beneficial and ensures the transition towards the circular economy. It stimulates the market for recycled content, significantly lowers the GHG emissions associated with the manufacture of new products, reduces reliance on virgin feedstocks and ensures resources are used much more efficiently.

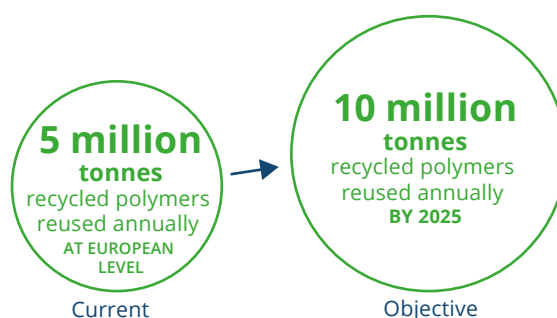
Plastics-converting companies play a crucial role in the transition towards a circular economy as any volume of recyclate is processed through a plastics-converting facility. Plastics-converting companies are thus best positioned to monitor the progress on the performance and quantity of the recycled polymers used.

The British Plastics Federation has partnered with the European trade association of plastics converters, EuPC,

to monitor and stimulate industry's efforts to integrate recycled content into new products.<sup>9</sup> This is done through the MONitoring Recyclates for Europe (MORE), an online tool which monitors the uptake of recycled polymers that converters are using across the EU.

Currently, the industry is annually reusing approximately 5 million tonnes of recycled polymers at European level. A joint initiative coordinated by the European Commission, the Circular Plastics Alliance, has the objective of reaching 10 million tonnes of recycled polymers reused annually by 2025.<sup>10</sup>

MORE is helping reach this goal by enabling the industry to monitor these efforts and to demonstrate the increased uptake in recycled content integrated into new products.



### CASE STUDY

#### Faerch pioneers PET innovation while maximising the use of recycled content

In addition to using 100% renewable energy for all sites around Europe, Faerch are pioneers in polyethylene terephthalate (PET) innovation and use a high volume of recycled content across their product range.

On average, only 20% of the PET produced by Faerch comes from virgin sources with approximately 70% coming from post-consumer and 10% from pre-consumer sources. Faerch pioneered the use of un-pigmented recycled PET in their range of amorphous and crystallised Evolve PET trays made from up to 100% recycled PET.

Another innovation patented by Faerch is the production of mono-material PET trays with a special sealing adhesive which does not impact the recycling stream while boasting the same properties as multi-layer materials and non-recyclable laminates.

Manufactured from post-consumer recycled materials, MAPET® II offers significant environmental benefits as it can be easily sorted and recycled. Rather than including a PE top layer, Faerch adds a small amount of special food-contact approved adhesive to the rim of each tray to ensure that it can be sealed easily. This adhesive is designed to deteriorate when it enters the waste stream and will be removed by the normal recycling process during PET recycling.



These innovations are helping to establish a secondary material market and contribute to the circular plastics economy. However, it is widely accepted that, for other plastic material streams, there are still technical restrictions and barriers that make it more difficult to integrate recycled content back into food contact applications.

Nevertheless, it is vital that the industry works to overcome these barriers and pursue innovation to replicate the success of the PET market for other types of plastics and drive further the circular plastics economy.

## 1.3 Eco-design: the pre-requisite for sustainable plastics manufacturing

Wide adoption of sustainable eco-design principles is needed across the plastics supply chain. The BPF has been working in collaboration with a broad range of stakeholders to develop tools and training on eco-design with the goal of embedding sustainability principles at design and product manufacturing stages.

One of the main focus areas has been within packaging, to help promote the development of packaging items that are easy to recycle, include recycled content and are designed to reduce overall environmental impacts.

### What exactly is sustainable packaging design?

In practice, sustainable packaging design often means designing for one or more of the following:

- Ease of recyclability
- Resource efficiency
- Inclusion of recycled content
- Reuse
- Environmentally beneficial consumer behaviour (e.g. portion control, reduction of food waste).

### The BPF's eco-design hub

The BPF has launched an eco-design hub, where all activities related to eco-design can be explored.<sup>11</sup> The website helps brands, retailers, manufacturers, designers and the interested public learn all they need to know about eco-design, signposting to the many BPF resources on the subject.

In 2018, the BPF and RECOUP launched a guide for recyclability targeted at packaging designers to guide them through designing plastic packaging with the ease of recyclability as the main design pre-requisite.<sup>12</sup>

Furthermore, the BPF has launched an online tool, PackScore, which can be used at the earliest stages of design to assess whether the packaging can be easily recycled and adjust the product's features to ensure it can.<sup>13</sup>

Supported by RECOUP and based on the RecyClass system developed by Plastics Recyclers Europe, PackScore allows users to answer a series of simple questions in order to receive a recyclability rating from A to F. The tool also highlights features such as light-weighting and the use of recycled content that help ensure efficient use of resources. Users can experiment with different combinations of materials and decorations to improve their packaging recyclability rating at an early stage, before the product is manufactured.

**FIGURE 4:** Eco-design hub includes all major BPF projects on sustainable design

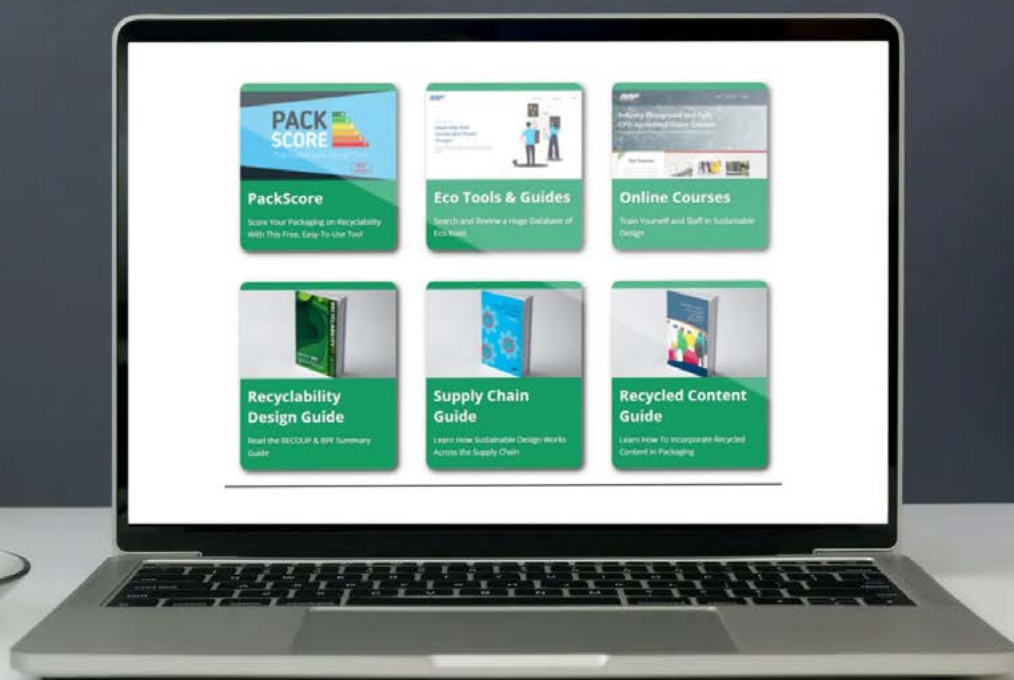




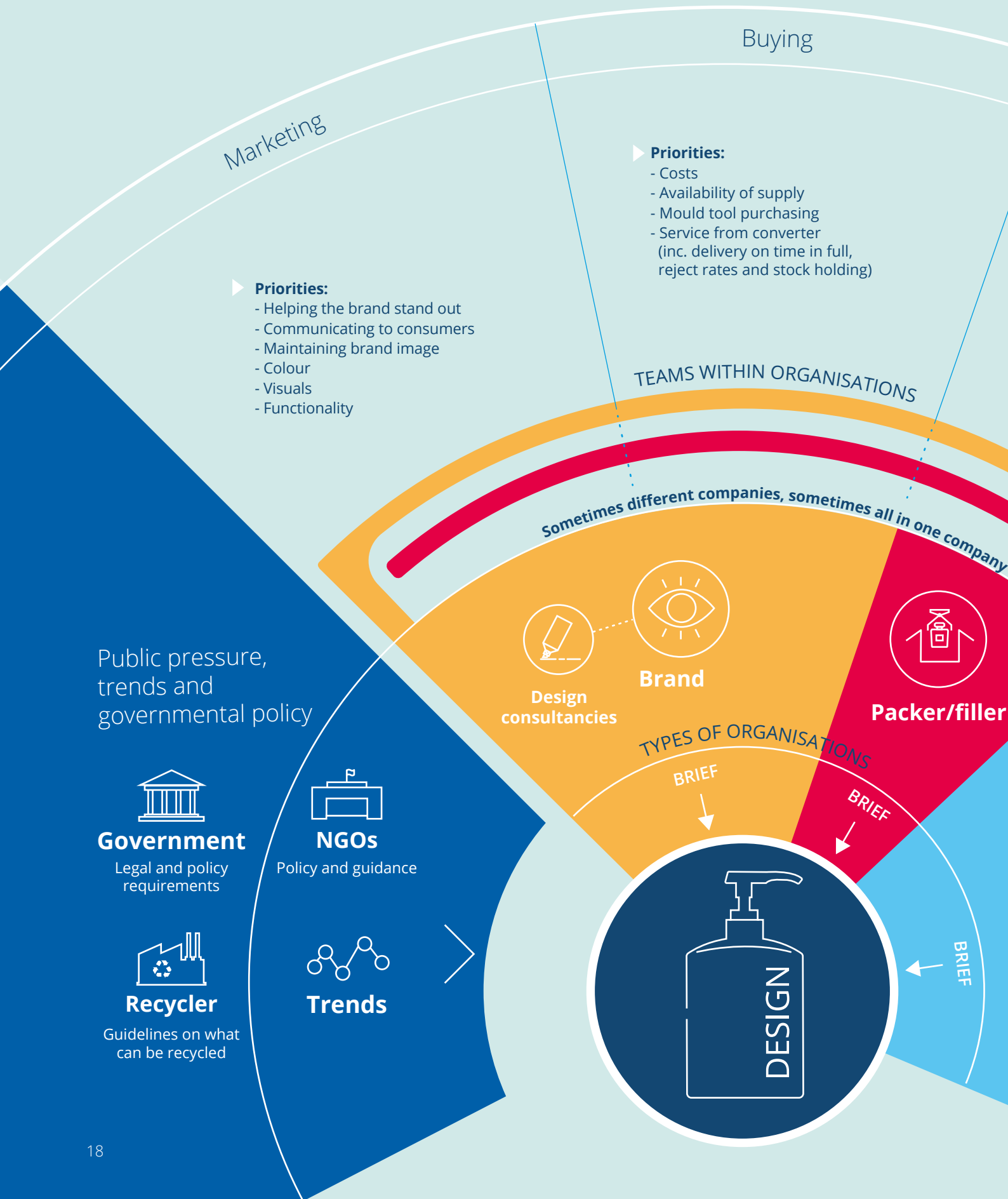
**FIGURE 5: PackScore is a tool aimed at packaging designers helping to identify packaging formats that are easily recyclable**

In 2019, the BPF launched a roundtable with a diverse network of actors in the plastics supply chain to address sustainability at all design stages. [A briefing](#) was published based on the views expressed during the initial roundtable to highlight how the supply chain can work together to address sustainability challenges in the packaging sector.<sup>14</sup>

The BPF has created and launched a searchable database of sustainable design tools, featuring carbon calculators, recyclability guides and other useful tools for the industry. This worldwide [collection](#) of resources allows users to find the tool or guide they need related to eco-design.<sup>15</sup>

Moreover, the BPF has expanded its work on sustainable design and has developed an [online course](#) for brand managers, packaging technologists, packaging designers and sustainability professionals. The training equips learners with the key knowledge to make more sustainable choices and limit the environmental impacts of plastic packaging at all stages of product design.

FIGURE 6: Eco-design priorities and drivers for the supply chain



Technical

► **Priorities:**

- Whether the product fits on the filling line
- Whether the product fits through the logistics chain
- Whether components are compatible with container
- Other considerations include:
  - o Shelf life
  - o Minimum change of line parts

Technical

► **Priorities:**

- The available manufacturing processes
- Technical issues with converting, such as tooling strategy (how to manage, i.e. tooling wears out), mouldflow (i.e. how easy something is to mould), etc.
- Whether input from machine suppliers is needed about novel methods of operating machines

Materials

► **Priorities:**

- Choosing the right material
- Possible to include within technical, legal, cost and availability requirements?

► **Priorities:**

- Projects to fill internal spare capacity:
  - o Market gaps
  - o Responding to competition, etc.

Sales  
(in house)



Converter

## 1.4 Eliminating plastic pellet loss



Plastic pellets, powders and flakes (collectively referred to as 'plastic pellets') are the building blocks of all plastic consumer goods. Plastic pellets are traded and distributed to manufacturing facilities across the world.

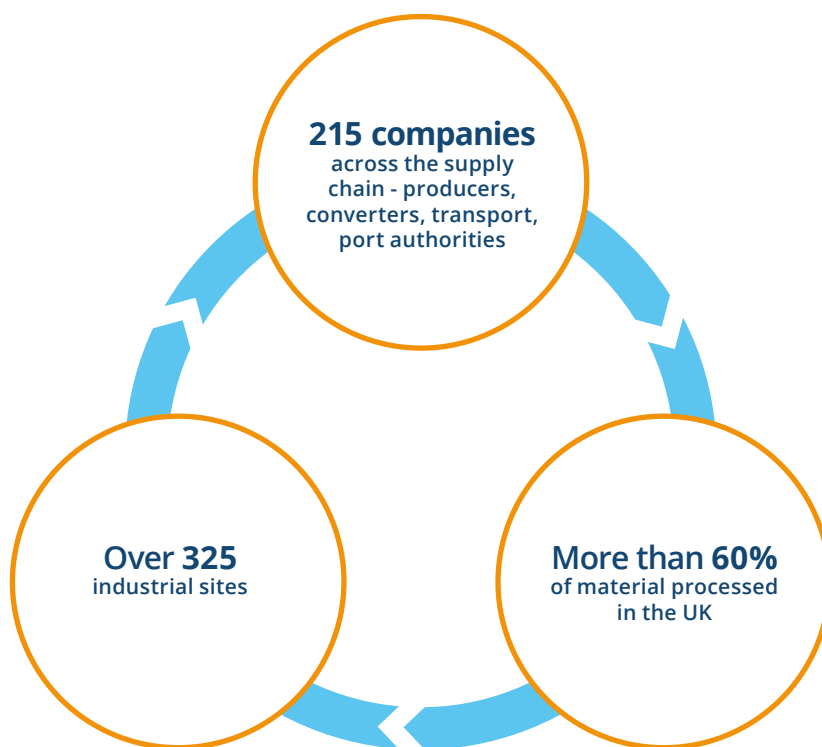
Many different actors across the supply chain, including producers, converters, haulage and port authorities are handling plastic pellets and thus bear responsibility for implementing best practice measures to mitigate any risk of pellets escaping into the environment. Thus, mitigating the risk of pellets escaping into the environment is a shared effort among all of these actors which all play a very important part in the supply chain.

Operation Clean Sweep® is an international initiative from the plastics industry to reduce plastic pellet loss to the environment. In the UK it is led by the British Plastics Federation.

In 2009, the UK was the first country outside of North America to introduce the programme and actively work with companies across the supply chain to implement pellet loss prevention measures. Most recently, the programme celebrates an important milestone as it registered over 200 companies. The UK also has the highest number of signatories per country in Europe.

By signing up to Operation Clean Sweep®, companies make a commitment to adhere to best practice and implement systems to prevent plastic pellet loss. The BPF offers a wide range of tools to support companies as part of the programme such as management and training checklists, case-studies with examples of implementation, webinars, workshops and continuous support on any matter related to pellet loss prevention.<sup>16</sup>

**FIGURE 7: Companies currently signed up to Operation Clean Sweep® in the UK**



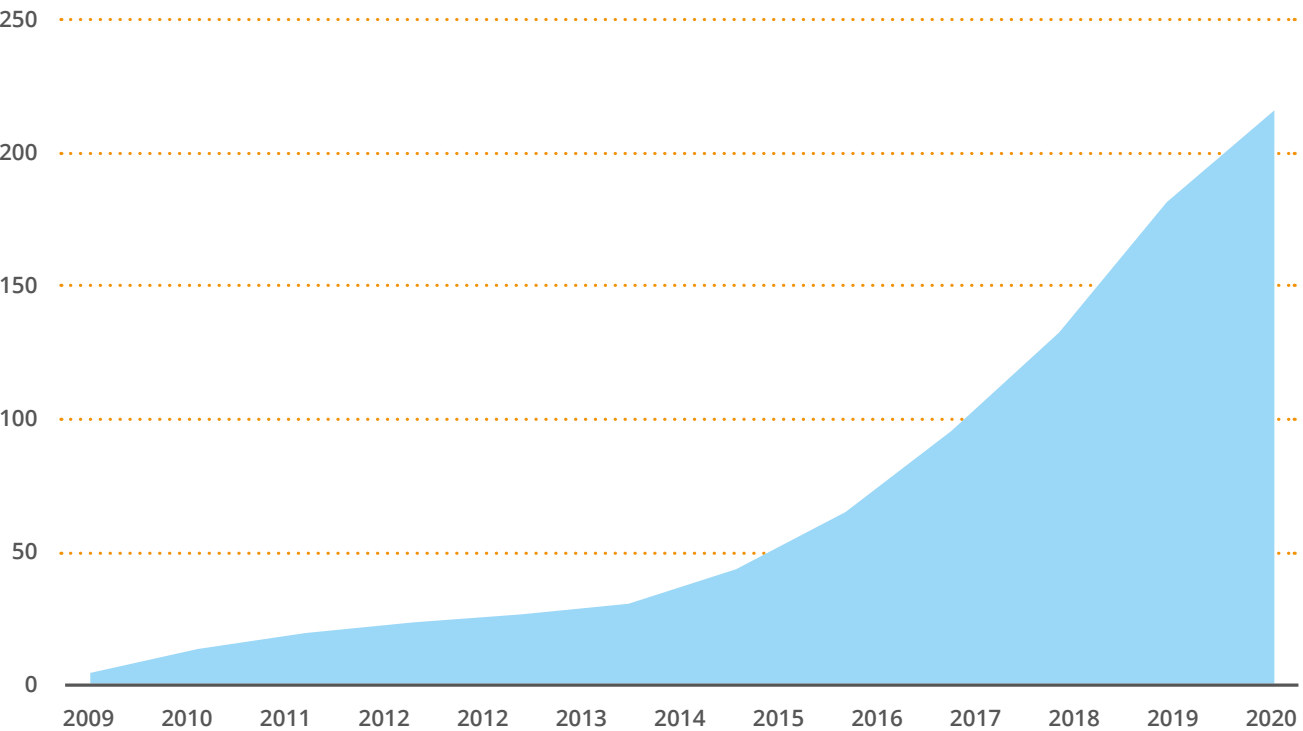
Operation Clean Sweep® helps companies ensure that plastic pellets are contained on-site, helps demonstrate companies' commitment to sustainability and assures others in the supply chain that plastic pellets are handled responsibly. The programme currently represents the best-in-class example of operational guidance and has enjoyed broad success in tackling pellet pollution in the UK.

More recently, the BPF has worked with Marine Scotland, The Investor Forum and the environmental charity Fauna and Flora International to define the first international standardisation project on preventing plastic pellet loss in collaboration with the British Standards Institution (BSI). A Publicly Available Specification (PAS) is a fast-tracked industry standard that can be used by all actors in the supply chain to demonstrate compliance with pellet loss prevention measures. PAS 510 will build on the successful track record of Operation Clean Sweep® and can be used

at international level by any company operating within the plastics supply chain, including transport and port authorities. At European level, the supply chain is also working on developing a certification scheme that will build on the progress of Operation Clean Sweep®.

As the loss of valuable raw material along the supply chain has serious environmental and economic consequences, the plastics industry is taking a proactive approach to successfully mitigate this risk and ensure no loss of raw material occurs within the supply chain.

**FIGURE 8: Evolution of companies registered to Operation Clean Sweep® in the UK**



Source: BPF



## 2. Sector contributions to sustainability

### 2.1 Packaging

#### Why do we use plastic packaging?

Plastic packaging plays a vital role in the reduction of food waste by:

- Protecting food and products in the logistics chain
- Ensuring hygiene and safety
- Stopping moisture evaporation to extend shelf life and keep products fresh
- Providing portion control through dispensing or multi-packs
- Allowing reseal or re-closure to stop contamination and enable multiple servings
- Contributing to resource efficiency by using less material in comparison to plastic alternatives
- Reducing GHG emissions by achieving energy savings in the transport of goods and reducing food waste.

#### Plastic has many physical attributes that make it ideal for packaging applications.

Alternatives to plastic packaging are heavier and bulkier than plastics and often require more resources to meet the same packaging requirements.

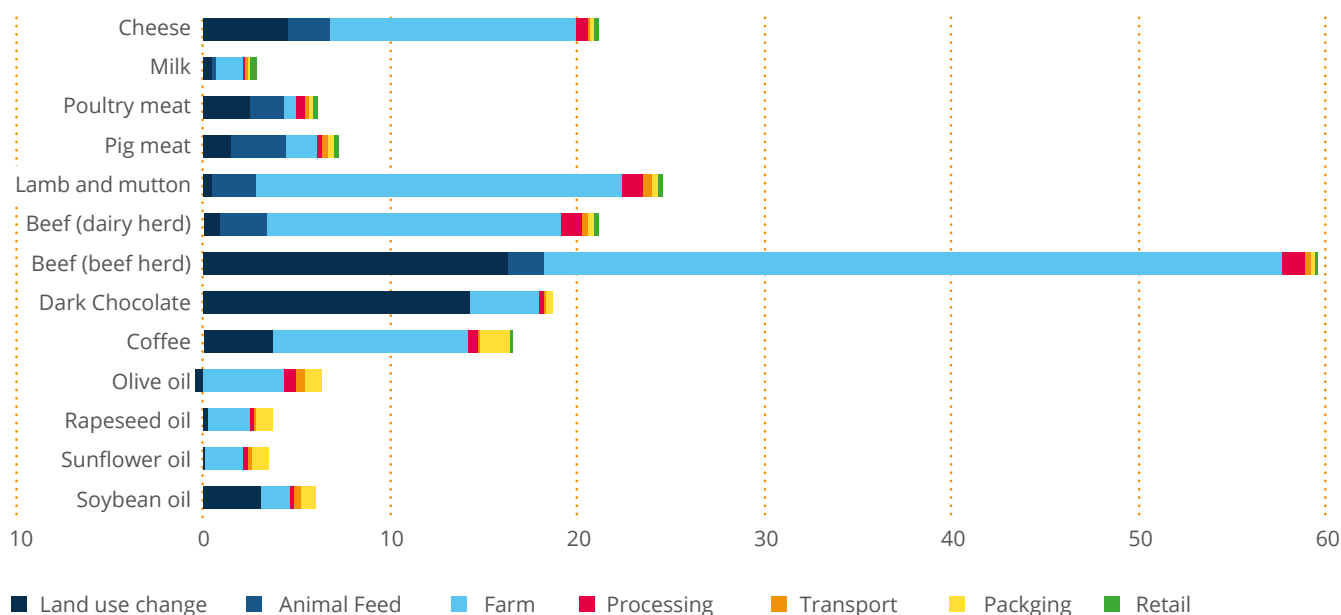
Plastic packaging is mostly used due to its protective function as it often helps to prevent food waste. The environmental benefit of avoided food waste is as much as five to ten times higher than the environmental cost of plastic packaging, especially in the case of resource-intensive food production (for example meat and cheese).<sup>17</sup>

Eco-design strategies as well as design for recycling, reuse and maximising the use of recycled content (when technically feasible to do so) lead to reduced environmental impacts throughout the life cycle of plastic packaging.

28-34% of total global GHG emissions are related to food production, depending on the definition of the system boundaries. 24% are caused by agriculture including the effects of land use and land use change while 5-10% are caused by the rest of the supply chain.<sup>18</sup>

**FIGURE 9: GHG impacts of food production and packaging**

Source: Adapted from Poore, J., & Nemecek, T., Reducing food's environmental impacts through producers and consumers, 2018, Science



A recent report by the environmental charity Green Alliance entitled 'Fixing the system' documents how UK retailers are under public pressure to switch to alternative materials although there is acknowledgement that this might have detrimental environmental effects, for example, by increasing carbon emissions. The report estimates that switching all current consumption of plastic packaging on a like-for-like basis to the other materials currently used for packaging in the UK could almost triple associated carbon emissions.<sup>19</sup>

An analysis by market research company ICIS highlights that the regulatory landscape in the UK risks triggering unintended consequences as the knock-on effect of the public focus on plastics is that it concentrates regulatory efforts disproportionately on plastics because it is providing a mandate to act which is not the case for other packaging types.<sup>20</sup> The analysis points out that in trying to find sustainable alternatives, retailers and other stakeholders need to balance the need for plastic packaging, resource efficiency and environmental impacts throughout the life cycle of the products.

Furthermore, an analysis by Imperial College London, 'Examining material evidence: the carbon fingerprint', critically reviews 73 life cycle assessments of different types of packaging and finds that most other alternatives to plastic packaging have a higher GHG emission contribution. Recycling is found to save between 30% and 80% of the carbon emissions that virgin plastic processing and manufacturing generate.<sup>22</sup>

In the search for truly sustainable packaging solutions, the focus must be on resource efficiency and life cycle assessments instead of simply replacing one material with another without analysing the unintended environmental consequences this might result in.

### Legislative drivers and their main aims

The main objective of the UK Government Resources and Waste Strategy, launched in 2018, was to put forward a long-term strategy to evolve from the traditional linear economic model to a sustainable and efficient circular economy model.<sup>23</sup>

This would:

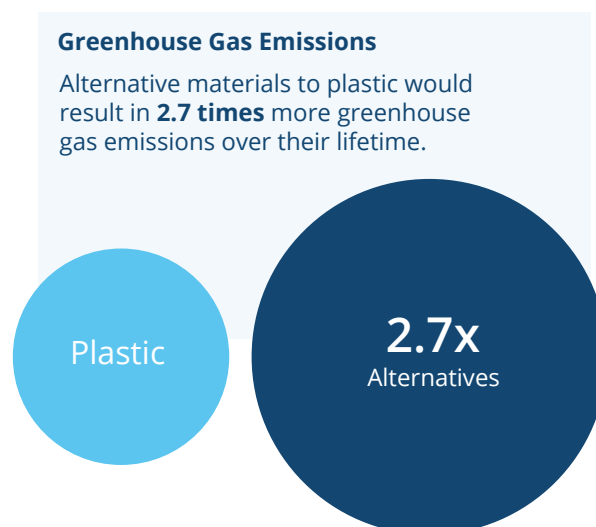
- Double resource productivity
- Eliminate avoidable waste of all kinds by 2050
- Work towards all plastic packaging placed on the market being recycled, reusable or compostable by 2025.

Non-plastic food-packaging alternatives – on average – increase energy use by 2.2 times, CO<sub>2</sub> emissions by 2.7 and weight of packaging used by 3.6 times. This is mostly because plastic packaging provides the same function with significantly less material mass per functional unit than alternative materials. It also has benefits throughout the use phase in terms of prevented food loss and less energy used for transportation as well as the net-benefits of recycling and recovery of plastics which are higher compared to other materials.

The environmental cost of plastic in consumer goods is 3.8 times less than the alternative materials that would be needed to replace plastic.<sup>21</sup>

### FIGURE 10: GHG emissions increase significantly as a result of replacing plastic with alternative materials

Source: The impact of plastic packaging on life cycle energy consumption and greenhouse gas emissions in Europe, 2011, Bernd Brandt and Harald Pilz.



**Targets from the Resources and Waste Strategy:**

- 75% recycling rate for all packaging by 2030
- 65% recycling rate for municipal solid waste by 2035
- 10% or less municipal waste to landfill by 2035

As part of the Resources and Waste Strategy, several legislative initiatives have been proposed with the following aims:

|                                                                                                                                                                       |                                                                                                                                                                                                                           |                                                                                                                                                                                                                |                                                                                                                                                                        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Consistent collection</b><br><br>Improve recycling rates by ensuring a consistent set of dry recyclable materials is collected from all households and businesses. | <b>Extended Producer Responsibility (EPR)</b><br><br>Extend producer responsibility (from the current level of 10% costs) so that producers pay the net costs of disposal or recycling of packaging placed on the market. | <b>Deposit Return Scheme (DRS)</b><br><br>Introduce a deposit return scheme to increase the recycling of single-use drinks containers including bottles, cans and disposable cups filled at the point of sale. | <b>Plastic packaging tax</b><br><br>Stimulate demand for recycled plastics by introducing a tax on plastic packaging with a content of less than 30% recycled plastic. |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

The BPF supports the overall aims of the Resources and Waste Strategy and works with BPF member companies and the government to define and shape these strategies in order to increase recycling collection, balance the producer responsibility system, implement a deposit return scheme for all beverage containers and increase the recycled content of plastic packaging.<sup>24</sup>

However, there are limitations to some of these proposals. The barriers to increasing 30% recycled content are not primarily financial but technical so are not therefore readily influenced by the introduction of a tax. The BPF has released guidelines that explain what the current limitations and technical challenges are related to the inclusion of recycled content into packaging. It is also important to underline that not all plastics are currently collected for recycling and this influences the availability of secondary material on the market. The BPF believes that the revenue raised through the plastic packaging tax, which is estimated at £695m in the first three years, should be used to strengthen the national recycling infrastructure.<sup>25</sup>

During the process of reforming EPR, any measures should ensure continued improvement in the collection of waste for recycling and the development of a robust and efficient domestic recycling infrastructure. Modulated fees should not solely be based upon whether an item is recyclable or not. The fees should be set to ensure that resource efficiency is incorporated alongside the amount of recycled material used and the recyclability of the product. Furthermore, the increase in the funding available from increased EPR costs paid by producers should be used to develop the national recycling infrastructure.

## Sustainable use of biopolymers

Bio-based plastics are made using polymers derived from renewable, plant-based sources such as starch, cellulose or lignin. Bio-based plastics can be engineered to be biodegradable; equally, they can be made to function exactly like conventional fossil-based plastic (i.e. to have the same durability).

As most of the current feedstock used for making plastics is derived from non-renewable sources, there is also a growing interest in bio-based plastics across the industry. Most bio-based plastics are made from first-generation feedstock such as sugar cane or oilseed plants. More sustainable second- and third-generation feedstocks such as agricultural and forestry by-products are also gaining market share.<sup>26</sup>

Biodegradable plastics can be broken down into water, biomass and gases such as carbon dioxide and methane. Biodegradability is highly dependent on environmental conditions such as temperature, humidity, microorganisms present and oxygen.

Compostable materials are a sub-set of biodegradable plastics that break down safely into water, biomass and gases under specific conditions. Industrial composting conditions are the most optimal: temperatures of 55-70°C,

high humidity and oxygen. However, materials that break down in industrial composters may not fully break down under home composting conditions.

Compostable packaging is not currently processed by anaerobic digestion plants. Operators of anaerobic digestion (which is the preferred way to treat food waste collected by local authorities) will remove compostable packaging (in the same way they do with plastic contamination). This is further sent to landfill or energy-from-waste facilities. Therefore, the use of compostable plastics is most suitable where food contamination prevents recycling or reuse, for example in closed-loop venues and in catering.<sup>27</sup> This material should be collected separately and sent to an in-vessel composter to be processed accordingly.

Regardless of whether a material is biodegradable or not, its leakage into the environment is damaging, and steps should be taken to ensure the material remains in the waste stream and is being managed through existing end of life options. A United Nations Environment Programme (UNEP) report noted that biodegradable branded products can have the unintended consequence that consumers litter them more (on the incorrect assumption that they completely biodegrade, making littering acceptable).<sup>28</sup>

### CASE STUDY

#### Dow introduces sustainable biopolymers

Dow is improving the sustainability of plastic production by integrating wood-based renewable naphtha – a key raw material used to develop plastics – into its slate of raw materials. This feedstock is used to produce bio-based PE for use in food packaging applications. Dow is now planning to scale production and address the increasing global demand for sustainable biopolymers.

Unlike many other alternative renewable feedstocks, no extra land is required for the feedstock production. The feedstock originates from sustainably managed forests. This process also significantly reduces CO<sub>2</sub> emissions, especially by carbon sequestration, compared to standard fossil-derived PE resins. The entire supply chain is certified through International Sustainability & Carbon Certification (ISCC) using a mass balance approach, meaning all steps meet stringent traceability and sustainability criteria. Packaging made from this renewable feedstock is fully recyclable.

Dow's strategy centres on enabling a shift to a circular economy for plastics by focusing on resource efficiency and integrating renewable feedstocks into its production processes.



## 2.2 Construction

The construction sector is the second highest user of plastic after the packaging industry.

Plastics are used in a growing range of long-life applications in the construction industry, for example profiles (windows and doors), insulation, cables and floor coverings with conduits and piping for potable water, drainage and sewage applications.

Plastic provides great versatility, being easily formable and combining excellent strength-to-weight ratio, durability and corrosion resistance. It is also low maintenance, thermally efficient, lightweight and easy to install, making it an economically attractive option throughout the construction sector. The most widely used plastic in construction is polyvinyl chloride (PVC), otherwise known as vinyl.

PVC is an intrinsically low-carbon plastic; 57% of its molecular weight is accounted for by chlorine derived from common salt, 5% by hydrogen and 38% by carbon. It is recyclable, and the recycled volumes are rapidly increasing year on year.<sup>29</sup>

### PVC recycling progress through VinylPlus

In 2000, the PVC industry embarked on a recycling programme which focused on PVC products. This was known as Vinyl 2010. The success of this voluntary commitment prompted the relaunch of this initiative as VinylPlus in 2010.

VinylPlus is committed to working towards a circular PVC platform with the aim of recycling 50% of all plastic waste by 2040.

The volume of recycled PVC reached 771,313 tonnes in 2019, a 4.3% increase from the previous year (this volume was entirely recycled in Europe) with the additional commitment to recycling at least 900,000 tonnes of PVC per year into new products by 2025. This represents a significant contribution to the objective of 10 million tonnes of recycled plastics set through the Circular Plastics Alliance for the entire plastics value chain.

The UK is contributing significantly to the aggregate EU volumes of recycled PVC with an average of 20% of total EU volumes recycled in the UK.

Average production CO<sub>2</sub> emissions savings per PVC product compared to a 2015-2016 baseline is 14.4% in 2019.

For each kilogram of PVC recycled, 2 kilograms of CO<sub>2</sub> are saved. Since 2000, more than 5.7 million tonnes of PVC waste were recycled within the VinylPlus framework, with around 11.4 million tonnes of CO<sub>2</sub> saved.

Notably, VinylPlus was highlighted as a case study in the Resources and Waste Strategy for England published in December 2018.<sup>30</sup> The VinylPlus® Product Label launched in March 2018 is also helping companies promote their contributions to sustainability and to a circular economy. To date, eight profile manufacturers have been awarded the label for 43 profile systems manufactured at 13 European sites.

Another VinylPlus initiative aimed at PVC sheeting and flooring is Recovynyl, launched by the European PVC value-chain in 2003 by Vinyl 2010 aimed at facilitating PVC waste collection and recycling under the Voluntary Commitments of Vinyl 2010 and now VinylPlus®. VinylPlus has led the way towards a circular economy by improving the sustainability performance of PVC and gained recognition for achievements in controlled-loop management with both markets and institutions.

### BPF Pipes Group

Plastic piping systems make a significant contribution to environmental sustainability and the circular economy. The BPF Pipes Group is a key player in the delivery of sustainable solutions within the circular economy.

In the UK housing sector, most new properties use plastic pipes for hot and cold water systems mainly because these meet operational needs, pipe sizing requirements, jointing preference and installation demands.

Plastic piping systems contribute very little to the overall impact of a construction project. Nevertheless, in seeking to meet sustainability demands, every bit counts. The Pipes Group has published a series of six bulletins to introduce Environmental Product Declarations (EPDs) and Life Cycle Assessments (LCAs) and how to use them in building design to aid product choice for sustainable plumbing systems.

Another example of one of the many uses of plastics in construction is EPS (expanded polystyrene). There are many different applications for this 100% recyclable, lightweight, durable and eco-friendly material which is 98% air.

Insulation is incorporated into walls and roofs and with its special properties does not degenerate through moisture, rotting, mould, UV exposure or compaction by vibration. The insulation combines lightness and strength, is simple to install and enables contractors to meet energy targets contributing to CO<sub>2</sub> reduction and tackling global warming.

EPS is being recycled by businesses and consumers across the world with developed collection infrastructures to support global recycling efforts. EPS can be recycled into a variety of new products including picnic benches, coat hangers and picture frames and, in some cases, is exported for insulation in new housing.

While the construction industry has always been dependent on economic conditions, industry changes are being accelerated through an increase in demand for housing alongside changing regulations which are intended to make the industry more energy efficient, improve end of life management, increase recycling and recovery, and take life cycle analysis into consideration.

The future will see the growth of intelligent buildings and methods such as modular building techniques which will move work away from construction sites and into factories. New materials and a range of polymeric composites and glass-reinforced plastic materials are continually being developed utilising the advantages of its versatility in design opportunities. With the focus on a more sustainable world, continuing research and the

#### CASE STUDY

##### **Covestro uses CO<sub>2</sub> in thermal insulation**

Covestro, one of the world's largest polymer producers, is pioneering a technology using carbon dioxide to manufacture energy-saving products like thermal insulation. It can also be used for flexible foam mattresses, as a binder for sport floorings and as elastic fibres for the textile industry as well as in building and cooling sectors. This innovative technology allows less reliance on conventional feedstock to transition to the circular economy.



ability to recycle and reuse products means that the benefits of this valuable material for our future are considerable.

**90%+**  
**GHG emission saving**  
compared to conventionally  
produced PVC

#### CASE STUDY

##### **Inovyn launches the world's first bio-attributed PVC**

Inovyn is the world's first commercial producer of bio-attributed PVC using a fully certified supply chain. BIOVYN™ is certified through The Roundtable on Sustainable Biomaterials (RSB) are delivering a 100% substitution of fossil feedstock in its production system, enabling a GHG emission saving of over 90% compared to conventionally produced PVC. Inovyn's choice of an RSB-certified feedstock also demonstrates its commitment to working within the emerging bioeconomy, adding to the strong sustainability credentials of BIOVYN™.

The Biovyn logo is displayed against a background of green trees and a blue sky. It features a stylized green leaf icon to the left of the word 'biovyn' in a lowercase, sans-serif font. Below 'biovyn' is the text 'INOVYN bio-attributed PVC' in a smaller, orange, uppercase font.

## 2.3 Automotive

Plastics are used mainly to make cars more energy efficient by reducing weight, together with providing durability, corrosion resistance allowing for longer vehicle life, toughness, design flexibility, resilience and high performance at lower cost. In automotive design, plastics have contributed to a multitude of innovations in safety, performance and fuel efficiency. The use of plastics in the automotive sector in the past decades has seen a sharp rise.

Current economic and environmental concerns make the creation of more fuel-efficient cars a top priority in the automotive industry. The wise selection and use of plastics in the automotive industry is making an increasing difference.

Each kilogram of plastic in a vehicle typically replaces two to three pounds of other, heavier materials.<sup>31</sup> As a result, plastics help to reduce vehicle weight, which in turn improves fuel efficiency and reduces GHG emissions. Recycled plastics are increasingly being used in vehicle manufacturing.

A 10% reduction in vehicle weight improves fuel efficiency by 6-8%. On average, 50% of the volume of modern cars is made of plastic, which is equivalent to 12-17% of the vehicle's overall weight.<sup>32</sup>

It is **estimated** that over the lifetime of the average car, lightweight plastic parts save around 3,000 litres of fuel.

### CASE STUDY

#### Jaguar Land Rover

Jaguar Land Rover is the UK's largest automotive manufacturer, built around two iconic British car brands. Land Rover, the world's leading manufacturer of premium all-wheel-drive vehicles, and Jaguar, one of the world's premier luxury marques, and the first ever brand to offer a premium all-electric performance SUV, the Jaguar I-PACE.

The company is pioneering innovation by developing completely new approaches to material technologies.

**FIGURE 11: Jaguar Land Rover product sustainability factsheet**

#### Life Cycle Assessment

- Up to 23% improvement versus the outgoing Defender across the entire life cycle for CO<sub>2</sub>e.\*
- 18 tonnes of CO<sub>2</sub>e lower impact per vehicle.\*

#### Centre Console

- By using virgin PP-LGF rather than recycled ABS JLR has managed to achieve a lifecycle saving of 63 tCO<sub>2</sub>e per year.

#### Recycled Polymers

- Use of polymers in vehicles allows JLR to reduce the environmental impact through lightweighting and the use of recycled polymers.
- Up to 9kg of recycled polymer is used in every new Defender.
- Applications include wheel arch liners, undertrays, brackets and seat materials.

#### More Sustainable Door Design

- The simplification of the door design as well as the use of ABS, EPDM and glass filled PP have helped reduce the impact of the Defender doors by 91kg compared to conventional design.
- That avoids 36.6 kilo tonnes of CO<sub>2</sub>e over the 7-year lifetime of Defender.

#### Interior Fabrics

- Using polymer based interior fabrics saves up to 197kg CO<sub>2</sub>e per vehicle.
- That avoids up to 65.5 kilo tonnes of CO<sub>2</sub>e over the 7-year lifetime of Defender.
- The use of polymers in seat fabrics also allows JLR to include 230g of recycled material within the DEFEND2 fabric, which is the equivalent of 21 plastic bottles in every vehicle.



\*Estimated figures, full LCA underway



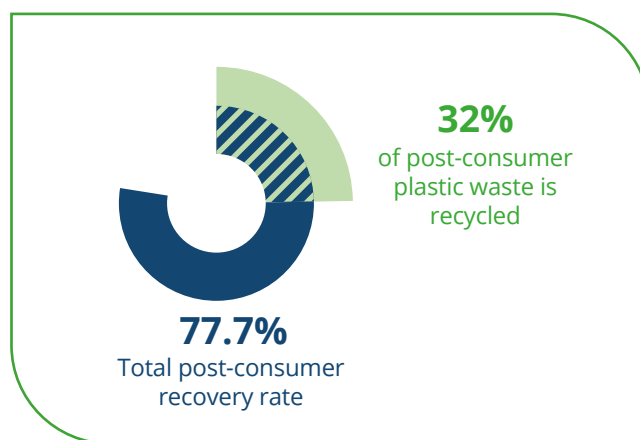
## 3. End of life management

### 3.1. UK plastics recovery and recycling rates

In 2018, the total recovery rate for post-consumer plastic waste was 77.7% with 32% of this material having been recycled.

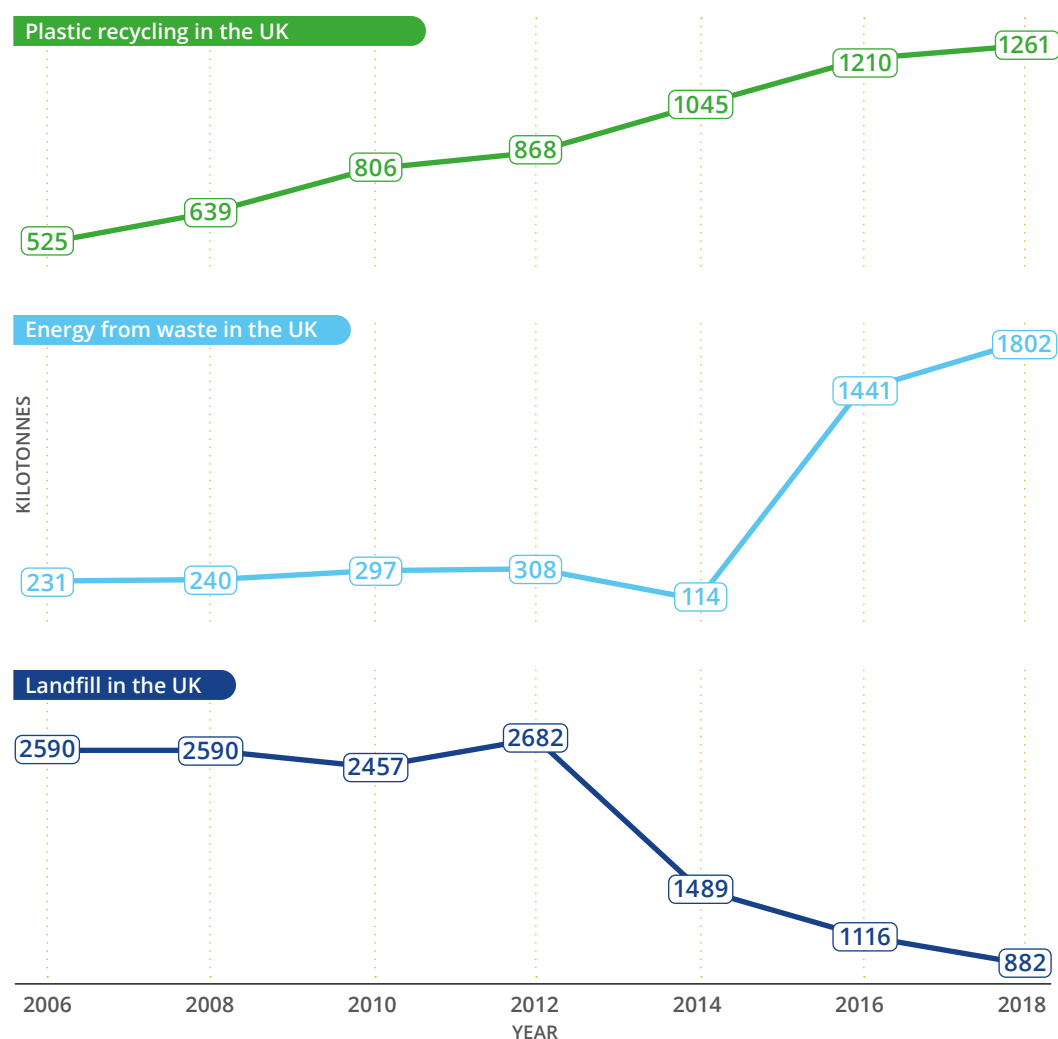
There has been an increase in mechanical recycling and energy recovery, and landfill has seen a sharp decrease. The UK is performing well in comparison with other EU countries and is ahead of others including France, Italy and Spain.

Notably, the UK has focused less heavily on energy recovery compared to other European countries.



#### The evolution of recycling, energy from waste and landfill in the UK

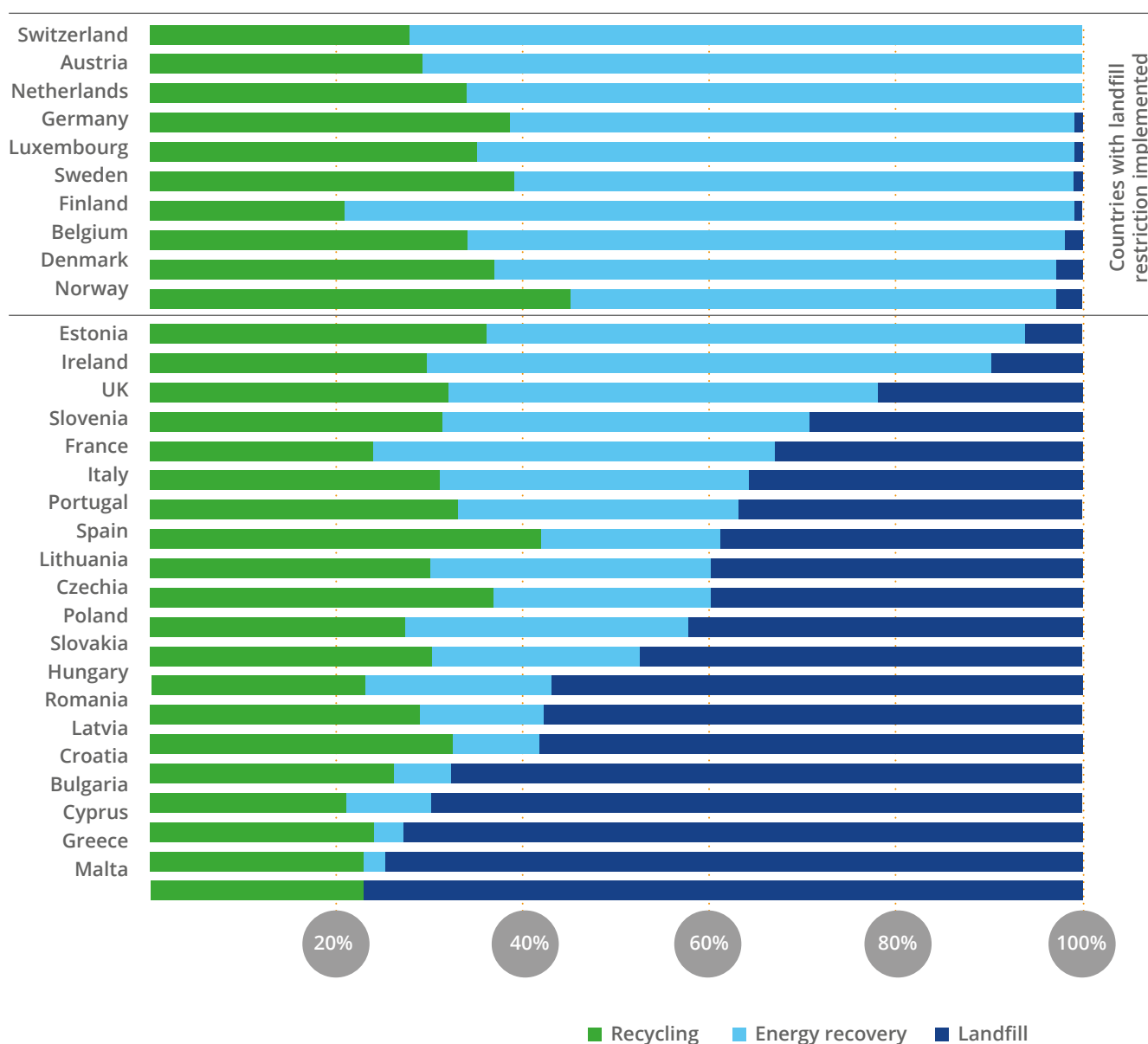
**FIGURE 12:** Recycling, energy from waste and landfill in the UK during 2006-2018 expressed in kilotonnes (kT)



Source: PlasticsEurope

**FIGURE 13: Post-consumer waste management in Europe, 2018**

Source: PlasticsEurope, Plastics The Facts, 2020



In 2019, nearly 560,000 tonnes of plastics packaging were collected in the UK for recycling, which represents a five-fold increase in the volumes collected for recycling compared to 2006.<sup>33</sup> The rate of plastic packaging recycling in the UK stands at 50% in 2019 which represents a significant improvement compared to 44% in 2018.<sup>34</sup>

**50%**  
Rate of plastic packaging  
recycling in the UK in 2019

## 3.2 Advances in mechanical and chemical recycling

Traditionally, plastics recycling is undertaken using mechanical methods.

Chemical recycling is the broad term used to describe a range of emerging technologies in the waste management industry which have the potential to complement mechanical recycling especially in the case of mixed plastic waste.<sup>35</sup> It also ensures the transition to a circular plastics economy and provides a solution for plastics recycling into food-contact applications.

By turning plastic waste back into base chemicals and chemical feedstocks, chemical recycling processes have the potential to improve recycling rates and contribute to the circular economy.

### Mechanical recycling

Mechanical recycling involves the processing of waste material into new material without altering the chemical structure of the material. It processes the separated, single-polymer stream, which is washed, granulated and then re-extruded to make recycled pellets that are ready for moulding applications.

Mechanical recycling itself has been established for a long time and over the years has seen improvements in the sustainability of its processes (i.e. energy-efficiency improvements and technological advances).

Further investment in the UK's capacity for mechanical recycling is needed in order to ensure more plastic waste is recycled in the UK and to contribute to a circular plastics economy while reducing GHG emissions.

#### CASE STUDY

##### Jayplas film sortation

In 2020 Jayplas inaugurated a plastic film sorting facility near Birmingham – the first recycling facility of its kind in the UK. The £10 million plant investment is intended to reduce reliance on plastic waste exports and can handle up to 80,000 tonnes of film a year. The plant has also begun to trial the sorting of films collected by local authorities and flexible packaging brought back by consumers in-store.

Low-density polyethylene (LDPE) is shredded and sorted into recyclable fractions and residual waste then transported to Jayplas' wash plant in Loughborough, where it is cleaned and turned into post-consumer LDPE granules. These granules are then sent for extrusion and conversion into plastic packaging (excluding food contact applications) and supermarket Bags for Life at the company's plant at Worksop in Nottinghamshire – therefore creating a closed loop for its suppliers.

The fully automated facility features optical sorters which use near infrared technology to sort the film into different polymer types and colours. This technology takes away the need for intensive manual sorting, which is how most exported films are currently sorted.

The plastic film sorting facility is the first of its kind in the UK and is able to handle up to **80,000 tonnes of film** per year.

## Chemical recycling

The term chemical recycling, also known as feedstock recycling or depolymerisation, is broadly used to describe an emerging group of technologies that utilise processes that directly affect the chemistry of the polymers.

The technologies fall into two distinct categories based on the position of their outputs in the plastics supply chain – there is a further category ‘purification’ which falls somewhere between chemical and mechanical recycling:

- Depolymerisation
- Feedstock recycling (thermal conversion)
- \*Purification (i.e. solvent dissolution) – typically done through solvent dissolution, this technique is not considered to be entirely pertaining to chemical recycling, as the product is a polymer as opposed to raw material precursors. Purification therefore is complementary to chemical recycling.

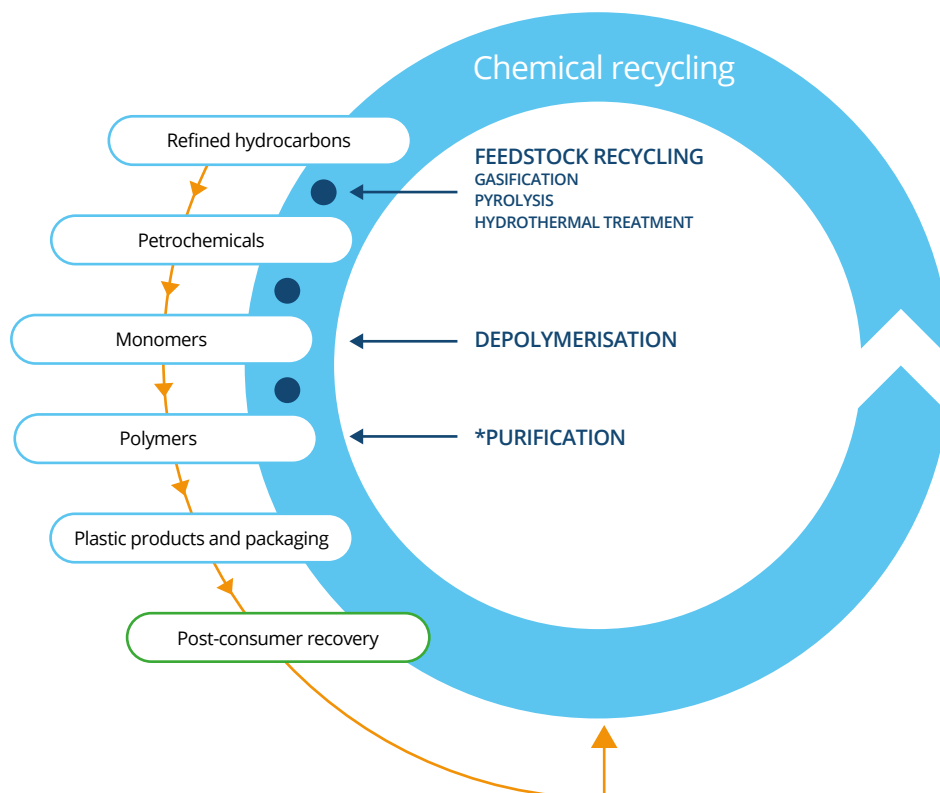
Chemical recycling differs from mechanical recycling, which uses operations to prepare waste polymers for reuse without significantly changing the polymeric structure of the material. Chemical recycling, however, breaks down the long hydrocarbon chains in plastics into shorter

hydrocarbon fractions or into monomers using chemical, thermal or catalytic processes. Purification, on the other hand, uses solvents for removing additives from the polymers, resulting in a purified polymer as its product.

Feedstock recycling derives its name from the primary output that is produced, namely a petrochemical feedstock. The term ‘feedstock recycling’ is used to differentiate thermal processes that convert the waste plastic into feedstock for a petrochemical plant, from chemical processes that purify the plastic waste stream (i.e. purification) or break down the waste product into monomers (i.e. depolymerisation) for further reprocessing or polymerisation.

Depolymerisation is typically used for ‘condensation polymers’ and utilises a hydrolytic process to break the polymer chain, returning monomers as the product.

**FIGURE 14: Different processes that describe chemical recycling**





An aPRF offers significant uplifts in recycling rates while minimising plastics to landfill and significantly increasing revenues.

#### CASE STUDY

#### **Recycling Technologies and Project Lodestar**

Facilitated by the Ellen MacArthur Foundation, UK-based feedstock recycling specialist Recycling Technologies led the research for Project Lodestar alongside 14 other companies in the value chain. Project Lodestar evaluated the economics of marrying mechanical recycling with feedstock recycling in what is termed an advanced Plastics Recycling Facility (aPRF). Compared to mechanical recycling alone, the results suggest that an aPRF offers significant uplifts in recycling rates, resulting in only 5% disposal to landfill or incineration, and could increase revenue by 25%.<sup>36</sup>

### 3.3. Plastic waste exports

While the UK has significantly improved the recovery, collection, sorting and recycling of plastic waste, there has been an overreliance on export markets for recycling the materials collected.

Overseas markets, including China which, until recently, imported as much as 62% of global plastic wastes, introduced bans on the import of any but the very highest-quality used materials. Other far-Eastern nations initially accepted some of this exported material but very quickly found themselves overwhelmed by its sheer volume, and they too have implemented or are considering similar import bans.

The lack of markets has increased the pressure for the UK to look at opportunities for investing in the expansion of recycling and reprocessing infrastructure. Furthermore, several policy drivers at national and European level also serve to encourage the collection of separated high-quality recyclates and the development of stable end-markets for recycled content.

#### **Why is there not enough capacity to recycle all our waste in the UK?**

The wide and unpredictable value of Packaging Recovery Notes (PRN), which are central to the operation of the packaging producer responsibility regulations in the UK, has negatively impacted the willingness to invest in the development of domestic reprocessing and recycling capacity, as it is neither guaranteed in value or predictable.

Plastic waste exporters, on the other hand, do not rely on capital investment, so their businesses are very low risk and have thrived under the current producer responsibility structure. Furthermore, PRNs are issued after the material has been sorted while PERNs (export PRNs) are issued on the basis of what goes into a container (including non-target material).

In recent years, the capture, collection and sorting of end-of-life plastics from packaging, automotive and electrical goods have fallen under a set of producer responsibility regulations to deliver the UK's recycling targets. In all these markets and especially in the largest sector, consumer packaging, achieving the national recycling rate has been dependent to a large extent upon the export of partially sorted and part-processed plastic waste.

The business case for investment in a UK-based recycling infrastructure is further strengthened by the highly volatile international trade in plastic waste that has seen most of Asia's biggest market players imposing bans and restrictions on plastic waste following China's initial plastic waste import ban in 2018.

Furthermore, at the state opening of parliament in December 2019, the Queen's speech included a reference to banning 'polluting plastic waste' to non-OECD countries. It is expected that a government consultation linked to this will be released in 2021.

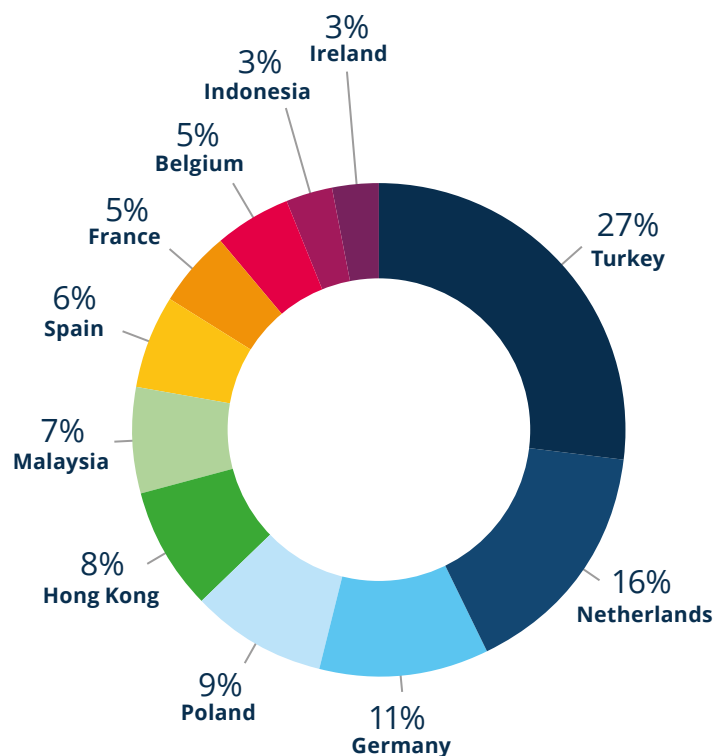
In the UK, stakeholders in the recycling industry would like to see current legislative reforms under instruments such as the EPR reform contributing to levelling the playing field between exporters and domestic recyclers as well as the adoption of quality standards for plastic waste exports. Tighter controls at an international level for the shipment of mixed plastics create a strong driver for increased capacity and investment in the UK reprocessing and recycling infrastructure. Furthermore, the BPF, through its Recycling Group, has been vocal about the need for these reforms ever since 2012.<sup>37</sup>

#### **Volatility around key export markets**

Following the closure of China's ports to the import of all but the highest standards of waste material resources (e.g. less than 1.5% non-target material) at the end of 2017, there has been a rapid shift in the list of countries where the UK and Europe's waste plastics are now being shipped to. Data from 2019 data indicates that Turkey, Malaysia, Poland, Indonesia and Vietnam have become the most common end destinations for UK-exported plastic waste (with other European countries being used as shipping transfer points – e.g. the Netherlands or Germany).

However, throughout 2019, Malaysia, Indonesia and India have also announced plans to ban the import of plastic waste, adding even more pressure to the already volatile market outlook. The export market for plastic packaging has fundamentally changed in recent years.

**FIGURE 15: Top 10 plastic packaging waste export destinations in 2019**



Source: NPWD – 360 Env. Feb 2020

In 2018, Norway addressed concerns about the international trade in plastic waste and tabled an amendment to the Basel Convention to ensure plastic waste exports are treated in an environmentally sound manner once they reach their end destination.<sup>38</sup> The proposal aimed to reclassify low grade, mixed plastics and bring them under the regime of Pre-Informed Consent (PIC). The amendment was adopted in 2019 and will enter into force in 2021, further increasing the need for reducing the reliance on exports and increasing the quality of reprocessed UK plastic waste.

The circular economy presents significant opportunities for the UK plastics industry. In order to realise these opportunities, investment in the national recycling and reprocessing infrastructure is paramount.

By retaining 'ownership' of the material, businesses can secure access to secondary markets, which will ease the economic and environmental cost of using virgin resources and also deliver GHG emission reduction benefits that will help decarbonise the economy. Another important benefit is an increase in the quality of recyclate to be integrated back into products and ensuring circularity of resources on the UK market. The UK should

lead the way in the management of plastic waste and become a world leader in the circular economy of plastics in Europe and beyond.

Investments in innovation are required to increase domestic recycling in the UK, thus to be less reliant on export markets to ship our waste, and at the same time to be less reliant on imports of food grade recycled material for inclusion where permitted in plastic packaging.

In 2019, the BPF hosted an investment summit together with WRAP exploring opportunities for growth within the UK's plastics recycling and reprocessing infrastructure. Senior figures within the investment community and representatives from numerous leading investment companies attended the summit and liaised with BPF and WRAP representatives in order to engage businesses in the opportunities for further developing the UK recycling infrastructure.<sup>39</sup>

The BPF has also produced a recycling roadmap laying out the conditions and mechanisms needed to achieve greater capacity in the national recycling infrastructure as well as reducing the reliance on export markets.<sup>40</sup>

### 3.4. Marine litter

Marine litter is one of the most important environmental concerns the world is currently facing. The plastics industry strongly believes that, no matter their origin, plastics should not end up in the aquatic environment, where they are severely affecting wildlife and the health of our oceans.

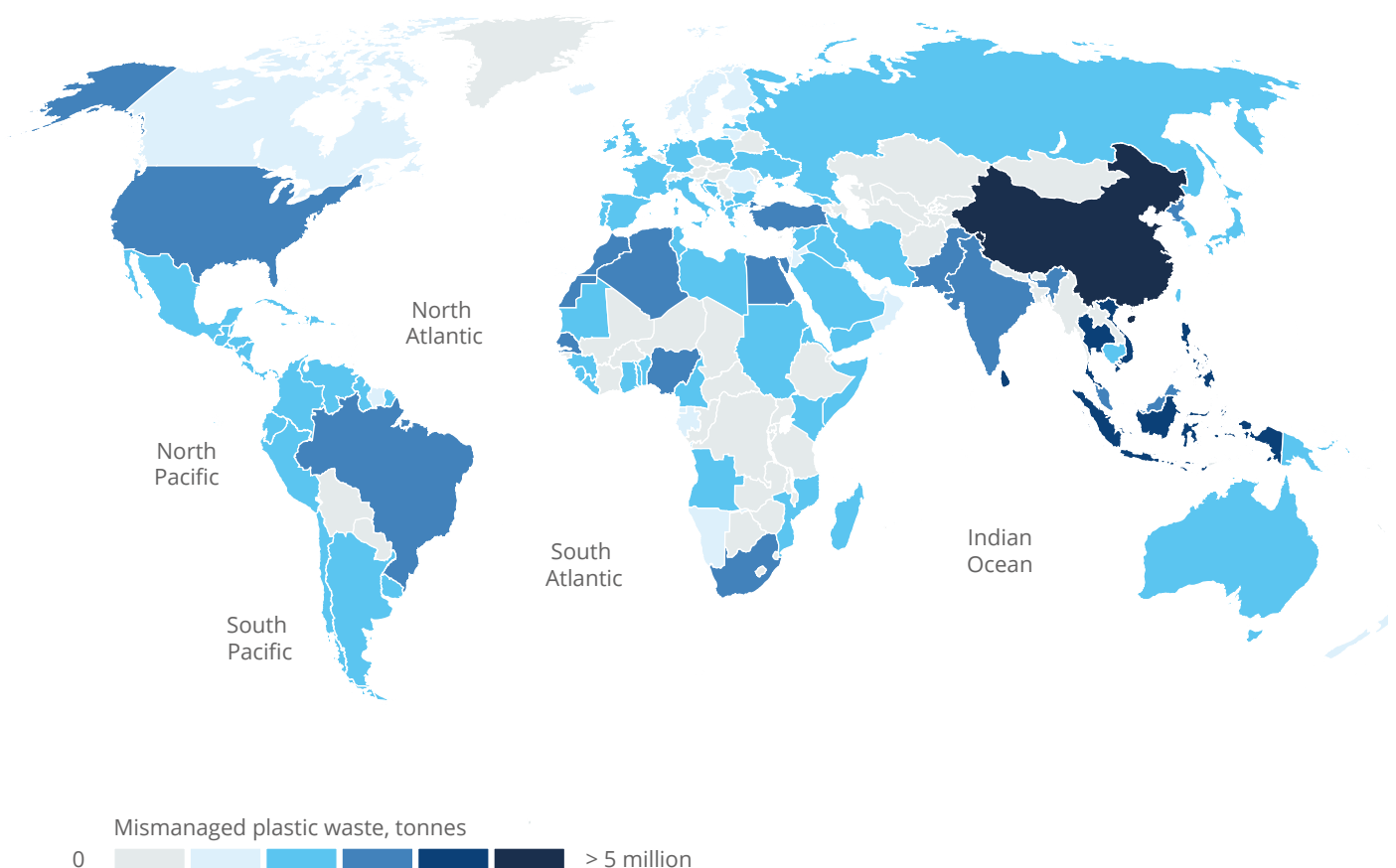
Industry, consumers and government all have a part to play in protecting the environment and making sure that the plastic we use to protect products and ensure safety, convenience and hygiene is easily collected for recycling.

#### What factors influence the accumulation of marine litter?

- Inadequate waste management and the absence of waste management infrastructure throughout the world
- Inappropriate items being flushed into the sewage system
- Waste being illegally dumped at sea
- Plastic pellet loss during either production, transport or processing or being accidentally lost at sea during shipping
- Fishing gear lost or discarded into the oceans
- The degree of collection facilities available on the sides of rivers and beaches
- Used articles carelessly discarded on beaches as well as other littering on both land and sea.

**FIGURE 16: Mismanaged plastic waste at global level and ocean plastics**

Source: Adapted from Jambeck et al., Science, 2015



## 80% of marine litter comes from land-based sources.<sup>41</sup>

Plastics are durable and recyclable, so we all need to ensure they are collected for recycling rather than irresponsibly littered.

- Waste management is a critical factor in reducing leakage into the environment and marine litter
- There is a need for more support and investment in waste management infrastructure, with a focus on Southeast Asia
- Current evidence suggests that the best way of reducing littering in the UK is to mount consumer education campaigns to discourage littering
- Further investment should be made in the recycling infrastructure in the UK to develop a circular economy,

ensuring that plastic waste is recycled as close to market as possible and remains within a well-developed waste management infrastructure

- The shipping industry and fishing industry should continue work to minimise plastic waste entering the sea from ships, shipping containers and lost or discarded fishing gear
- The UK plastics industry will continue to play a significant role through industry-led schemes such as Operation Clean Sweep® as well as continue to support anti-littering campaigns and educational initiatives.

### CASE STUDY

#### Plastic river waste valorised as part of the River Keekle restoration project

The River Keekle restoration project – the largest of its kind in the UK – involves the removal of an environmentally damaging plastic liner from a 2.5-kilometre stretch of the Cumbrian river. It is part of a partnership between West Cumbria Rivers Trust and the Environment Agency. Nine tonnes of plastic have been removed from a 170-metre trial site in the recently completed first phase of the project and the riverbed restored with stone in 2019.

Plaswood, a brand of Berry Global which manufactures outdoor fencing, furniture and decking using recovered plastic, offered to collect the material from the site to demonstrate how it could be recycled to create useful second-life products.

Plastic removed from the River Keekle was sent to Plaswood's recycling plant in Dumfries for shredding, cleaning and remanufacture into recycled plastic lumber, from which the company makes its end products. The process diverts waste from landfill and provides a valuable, sustainable and long-lasting alternative to hardwood, which itself can be recycled at the end of its use.

In September 2020, phase two of the project was completed with up to 150 tonnes of plastic removed,



**9 tonnes**

**Plastic removed  
in phase 1**

**150 tonnes**

**Plastic removed  
in phase 2**

leaving the full 2.5 km stretch restored, with the potential to become a great habitat for fish spawning. The project is part of the Environment Agency's River Restoration Programme in Cumbria – one of the biggest portfolios of river restoration projects in the UK.

## **BPF Marine Litter Platform**

The BPF is working collaboratively to find solutions and support projects to prevent leakage of plastics into the environment through the Marine Litter Platform.<sup>42</sup> Past activities have included collaborations with NGOs and charities on anti-littering campaigns as well as seminars and events bringing together producers, brands and retailers on the issue of marine litter.

## **Global collaborative solutions on marine litter**

The Alliance To End Plastic Waste (ATEPW) is an alliance of global companies in the plastics and consumer goods value chain. Together they have pledged \$1.5 billion over five years to help end plastic waste from entering the environment we live in. The alliance is representative of organisations located throughout North and South America, Europe, Asia, Southeast Asia, Africa and the Middle East. This truly global initiative is expected to make a significant impact on preventing plastic waste leakage over the next five years in the form of infrastructure development, innovation, education and research.

The Global Plastics Alliance is a collaborative network of plastics producers and manufacturers supporting global efforts to reduce waste, increase recycling and litter prevention programs, and foster regional and global partnerships.

As of early 2020, approximately 395 projects have been planned, underway, or completed. This represents an increase of four times the number of projects since 2011 when the Global Declaration was announced. The projects vary widely, from beach clean ups to expanding waste management capacities, and from global research to awareness and education campaigns.

To increase material circularity, leakage of plastic must be reduced and prevented. Clear and reliable information on plastic leakage is needed to ensure that companies can

identify hotspots and take meaningful action to reduce leakage to the environment. However, until recently, reliable, standardised methodologies were not available.

The Plastic Leak Project (PLP) aims to fill this knowledge gap by delivering new methodologies and metrics to assess plastic leakage within the life cycle assessment (LCA) framework. The PLP provides industry-specific guidance as well as generic datasets to perform plastic leakage assessments.

The PLP thus aims to provide a meaningful contribution to mitigate plastic leakage by supporting companies in identifying the most relevant and fruitful actions and strategies to reduce plastic leakage.

Developed through a multi-stakeholder initiative with 35 organisations, the Plastic Leak Project (PLP) Guidelines provide the first science-based methodology to map and measure plastic leakage across corporate value chains. They provide sustainability managers and corporate decision-makers with the framework for understanding where and how much leakage is occurring and lay a strong foundation for the creation of impactful strategies and actions that effectively address plastic pollution and mitigate key business risks.

## Moving forwards

Representing companies from all spectrums of the plastics supply chain from producers and converters to waste management and recycling, the BPF is uniquely positioned to work with its member companies and the wider supply chain to drive sustainability and work towards the realisation of a truly circular economy in the UK.

The BPF is currently engaged in a broad programme of sustainability initiatives and is moving forwards with a progressive agenda. A balanced dialogue among all stakeholders as well as meaningful cooperation with all parties interested in delivering change will be paramount to help the BPF deliver a successful sustainability agenda focused on realising the goals of the circular economy as well as responding to the pressing need to reduce global carbon emissions.

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