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# Plastics: Have consumers fallen out of love?

Plastics are an integral part of modern life, even to the point of being deliberately incorporated in our bodies within knee and hip replacements. Plastic cards give us entry to buildings and transport, allow us to pay our way and obtain cash. Plastics form part of popular culture: from vinyl records through to the tape in music cassettes, from CDs to the portable devices on which we now play digital music files.

As the UK Government consults on plastic waste recycling, we examine the broad spectrum of issues that affect our relationship with plastic. What is it made of, how long has it been around, why is it such a successful material? How are chemical substances incorporated into plastics regulated and what new steps are proposed to regulate harmful environmental impacts from plastic waste?

Such issues are generating a great deal of interest at present from consumers and may affect buying choices. Regulation is being targeted to manufacturers and suppliers of goods incorporating plastics and those wrapped in plastic packaging. In the UK, Government is using the tax system to incentivise the use of recycled plastic, and at the same time proposing to extend existing schemes so as to ensure that it is industry rather than the tax payer who bears the full financial cost of the eventual disposal of plastic waste. These measures will inevitably bring greater compliance costs for the consumer goods sector.



## Plastics – a love-hate relationship

The contemporary uses of plastics in all their forms are almost too numerous to count and not always readily apparent, such as the use of microplastics within inks or the plastic liner inside the tin can, needed to prevent rusting and consequent spoiling of food. Plastics also perform sophisticated functions, for example slow release capsules within modern fertilisers and drugs, helping to feed growing populations and stave off disease and discomfort.

The very affordability and ubiquity of plastics is also their Achilles' heel. Being cheap to produce in mass quantity using injection moulding techniques, they are seen as having little value and are also readily discarded after use. As has been much publicised recently, microplastics in rinse-off products find their way into the marine environment and drinking water and studies now show that a large amount ends up in soil spread with sewage sludge. Single-use plastics such as carrier bags have been pictured entangling or having been swallowed by marine animals.

## The history of plastics

Our love affair with man-made plastics really began in the 19<sup>th</sup> century with a material derived from cellulose called Parkesine after its British inventor Alexander Parkes. Parkes however ran out of funds and Americans, the Hyatt brothers, added camphor and in 1870 renamed it celluloid, from which cinema film

strip was originally made. In 1907 another American, Belgian-born Leo Baekeland, invented Bakelite. This was the first synthetic plastic as it derived not from plant or animal products but from fossil fuels. An explosion of discoveries followed in the 1930s and 1940s: polystyrene in 1929, polyester in 1930, the discovery of polyethylene at ICI's Winnington facility in Cheshire, polyvinylchloride (PVC) and polythene in 1933 and Carothers and Dupont patenting nylon in 1935. As early as 1936, perspex canopies were used in fighter aircraft. Plastic insulation was used for wiring in radar installations during the Second World War. The first toothbrush with nylon tufts appeared in 1938. PET (used for drinks bottles) was patented in 1941 as well as the first polyester fibre, Terylene. Superglue was discovered in 1942.

Following the war, mass consumer goods production began in earnest. Tupperware (made from polyethylene) launched in the US in 1949. The first Airfix kit and Lycra appeared the same year. The plastic carrier bag arrived in 1950 and polystyrene foam in 1954. The plastic hula hoop and Lego in 1958.

## The chemistry of plastics

All plastics are polymers, but not all polymers are plastic. Polymers are large molecules consisting of chains of linked sub-units, called monomers. Where one type of monomer is used these are known as homopolymers

Where a mixture of different monomers units are used to link together, these are known as copolymers. Both types can form either straight or branched chains.

However, wool, cotton and silk are also polymer-based materials and cellulose, the main component of wood and paper, is a natural polymer too. The difference with plastics is that although they too are organic (the raw material is usually oil), they are made synthetically.

## They come in two main varieties:

### Thermoset plastics

These plastics hold their shape once cooled to room temperature and hardened completely. They cannot then return to their original form, even if melted down. Examples are epoxy resins. Thermoset plastic is commonly used in tyres, car parts and composites.

### Thermoplastics

These are more flexible and versatile. They return to their original form when heated and can be made into films, fibres and other forms.

## Plastic facts

- Bakelite was the first completely synthetic plastic, made by Leo Baekeland in 1907. Baekeland invented the term plastics.
- The word plastic comes from the Greek word *plastikos*, meaning able to be shaped or moulded.
- Plastics are usually solids but can be crystalline or semi-crystalline solids (crystallites).
- They are usually poor conductors of heat and electricity. Most are insulators.
- Approximately a third of plastic that is produced is used to make packaging.
- Pure plastics are usually insoluble in water and non-toxic. But some additives used in the manufacture of plastics are toxic and may leach into the environment, eg phthalates.
- 4% of oil production worldwide is used to produce plastics.





There are around 45 unique types of plastics, each with dozens of variations (**see text box – Common types of plastics**). Manufacturers are able to vary the physical structure to tailor it to the particular application required. By modifying the molecular weight distribution, the density or the melt indices, they can alter the properties of the resulting plastic.

**Plastic additives**

Additives are used to make plastic safer, cleaner, tougher and to add colour. They can also reduce production costs and increase durability (**see text box – Additives**).

Manufacturing goods with plastic usually involves melting polymer powder or granules inside a heated tube. This ‘melt’ is forced through a shaped die, injected into a mould, or rolled or blown into flat film (**see Text Box – Injection moulding**). How easy the

plastic is to work with depends on its physical and chemical properties, and this can be improved through the use of certain additives known as process aids. For example, some of these form a liquid around colour particles so that they mix better. Others make the polymer particles melt quicker, saving energy and minimising heat damage.

Some additives, however, deliver important properties for the end user rather than just facilitating the manufacturing process. They may filter out light to protect the contents of a package, for example in medicine bottles. Consumer goods such as vacuum cleaners need additives to make the plastic parts impact resistant. Plastics, being organic, are combustible. For electrical goods, flame retardant additives may be used to reduce the risk of the plastic catching fire from an electrical spark. Specialist additives do however significantly increase the cost of

**Injection moulding**

Injection moulding is a manufacturing process allowing manufacturers to produce high volumes of identical plastic goods at minimal cost per unit.

Three main units make up an injection moulding machine

- feed hopper,
- heater barrel; and
- ram.

Plastic granules or powder in the hopper are heated until liquid. The ram forces the liquid into every crevice and corner of the tightly clamped mould and the liquid plastic sets. More viscous molten plastics require higher pressures (and higher press loadings). The plastic cools as the metal mould conducts heat away and then the press is cycled to remove the moulded item. For thermoset plastics the mould has to be heated to make the plastic set.

**Advantages**

- Enables complex shapes to be manufactured, some of which might be near impossible to produce economically by any other means.
- Can use a wide variety of materials to deliver the physical properties required by the article, and multiple layers of moulding can be used to deliver specific mechanical properties and visual appearance even in small items.
- It is a low-cost process with low environmental impact and leaves little by-product; any scrap that is produced can be re-ground and re-used.

**Disadvantages**

- The expensive tooling requires high volume production in order to recover the investment.
- It takes time to develop the tooling and not all objects can be moulded easily.
- Cheap injection moulding has allowed disposability – for example of razors and ballpoint pens (although this is also an advantage for example in medical devices).
- A high-quality mould, although of relatively high cost, will be capable of turning out hundreds of thousands of ‘impressions’.

**Common types of plastic**

Plastic	Use
Polyethylene terephthalate (PET)	Can be drawn out to make fibres or films. Used for food storage containers and bags and water bottles. Does not leach into food.
Polyvinyl Chloride (PVC)	Requires stabilizers to make it soft and easy to mould. Used in plumbing applications because of its durability and being non-corrosive, as well as affordability. Plasticisers may leach out of it over a long period of time, leaving it brittle.
Polystyrene	Very lightweight, easy to mould and can be used as an insulator. Used in packaging, furniture and where impact-resistance is required. Can form a harder, impact-resistant plastic for cabinets, computer monitors, TVs, utensils, and glasses. Turns into EPS (Expanded Polystyrene) when heated and air added.
Polyvinylidene Chloride (PVC)	Durable, non-corrosive, as well as affordable. Used as cling film also for pipes and plumbing. Requires addition of a plasticiser to make it soft and mouldable and this may leach out over a long period making it brittle.
Polytetrafluoroethylene (Teflon)	Heat resistant and used in bakeware and saucepans but also in tubing, plumbing tapes and waterproof coatings. First manufactured by DuPont in 1938. Stable, strong and resistant to damage by chemicals. Creates an almost frictionless surface.
Polypropylene (PP)	Applications include tubes, car trims and bags.
Polyethylene (HDPE or LDPE)	Used to coat electrical wires and as piping but also in several disposable products, including sandwich bags, gloves and garbage bags as well as wraps and bottles and most household plastic packaging. Almost 1,000 different grades.

## Plastics additives

Additives perform the following functions:



Click on a plastic additive to view more information

manufacture. They may also be released to the environment when the polymer degrades where they could be toxic or for example may give rise to fumes dangerous to human health if the plastic is burned.

However, not all additives are chemicals. Mineral fillers like chalk, talc and clay are naturally occurring and whilst they can be used to bulk out the plastic polymer cheaply, they may also be used to impart rigidity (talc and chalk), improve electrical properties (clay) or to increase thermal conductivity, so that plastics heat up and cool down quickly.

### Could banning plastics increase environmental damage?

The untrammelled rise and rise of plastics may be about to suffer a rebalancing. In its recently published Energy Outlook 2019, BP speculated that, as a result of the public outcry against single-use plastics, there could be a worldwide ban on them in place by 2040. Certainly, they have ignited the public imagination, assisted in the UK by graphic images of plastics affecting the marine environment in David Attenborough's Blue Planet series for the BBC, images that have been widely circulated around the world's media.

BP's Energy Outlook 2019 cautions that a global shift to the use of paper, glass and other materials as replacement for plastic would limit oil demand for making plastic in decades to come. But substituting other materials for plastic could, says the report, give rise to a net increase in energy usage and carbon emissions unless there is widespread deployment of efficient collection and re-use systems that could lower the additional emissions associated with reverting to heavier products.

There is some support for this from academics at Herriot Watt University. A November 2018 news report on the University's new multi-disciplinary group on plastics refers to estimates from a July 2011 report by Denkstatt GmbH to the effect that replacement of plastics with currently available materials would lead to a doubling of global energy consumption and a tripling of greenhouse gas emissions. Herriott Watt also refer to the 2016 Sustainability and Plastics report by Trucost, which found that the environmental cost of replacing plastic would be nearly four times greater. Herriott Watt note that replacing plastics with alternative materials such as glass and metals would produce a net increase in manufacturing costs due to the energy consumed and resources, including water, required in the production of these alternative

materials. Also transport of lightweight consumer goods in plastic packaging, or goods made of plastic rather than metal or glass, requires fewer vehicles or ships, therefore consuming less fuel and reducing the associated greenhouse gas emissions.

There are other trade-offs too when using plastic. Plastic packaging helps to keep food fresher for longer, thereby reducing food waste. Food waste if it ends up in landfill breaks down to release methane, a 20 times

more potent greenhouse gas than carbon dioxide. What is therefore needed is a holistic analysis of the overall best environmental option for each use to which plastics are currently put. Nevertheless, making achievable progress by tackling the 'low hanging fruit' is often better than years spent debating.

### UK and EU action on single-use plastics

The UK consulted in autumn 2018 on imposing a ban from October 2019 on plastic straws,

## Existing and Proposed Regulation of Plastics – UK and EU

### UK

Single Use Carrier Bags Charges (England) Order 2015/776	19 March 2015
Environmental Protection (Microbeads) (England) Regulations 2017	9 January 2018
Plastics Bill	8 June 2018
DEFRA consultation on the proposal to extend the single-use carrier bag charge to all retailers to increase the minimum charge to 10p	27 December 2018
DEFRA consultation on introducing a Deposit Return Scheme in England, Wales and Northern Ireland	18 February 2019
DEFRA consultation on reforming the UK packaging producer responsibility system	18 February 2019
HM Treasury consultation on A Plastics Tax	18 February 2019
Phase-out of Plastic Pollution Bill	25 February 2019

### EU

European Parliament and Council Directive 94/62/EC of 20 December 1994 on packaging and packaging waste	20 November 1994
Regulation (EU) No 10/2011 on plastic materials and articles intended to come into contact with food	14 January 2011
Commission Directive 2011/8/EU amending Directive 2002/72/EC as regards the restriction of use of Bisphenol A in plastic infant feeding bottles	28 January 2011
Directive (EU) 2015/720 of the European Parliament and of the Council amending Directive 94/62/EC as regards reducing the consumption of lightweight plastic carrier bags	29 April 2015
European Commission Communication: A European Strategy for Plastics in a Circular Economy COM/2018/028 final	16 January 2018
Proposal for a Directive of the European Parliament and of the Council on the reduction of the impact of certain plastic products on the environment (2018/0172(COD))	28 May 2018
Annex XV Restriction Report - Microplastics, European Chemicals Agency	11 January 2019

plastic-stemmed cotton buds and plastic drink stirrers. It estimated that a quite mind-boggling 4.7 billion plastic straws alone are used in the UK each year. This forms part of the Government's pledge included in its 25 Year Environmental Plan issued in January 2018 (**A Green Future: Our 25 Year Plan to Improve the Environment**) to eradicate all avoidable plastic waste by the end of 2042. The plan includes the intention to impose bans on further 'problematic' single-use plastics where suitable alternatives exist.

At the EU level, a new directive on single-use plastics was provisionally agreed in December 2018 (**Proposal for a Directive of the European Parliament and of the Council on the reduction of the impact of certain plastic products on the environment (2018/0172 (COD)) (the Directive)**) and is awaiting formal adoption. As well as cotton buds, straws and stirrers, it will ban plastic plates and cutlery, plastic balloon sticks, food containers, expanded polystyrene cups and oxo-degradable plastics. Oxo-degradable plastics include additives within the plastic to help the plastic break down to facilitate recycling, but if littered may give rise to fragments of plastic in the environment instead. The Directive will also set collection targets for plastic bottles of 90% by 2029, and a 25% target for recycled content in PET plastic bottles by 2025, rising to 30% by 2030. In addition, the Directive will impose a labelling requirement on the environmental impact of plastic cigarette filters littered in cigarette butts, as well as for plastic cups and wet wipes. The aim of the Directive is to reduce litter making its way into the sea, of which, the European Commission says, over 80% is made of plastic and 70% of the items most frequently found in the sea are specifically targeted by the Directive.

Action has also been taken over the past few years to reduce plastic carrier bag use with the introduction of a charging in Scotland and Wales and from October 2015 in England. The expectation is that the money paid for bags is donated to charity rather than being retained by the retailer. Impressive results in reducing carrier bag usage have been cited by the UK Government. Subject to the results of consultation (**Consultation on the proposal to extend the single-use carrier bag charge to all retailers and to increase the minimum charge to 10p, December 2018**) which closed on 22 February 2019, the UK Government proposes to increase the charge per bag in England from 5p to 10p and to extend it to small and medium sized retailers who are estimated to give out over 3.6 billion single-use bags per year but who up till now have not been required to charge for bags.

At the EU level, all EU Member States are required by the **Plastic Bag Directive 2015** to significantly reduce consumption of lightweight plastic carrier bags with a thickness less than 50 microns. The choice of measures to achieve this is left to Member State governments. There are also labelling requirements for biodegradable and compostable plastic.

In another product specific move, the UK is consulting (**Consultation on introducing a Deposit Return Scheme in England, Wales and Northern Ireland, 18 February 2019**) on the introduction of a deposit return scheme for soft and alcoholic drinks containers other than milk and plant based products such as soya milk. Consumers will pay an upfront deposit and be able to redeem it from designated bottle collection points – which may include reverse vending machines in supermarkets and other venues. Drinks producers and importers

(though not bottle manufacturers) will be required to join the scheme and pay for a new industry-led body to administer it. Fees paid by drink producers and importers will fund the transport of containers returned by consumers to recycling facilities and the circle will be completed by producers buying the resulting recovered materials for incorporation into new containers. The new scheme will cover plastic bottles, may cover Tetrapak and gel sachets but is not proposed to include plastic lined hot drinks cups.

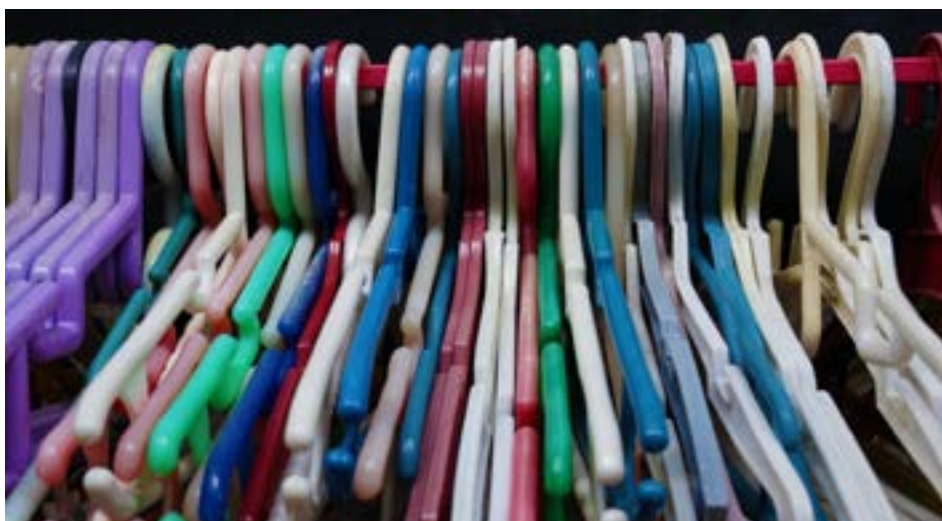
On 25 February 2019, a draft private members Bill was introduced to the UK Parliament presented by Alistair Carmichael under which plastic would be phased out by 2042, except where it is essential. The **Phase-out of Plastic**

## Packaging and plastics associations

**Industry Council for Packaging & the Environment (INCPEN)** – an international organisation established in 1974 for research on packaging and the environment. INCPEN aims to understand and improve the environmental and social impacts of packaged products. Its members are manufacturers and retailers across the supply chain who collaborate to optimise packaging and minimise the environmental footprint. Encourage companies to continuously improve packaged products systems, and seek to ensure sustainability of packaging policy whilst informing about the role of packaging in society. Website: [https:// www.incpen.org/](https://www.incpen.org/)

**British Plastics Federation (BPF)** – trade association for the UK plastics industry. The BPF Packaging Group represents UK manufacturers of all types of plastic packaging including containers, bottles, drums, trays, boxes, cups and vending packaging, baby products and protection packaging. Has a useful website with facts on plastics and their use: [http:// bpf.co.uk/plastipedia/Default.aspx](http://bpf.co.uk/plastipedia/Default.aspx)

**Plastics Europe** – represents the interest of the plastics manufacturing industry in Western Europe at European level and promotes the benefits of plastics in every aspect of life. Website: [http:// www.plasticseurope.org/](http://www.plasticseurope.org/)



**Pollution Bill** has been drawn up by Friends of the Earth and the National Federation of Women's Institutes (NFWI), who claim to have the support of a cross-party group of MPs. It includes:

- a statutory long-term target for the significant reduction of plastic waste and pollution by 2042, by phasing out all but the most essential uses of plastic, with plastic waste and pollution being substantially and progressively reduced in the years leading up to 2042; and
- a 2025 target to end non-essential single use plastic.

It would also create an independent advisory committee (the Committee on Plastics Pollution (**CPP**)) to advise the Government. The CPP would assesses plastic use, develop a

list of essential plastic uses that cannot be phased out, and advise the relevant Secretary of State on policy measures to achieve the statutory targets. The CPP would then monitor progress towards the targets. The Bill would also require the Secretary of State to lay before Parliament a strategy based on the CPP's advice for reducing plastic pollution in line with the targets. Friends of the Earth describe the Bill as providing: "tough and timetabled action to tackle the crisis and put the UK at the forefront of efforts to end plastic pollution". However, few private members' bills succeed in becoming law.

A second private member's bill on plastics was already in the pipeline, **The Plastics Bill** sponsored by Geraint Davies MP, which was introduced in 2018. This second bill would give the Government a duty to set and achieve

annual targets to limit the production and use of plastic packaging and to increase its recovery and recycling. The UK would, under this bill, be bound to meet or exceed the equivalent EU targets, even after Brexit. Again, a new body, the Plastics Agency, would be created to monitor the UK Government's performance in setting and taking adequate steps to achieve the targets, and would be able to take the Government to court were it to fail in its duties or its targets.

Both bills were scheduled for a second reading in the House of Commons on 15<sup>th</sup> March 2019.

**Small comfort – microbeads and microplastics**

Small pieces of plastics present particular problems. Microbeads (a type of microplastic)

**Plastic packaging – qualities**





were until recently commonly incorporated into facial scrubs and shower gels, acting as exfoliators. However, research has showed that microbeads have been accumulating in the marine environment, where they can be ingested by sea-life with uncertain effects and the potential to get into the human food chain.

The incorporation of microbeads in rinse-off personal care products was made illegal in England from 9 January 2018 under the **Environmental Protection (Microbeads) (England) Regulations 2017**, and sales of such products containing microbeads became illegal from 30 June 2018. For the purposes of the regulations, a microbead is any water-insoluble solid plastic particle of less than or equal to 5mm in any dimension. The ban applies to the use of microbeads in any substance, or mixture of substances, intended for application to any

relevant human body part, from which it is washed off with water rather than being left to wear off. These regulations are enforced by local authorities who have power to prosecute offences in the criminal courts and issue stop notices and other forms of civil sanctions. It is a defence for a supplier accused of supplying a product containing microbeads to show that it took all reasonable steps and exercised all due diligence to avoid committing the offence. Fines can be imposed upon conviction. Equivalent legislation was brought into force in Scotland and Wales from 30<sup>th</sup> June 2018.

The EU is also taking steps to control microplastics (a wider category than microbeads - including even smaller particles) and has included commitments to reduce their use in its 2018 plastics strategy (**A European Strategy for Plastics in a**

**Circular Economy, Annexes 1-3 of COM(2018) 28 final**) which forms part of the EU Circular Economy Action Plan, for which plastic is one of the five priority areas. EU measures are expected with regard to microplastics deriving from tyres and textiles which are coming under increasing scrutiny, such as the release of plastic particles in rainwater run-off from roads and discharges to the drain from washing machines.

The EU flagship chemicals legislation (**REACH - the EU Regulation on the Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation (EC) No 1907/2006**) is being used to restrict the mixing of microplastics with other substances. The European Chemicals Agency (**ECHA**) announced on 30<sup>th</sup> January 2019 a proposal to prevent microplastic particles being

## Plastics in electronic goods





intentionally added to mixtures from which they are likely to later be released into the environment. As justification for the ban, ECHA points to the very long periods for which plastics persist in the environment without biodegrading, with a growing level of plastic accumulating in the environment much of which is extremely difficult to remove. If the proposal is adopted it will be illegal to place microplastics on the market on their own or in mixtures, for uses where it would result in releases to the environment. For other uses that do not entail inevitable release of the microplastic to the environment, labelling will be required instead. The next step towards including these uses of microplastics on the list of substances subject to restriction under REACH is for ECHA to consult on its proposal before putting forward amendments to the relevant Annex of REACH.

REACH already controls substances used as additives within plastics, albeit not the polymers themselves. Additive substances manufactured in the EU or imported into the EU territory in volumes above 1 tonne per year must be registered with ECHA. Registration requires a dossier of information to be submitted to ECHA for technical evaluation on the safety of that substance for the environment and human health. The intended uses of substances must be identified and safety information passed along to users.

On 21 February 2019, ECHA published information on 419 substances used as additives in plastics in the EU. The mapping exercise involved governments as well as academics and industry body CEFIC and 21 industry sectors, covering additive manufacturers and end users. One thousand substance registrations were screened to identify those identified as being used as plastic additives. The inventory of additives created includes information on the polymer types that the additives are most commonly found in and the expected concentration ranges. As part of the project, a model was developed to calculate the release potential of each additive into the environment. This information will now be used by ECHA and EU Member States to help prioritise groups of substances for further detailed assessment. ECHA points out in its 21 February 2019 press release ([ECHA/PR/19/04](#)) that the availability of information on the chances of particular additives being released from plastics can assist producers to substitute safer alternatives.

New substances are regularly added to ECHA's list of 'substances of very high concern' for further scrutiny, following which they may be either banned altogether or their use only allowed under authorisation from ECHA (where there are no suitable alternative substances available). Despite this, spot checks have revealed worrying quantities of non-compliant items making their way onto the EU market.

In addition to REACH, there are specific EU regulations on the safety of food contact materials and toys and other products designed for children, although these often take time to be introduced. For example, in the face of temporary national bans introduced by Denmark and France, the use of bisphenol-A (known as **BPA**), a suspected endocrine disruptor, was banned by the EU for use in baby bottles from March 2011. Products containing BPA had already been removed from shelves in the US and Canada some years previously.

#### Taking responsibility for plastic waste – “extended producer responsibility”

Waste regulation started out by focussing on the end of use phase: the person throwing away the plastic wrapper has a duty to take care of its proper disposal and the waste management company accepting it into its facility must have the requisite permit. But later the responsibility of the producer of the object to design it in a way that takes into account its final disposal and to contribute to the cost of dealing with waste was recognised. This is known as 'producer responsibility' but has so far only been mandated with regards to certain

waste streams: end of life vehicles, batteries, electronics and electrical goods, and packaging (including plastic packaging). Targets are established by EU legislation for the percentage of these types of goods that should be recycled. In the UK collective schemes have been introduced which producers join in order to meet national targets.

The existing UK packaging waste producer responsibility scheme was brought into effect in 1997, to implement the **EU 1994 Packaging Waste Directive (European Parliament and Council Directive 94/62/EC of 20 December 1994 on packaging and packaging waste)**.

The scheme is credited with driving recycling of packaging waste from 25% twenty years ago, to 64.7% in 2016, and at relatively low cost to business. Under the scheme, businesses handling over 50 tonnes of packaging per year, with an annual turnover more than £2 million, must meet a share of the UK's annual packaging waste recycling targets. Registration must be with a scheme approved by the relevant environmental regulator (Environment Agency for England, Scottish Environmental Protection Agency for Scotland or Natural Resources Wales).

This system doesn't require producers to meet the full cost of recycling all of the products that they place on the market. However, producer responsibility is now moving up a gear to 'extended producer responsibility'. In a consultation launched by the UK Government on 18<sup>th</sup> February 2019 (**Consultation on reforming the UK packaging producer responsibility system**), the UK Government aims to place the full costs of managing packaging waste on business users



of packaging. Currently producers only fund at most 10% of waste management costs via the packaging waste scheme. The consultation document proposes that producers should in future cover the full net cost (minus receipts from recycling) of all “consumer-facing” packaging.

Under the existing schemes, businesses aren’t required to collect or recycle their own packaging themselves to meet their share of the national target, but must obtain packaging waste recovery notes (**PRNs**) to demonstrate that tonnages equivalent to their individual targets have been recovered and recycled during the year. Only accredited re-processors and exporters are allowed to issue PRNs. Their value fluctuates and PRNs can only be bought and sold between registered producers (and compliance schemes) and accredited exporters or re-processors. The additional revenue this provides for re-processors is intended to support the diversion of more packaging waste into recycling, so stimulating investment in more UK reprocessing capacity and supporting the collection of more packaging waste for recycling.

However, under this existing system there is no advantage to recycling packaging in the UK versus sending it for recycling abroad. As a

result, a large proportion is sent to destinations in South East Asia and there is thus little need to invest in the creation of UK recycling infrastructure. China (a major export destination for dry waste streams) sent jitters through local government waste disposal authorities recently, when it shut its doors to shipments of mixed plastic waste. Waste exports have since been diverted to other South East Asian nations. As a result Thailand and Vietnam both declared similar import bans in June 2018, which in Thailand’s case is to take effect from 2021. India announced in March 2019 that it too will no longer continue to accept plastic waste shipments. Malaysia and Indonesia are the main waste export destinations still willing to receive shipments.

The changes now proposed by the UK Government in the consultation document cover the following areas:

- Full net cost recovery
- Incentives to encourage design with recycling in mind
- Extending the system to cover more businesses
- Using producer contributions to fund local authority waste collection and management

- Requiring labels to indicate recyclability
- Creating new packaging waste targets
- Introducing a new system of organisation and governance for the system
- Strengthening monitoring and enforcement of compliance

With regard to designing for recyclability, two options are put forward:

- “Placed on the market” (**POM**) fees, which rise for packaging that is difficult to recycle; and
- a deposit fee, a variable sum payable per tonne of packaging material produced, that is redeemable if the producer can prove that an equivalent amount of packaging that they have placed on the market has been recycled.

The current system imposes shared responsibility for compliance across the packaging chain: manufacturers of raw materials (6%); convertor (9%); pack filler (37%); and seller (48%), although the exclusion of producers who turnover less than £2 million and handle less than 50 tonnes of packaging results in 15% of waste falling outside the scheme. The new proposals set







out in the consultation document would instead make the person with the greatest amount of influence over packaging design and choice of materials used solely liable to comply with the revised packaging waste regime, be this the pack filler, retailer or importer. If not, then it proposes that responsibility would continue to be shared through the supply chain, but either smaller producers could be brought within the system, or it could be extended to also cover distributors of packaging.

Producers based outside of the UK, selling to consumers online also currently fall outside the UK scheme. Given the volumes now traded across the internet in contrast to when the scheme was first introduced, it is not surprising that the UK Government is now looking to include online sellers by imposing on them an obligation to take responsibility for the recycling of packaging of goods sold through their websites. Quite how this would be enforced may be another matter.

### Very taxing – new plastics tax from April 2022

A plastics tax is proposed to be introduced from April 2022 on UK manufacturers and importers of all plastic packaging manufactured in the UK, or imported (unfilled) into the UK that does not incorporate at least 30% recycled plastic. The proposals are contained in the Plastic packaging tax consultation launched by the UK Government on 18 February 2019.

It is proposed that this applies to not only fossil-fuel derived plastics but also to bioplastics, as well as compostable, biodegradable and oxo-degradable plastics. The objective is therefore not to drive innovation in eco-friendly plastic material choices, but to incentivise recycling. The types of packaging within scope for the tax will likely include all levels of packaging from the individual goods wrapper to the packaging used to protect pallets of goods in transit. The tax would apply at the point of sale or supply for packing or filling. The UK Government is not currently proposing to tax imported goods where packaging has already been filled and

small operators will probably also be excluded from paying the tax. The rate of tax has not yet been decided either, but is likely to be calculated on each tonne of plastic packaging. This may not however be easy to assess where the packaging also incorporates other materials.

Businesses registered for the scheme will be expected to self-report and penalties will apply for non-compliance. The Government is not proposing to set out a prescribed set of criteria for reporting, and so businesses may need to develop their own methods to record the quantities and recycled content of plastics that they use. They will have 3 years to put this in place if the tax goes ahead.

### Going our separate ways – the impact of Brexit

So where will the regulation of plastic and plastic waste be headed in a post Brexit UK? Most UK environmental legislation derives from the EU, without which we would be facing a gaping hole in environmental protection. The effect of the **European Union (Withdrawal) Act 2018** is to retain the effect

of all EU derived laws that are in force on Brexit day so that the EU measures which have been implemented in the UK or currently apply directly by virtue of being EU Regulations (such as REACH) will still be in place immediately post-Brexit.

The UK Government has consistently stated that it has no intention of weakening environmental regulation after the UK leaves the EU and that it stands by its political commitment to be the first government to leave the environment in a better state than it found it. It has committed to creating in a **new Environment Bill**, including a new body (Office for Environmental Protection (OEP)) to oversee national level environmental commitments that would have fallen to the European Commission and the European Court of Justice to police. Draft legislation was published in December 2018. Whether the OEP as proposed would be sufficiently independent of Government, with the right enforcement powers, is a point of current hot debate.

Perhaps rather unexpectedly, the UK Government is going further than just preventing backsliding on EU environmental regulation and is currently working up proposals for reforms in a number of areas to include in the new Environment Bill. The Bill will also put on a statutory footing the 25 Year Environmental Plan including the commitment to reduce avoidable plastic waste by 2042.

As described above, the reform of the packaging waste system is already being consulted on alongside other measures. A solution to the UK's current reliance on exports of waste to South East Asia will need to be found regardless of the UK's EU membership status, but whether reform of waste packaging rules and the new plastics tax and deposit return schemes are enough to incentivise the private sector to invest in the recycling infrastructure necessary to process our own plastic waste, may be questionable without Government financial support.

#### Never a dull moment – regulation of plastics continues

As demonstrated above, regulation of plastics is evolving at a blistering pace currently, both within the UK and the EU. As with all reactions to a sudden increase in public awareness, it is important that regulation remains properly considered and proportionate rather than being reactionary or creating unwarranted incentives. The approach taken must be future proofed as far as possible: measures addressed to single products are likely to be quickly outpaced by changing consumer preferences and innovation.

The use of circular economy thinking is being readily applied to plastics and their uses. This is wide enough to consider the whole plastic value chain and the lifecycle of plastic products from design to disposal. It also has the benefit of being an approach that is not dependent on national boundaries or jurisdictions. All new measures should to be

evaluated against that backdrop. Plastics have enabled huge advances in our comfort, enjoyment and safety, and although some now advocate 'giving them up', in practice they are far too integrated into our world for this to be other than a token gesture. If we use a bamboo toothbrush we will still travel to work in a car, bike or train incorporating plastic parts, use a plastic card to pay for our coffee, and communicate on a phone with a plastic casing. In conclusion, our love affair with plastic may have cooled a little, but it is far from over.

For businesses in the consumer goods sector, the sudden uptick of consumer and political interest in reducing single-use plastics in particular, and the welter of regulatory initiatives that it is now spawning, may be difficult to adjust to. The range of measures being proposed – outright bans, additional labelling requirements, taxes on importers, reformed recycling obligations for producers, deposit return schemes on drinks bottles – is notably wide. Manufacturers may find themselves subject to a cocktail of these measures and with Brexit approaching there may also be future divergence between what is needed to comply with goods intended for the UK market versus what is required for export to the European Union. The result, we suspect, is likely to be additional manufacturing costs. Added to this, the focus on plastics also comes at a time when there is increased scrutiny of companies' wider environmental and sustainability performance from the likes of institutional investors and shareholders. It is truly challenging times.





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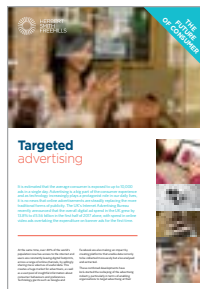
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