

Schroders

Plastics Phase-Out:
Exposure through the value chain

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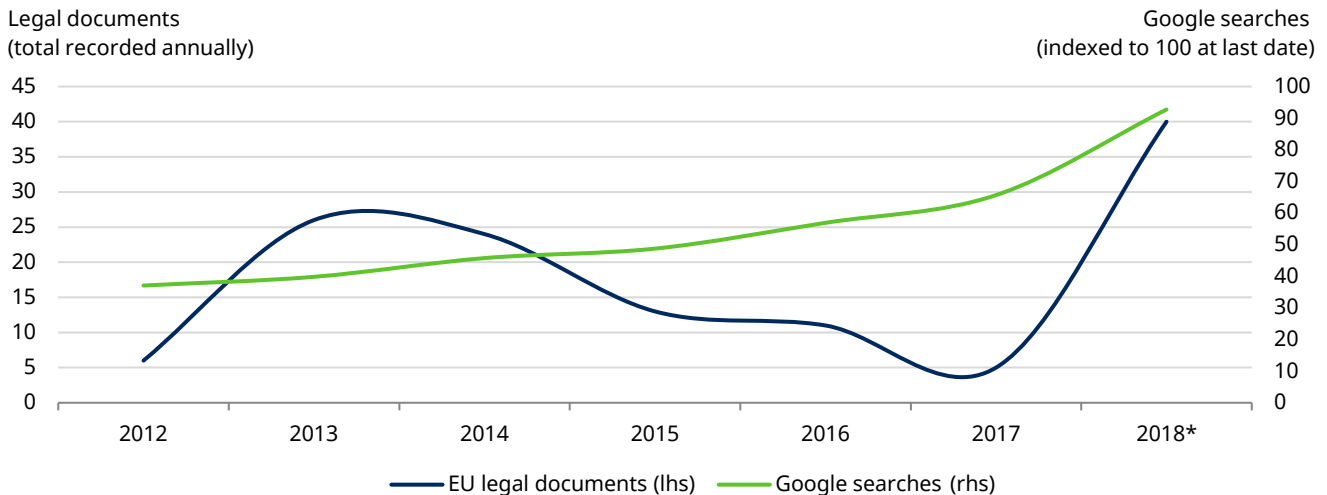
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Executive summary

Plastics use has come under intense scrutiny over the last year. Prompted by headlines like ‘More plastic than fish in the oceans by 2050¹’ and ‘UN commits to stop ocean plastic waste²’, consumers and regulators have turned their attention to an issue that has escaped mainstream focus until recently. Plastics concerns are well past a tipping point of public concern and regulatory action.

Public and policymaker interest in plastic waste at historical highs



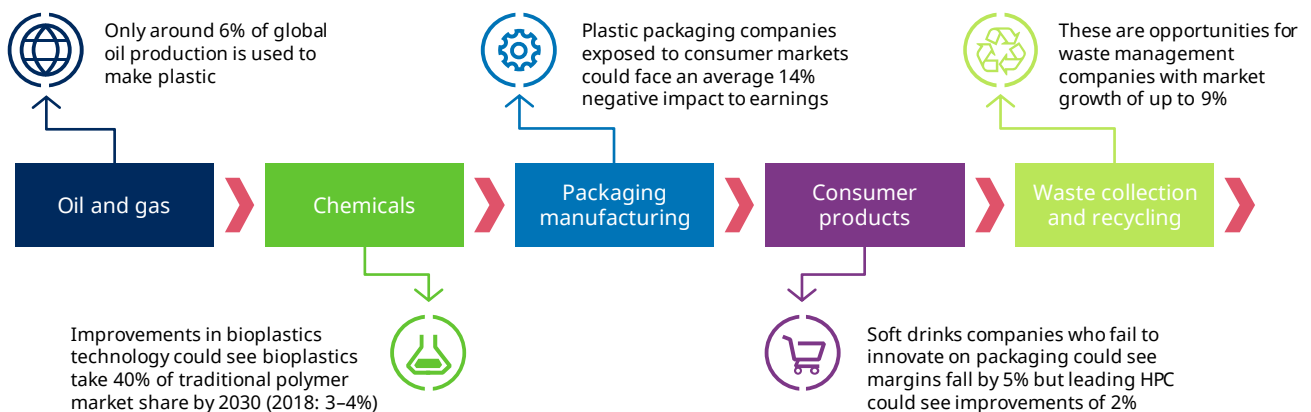
Source: EUR-Lex database, Google.
*2018 is annualised value based on Q1 values.

Plastics manufacturers most at risk

The impacts to date have been relatively modest and focused on narrow areas. While individual plastic products have found themselves in the limelight, the issue spreads much further than carrier bags, micro beads or straws. We apply a broader lens to the wider plastics landscape, assessing the areas of consumer packaging likely to face the most pressure, the companies that supply those products and the raw materials they contain.

While consumer companies have been most visibly affected by the increased attention, the impacts elsewhere in the plastics value chains – among packaging companies and raw material suppliers – are likely to be more intense and disruptive. We have looked through that value chain to assess potential risks, the companies exposed to them and the steps some leaders are taking. We expect the biggest impacts to be felt by manufacturers of plastic packaging.

Consumer plastics touch a range of industries



Source: Schroders.

¹ G. Wearden, ‘More plastic than fish in the sea by 2050, says Ellen MacArthur’, The Guardian, January 2016.

² R. Harrabin, ‘UN commits to stop ocean plastic waste’, BBC News, December 2017.

Industry impacts

While the impacts of a growing backlash against plastics use are likely to be strongest among plastic manufacturers, every step of the value chain will feel the effects:

- **Consumer companies** will need to reduce plastics use, by substituting single use plastics for alternative materials or redesigning or reducing packaging. A long list of companies has already announced plans to change their approaches to packaging use. For instance, Costa Coffee has launched a nationwide recycling scheme, Coca Cola (which has recently announced its acquisition of Costa) has committed to collect and recycle the equivalent of all its packaging in Western Europe by 2030 and McDonald's plans to make all of its packaging renewable or recyclable by 2025. There will be costs to retooling equipment, reconfiguring supply chains and in some cases higher materials costs. However, our analysis shows that companies already adapting to these trends may benefit. Cost savings achieved by lower packaging use, improved consumer perceptions and reduced regulatory risks could contribute to higher margins for food producers and household and personal product companies. We find that soft drinks companies carrying on with business-as-usual face the biggest downside risks
- **Packaging companies** face bigger challenges. Currently, 37% of consumer packaging is plastic³, the outlook for which is clearly challenged. On the other hand, leaders that are able to develop sustainable alternatives – like bioplastics or improved recyclability – will emerge from these challenges stronger. They should be able to establish distinctive products for which they have pricing leverage, replacing their current reliance on traditional commodity plastics categories. While some major players are already directing their innovation efforts to developing more sustainable packaging, we believe that innovation is too slow to allow the industry as a whole to pivot away from traditional plastics undamaged. Our analysis of the operating profit exposures of individual packaging companies highlights the value of leadership, with well-placed companies suffering little impact and laggards seeing up to one-third of earnings at risk
- **Chemicals companies** are starting to develop compostable, bio-based plastics as well as different types of polymers that can achieve reductions in material used. Bioplastics and compostable materials are starting to gain traction. Some commentators predict the bioplastic market is set to grow at a 30% compound annual growth rate to 2030 (from 2013), compared to an average of 3% growth for fossil-based plastic.⁴ Bio-based plastics have their flaws: they are loosely defined; can be hard to recycle; more expensive to make; and not yet available in large quantities. But improvements in cellulose conversion technology are expected to enhance the quality, quantity and cost. As manufacturers face pressure from their consumer-facing customers, the more innovative companies should gain market share. Most of those beneficiaries appear likely to emerge from the current industry leaders
- **Waste utility and recycling companies** are likely to benefit from growing demand for end-of-life recycling and reuse. Recent Chinese waste import restrictions, coupled with increased political and regulatory pressure on plastic waste, create a potential springboard for the recycling industry. New geographies, new applications and new products could lead to market growth of 7–9%. Picking out winners from a fragmented, highly competitive industry is challenging and we think localised solutions will be key
- **Oil** is the main raw material used in plastics production. However, 4–8% of global oil production is used to make plastic⁵, of which an estimated half is used for packaging. As a result, the impact on that market is likely to be modest, although the issue unhelpfully compounds the wider challenges facing the energy sector

Single use plastics have become ubiquitous in today's consumer product industries and value chains. We expect pressures to spread from the specific niches on which attention has focused so far, to the wider range of products contributing to a global environmental challenge that has begun to move from ecological concern to economic driver.

³ Neil-Boss, N. & Brooks, K. 'Unwrapping the Packaging Industry', Ernst & Young, 2013.

⁴ 'Global Bioplastics Market Predicted To Grow 350%', Energy and Gold, March 2016.

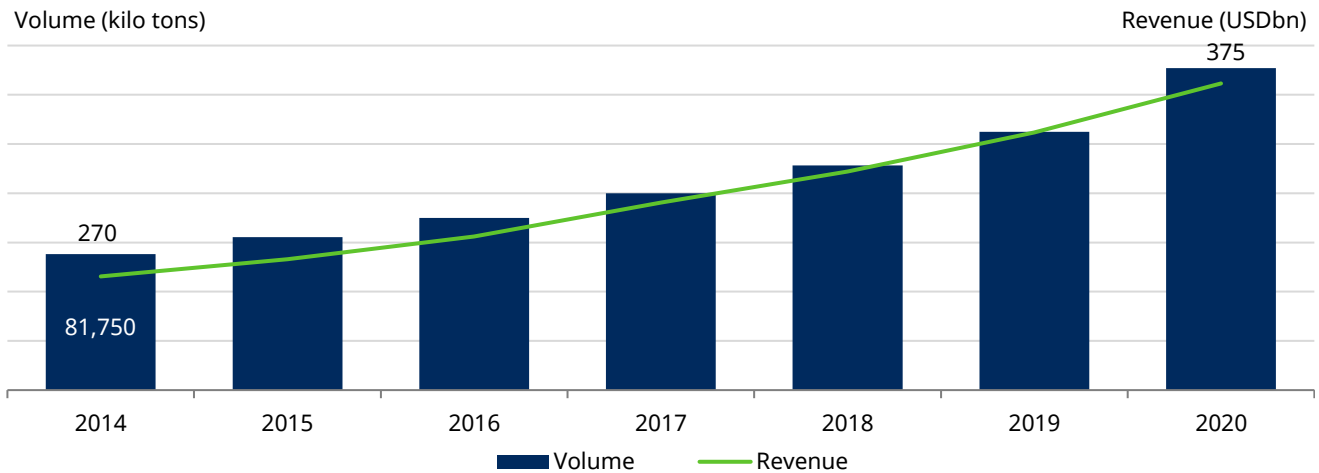
⁵ [New Plastics Economy: Rethinking the Future](#), Ellen MacArthur Foundation, December 2017.

Beyond the ‘Attenborough effect’

Challenging consensus on plastic packaging increase

Plastic packaging consumption is on the rise, propelled by an emerging middle class and a growing demand for convenience.

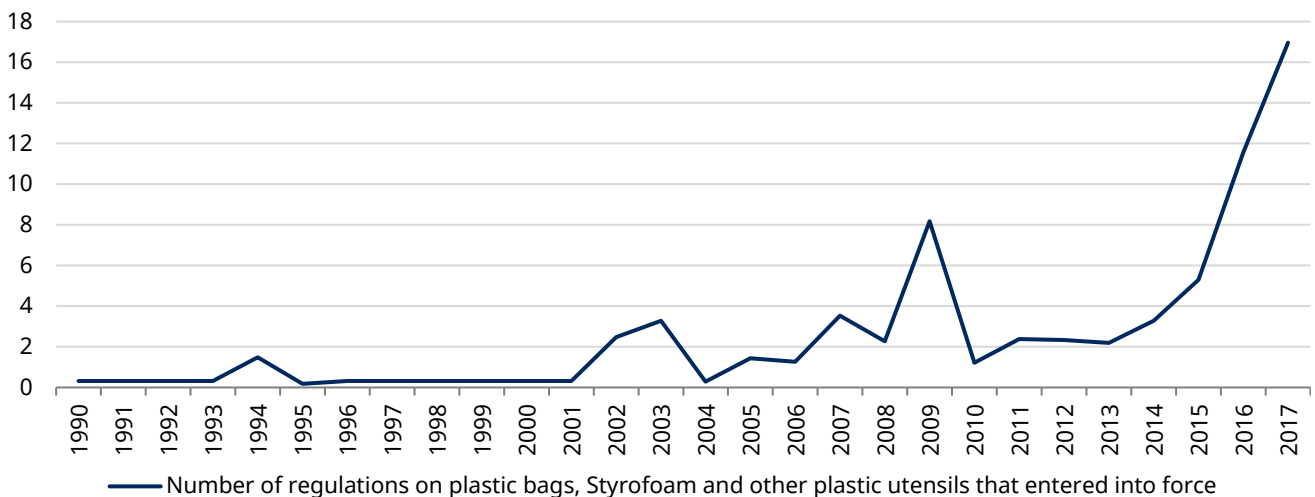
Global plastic packaging market, 2014–2020 (kilo tons) (USD billion)



Source: Zion Research Analysis, 2016.

However, it is increasingly clear that growing plastics use and the expanding disposable economy creates side effects, upon which social and political scrutiny is increasingly focused – as illustrated by research from the UN Environmental Programme below.

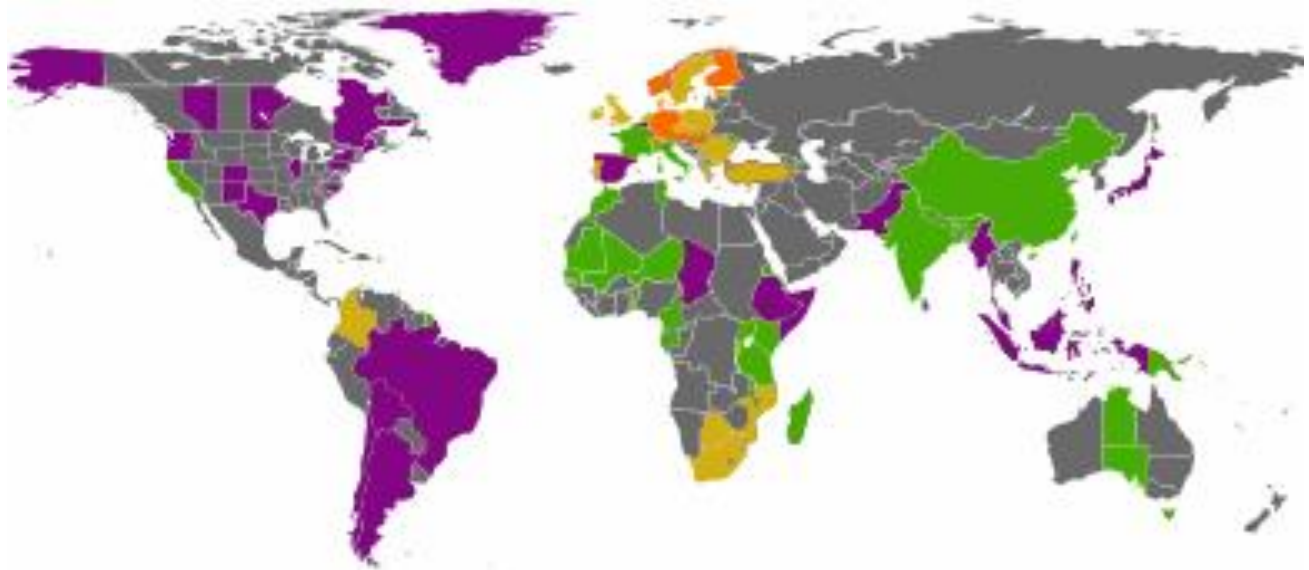
Estimated number of new regulations on single-use plastics entering into force at the national level worldwide



Source: Single Use Plastics: A Roadmap for Sustainability, UNEP, 2018.

Regulation has risen across regions. For example, India has banned the manufacture of multi-layer plastics, and the phase-out of lightweight plastic bags has already proliferated globally.

Plastic bag phase-out is a global phenomenon



Phase out of lightweight plastic bags around the world

- Plastic bags banned
- A tax on some plastic bags
- Voluntary tax agreement
- Partial tax or ban (municipal or regional levels)

Source: Wikipedia.

Re-imagining waste management

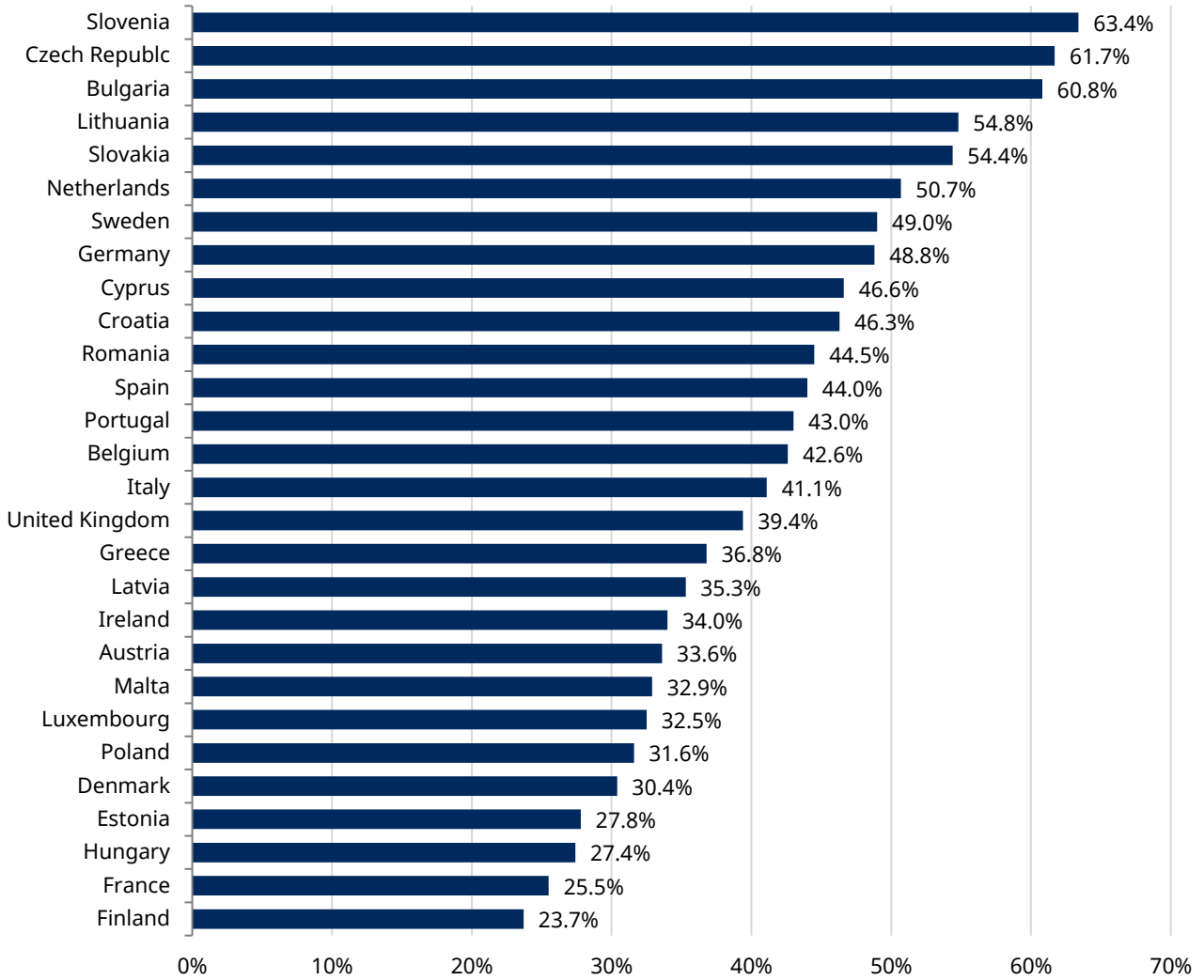
According to the World Bank, the quantity of waste and costs related to its treatment are likely to double by 2025⁶. Costs of waste management have generally not to date been borne by companies but by governments, end customers and society. Waste collection costs vary greatly by region ranging from \$20–250 a tonne, while landfill costs \$10–100 tonne. Sentiment on who should bear these costs is changing, and potential opportunities are rising. The Ellen MacArthur Foundation estimates that after a short first-use cycle, 95% of plastic packaging material, costing \$80–120 billion annually to produce, is lost to the economy⁷; it is only a matter of time before this value is recaptured.

Meanwhile, there is huge disparity in recycling rates globally and progress in some regions remains slow.

⁶ ['What a Waste' report shows alarming rise in amount, costs of garbage](#), World Bank, June 2012.

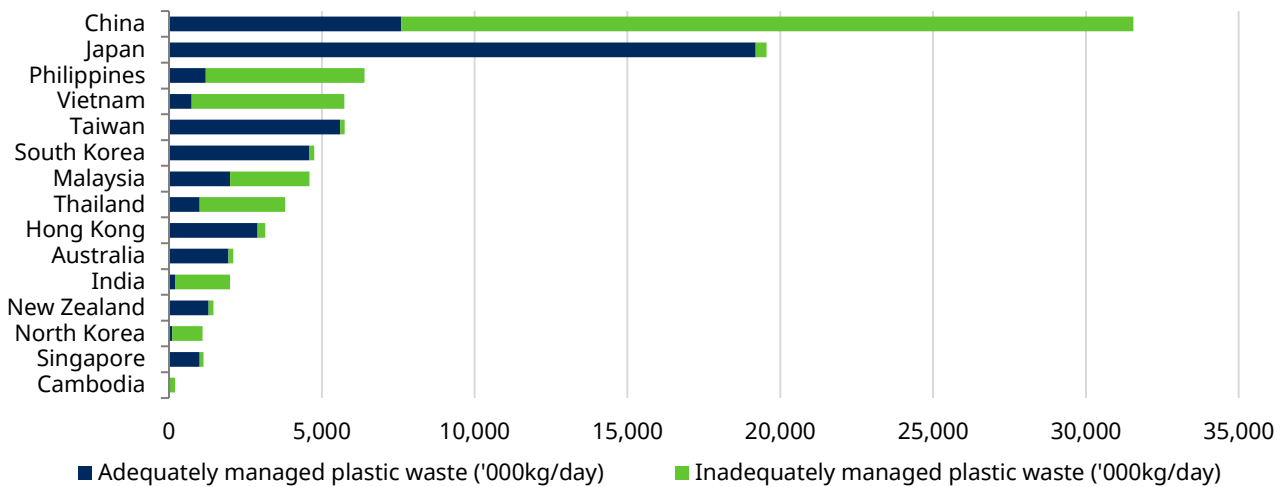
⁷ [New Plastics Economy: Rethinking the Future](#), Ellen MacArthur Foundation, December 2017.

Recycling rate of plastic packaging waste in the EU in 2015



Source: Statista, Eurostat.

Plastic waste recycling/management Asia (2015)



Source: BAML, July 2018.

Regulatory changes already afoot

Regulation has gained further traction in the last 12 months, with **proposed regulations and voluntary targets** from individual companies, national governments and the UN:

- **July 2017:** China [announced](#) that it will no longer import plastic waste
- **December 2017:** UN Plastics [ban](#) signed by nearly 200 countries. The aim of the ban is to eliminate plastic waste from polluting oceans. The resolution commits all signatories to start monitoring volumes of plastic waste and explore a legally binding instrument within the next 18 months
- **January 2018:** The UK government [published](#) its 25 Environmental Plan which focused on biodiversity and eliminating plastic waste, followed by a consultation on single use plastic tax in March 2018
- **January 2018:** The EU announced its [vision for a 'circular economy'](#), stating that by 2030, all plastic packaging will be easily recyclable, more than 50% of plastic waste would be recycled (currently around 27%), and recycling capacity would increase fourfold
- **May 2018:** The European Commission put forward a plan to ban almost all single use plastics, to be voted in May 2019
- **May 2018:** The American Chemistry Council's Plastic Division has announced a goal of ensuring 100% of plastic packaging is to be reused, recycled, or recovered by 2040⁸
- **June 2018:** Five of the G7 countries adopted a plastics charter pledging to recycle and reuse 55% of plastic packaging by 2030 and recover all plastic by 2040
- **2017–18:** Aside from plastic bag bans, India, Japan and Taiwan have introduced some form of 'producer responsibility' for plastic waste, and Malaysia, South Korea and Taiwan have introduced consumer waste charging systems

Plastic packaging represents 26%⁹ of the total volume of plastics used, so reduction in its use has material impacts for the consumer sector, and throughout the packaging and polymer supply chain. The associated impacts on waste management will have further impacts on the utility sector.

The market response to plastic bans has thus far been underwhelming. In our view, risks are growing sufficiently that assessing the potential impacts is becoming increasingly critical. The quotations below summarise the state of conflict among industry and politics as to where the impacts and opportunities lie. In the subsequent sections, we analyse impacts on the consumer, materials, and waste industries.

We need plastics, plastic is everywhere. The idea is just to make it more recyclable and reusable. It's not like a war on the industry, it is more trying to make the shift [to a circular economy].

The European Commission, January 2018

Recycling will be key, but plastic reduction must also be prioritised. Ultimately, there is just too much being produced.

Iceland's Head of Packaging, March 2018

A radical and joint rethink of both design and after-use processes will be required, in addition to other measures such as stimulating demand for secondary raw materials.

Jean-Louis Chaussade, CEO of Suez, January 2016

⁸ 'US plastics resin producers set circular economy goals to recycle or recover 100% of plastic packaging by 2040', American Chemistry Council press release, May 2018.

⁹ [New Plastics Economy: Rethinking the Future](#), Ellen MacArthur Foundation, December 2017.

Consumer companies – kickstarting the movement

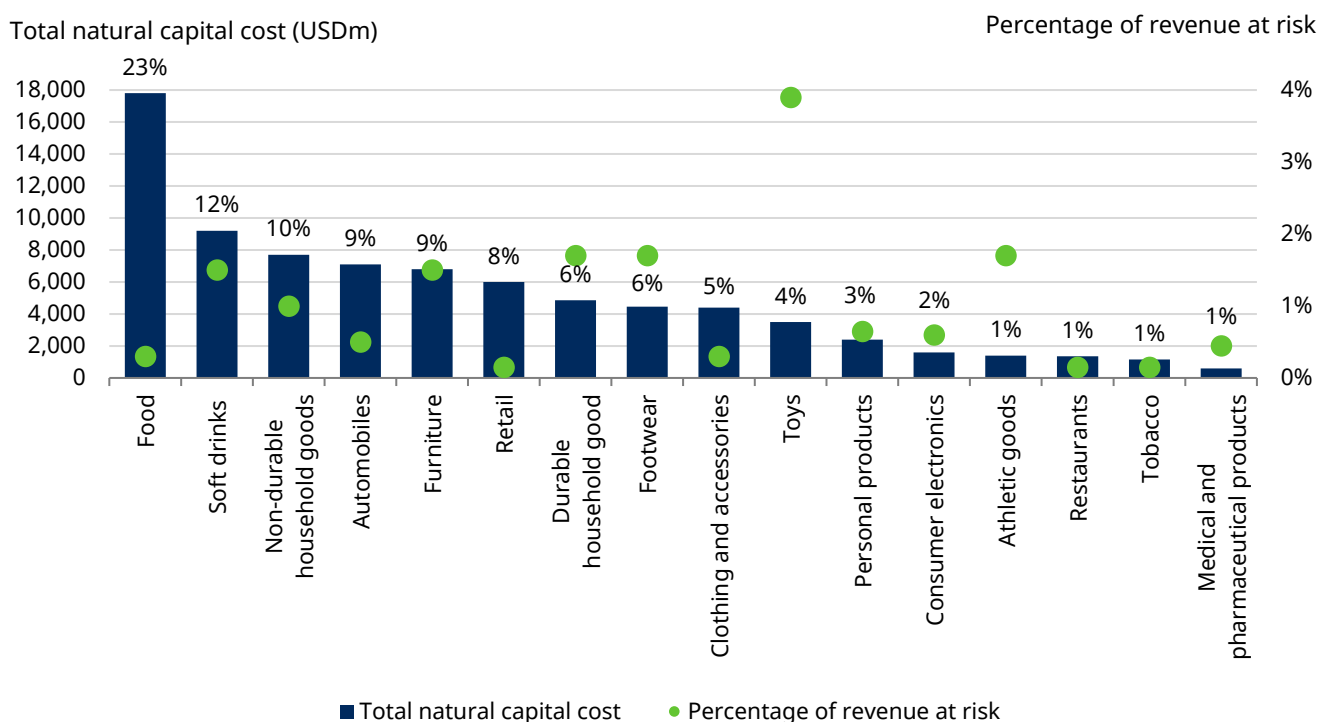
Packaging focus

Plastics have a range of uses from water pipes and car interiors to building materials and food packaging. We think this latter category faces the greatest regulation risk as plastic packaging accounts for 26% of the volume of plastics used, but it has the shortest life cycle, often just single use. The consumer sector makes a significant contribution to ocean plastics, on which policy focus has been particularly acute. Not only are governments and consumers concerned about the negative environmental impacts of this pollution, but increasingly concerns are being raised about the impact on our food chain. Plastic found in seafood is a popular headline, but more recently a World Health Organisation study highlighted the presence of micro-plastics in bottled water¹⁰.

So what does this increased focus on consumer packaging mean for the staples sector? We think there are a range of possible outcomes including packaging innovation, light-weighting existing packaging, moving to a circular economy and the risk of single use plastic tax. We have quantified these costs and opportunities to understand the potential impact on company profit margins using the following methodology:

1. **Understanding sector exposure.** Using the total natural capital cost, calculated by environmental research firm Trucost, the food producer, soft drinks and household and personal care sectors were shown to have the greatest environmental impact. The natural capital cost quantifies the environmental impact of plastic use. This captures greenhouse gas emissions, air and water pollutants and water consumption. It looks at the life-cycle impact from up-stream (raw material extraction and plastic manufacturing), to consumer use, to end-of-life (recycling, incineration, landfill and subsequent impact on freshwater, marine and terrestrial eco-systems)¹¹. Consumer sectors have a high environmental cost as a result of short lifecycles. Plastic food packaging will have a much shorter lifecycle than a plastic toy or plastics used to make a shoe sole.

Total natural capital cost and intensity of selected sectors



Corresponds approximately to over 80 million tonnes of plastic. Trucost calculations derived from, but not limited to, World Bank [7]; Plastics Europe [8]; Eurostat [9] and the US EPA [10] datasets (full set of references and methodologies available in appendices 3 and 4 of this report).

¹⁰ Readfearn, G. 'WHO launches health review after microplastics found in 90% of bottled water', March 2018.

¹¹ 'Valuing plastic: the business case for measuring, managing and disclosing plastic use in the consumer goods industry', UNEP and Trucost, 2014.

2. **Single-use plastic tax: internalising costs.** If the natural capital costs imposed by the six companies included in the food sector of the graph above were internalised, then 81% of their operating profit would be lost. It is not realistic to assume that unpriced externalities may be crystallised on that scale via a single use plastic tax. For example, the environmental cost of sending coffee cups to landfill is unknown, but the initial UK coffee cup tax proposal was 10% of the retail price of a take-away coffee. Therefore, in our analysis we apportioned 10% of the additional environmental cost for the sector leaders in the form of a plastic tax and 25% for laggards. We think sector leaders who are already using some recycled content or light-weighting packaging may be partially exempt from a potential plastics tax.
3. **Offsetting plastic tax: cost savings and opportunities.** We also looked at how potential plastic taxes could be offset through savings. The consumer sector already provides examples of cost savings through light-weighting packaging. Analysis from Trucost suggests that savings of up to 12.17% can be achieved through these efficiencies alone. Again we applied a different level of cost saving benefit to costs of goods sold for leaders and laggards. Sector laggards may respond to taxes and launch recycled packaging but the savings will be lower as they will have to invest more heavily in R&D and adapt manufacturing processes.

Results

Our analysis of the impact across sector profitability margins highlights **soft drinks** companies as the most exposed to potential plastics tax. More importantly, the potential impacts on better or worse placed companies could drive a material wedge in profitability. Laggards in the soft drinks sector might see margins drop by as much as 5%, while leaders in the household and personal goods sector may see cost savings contributing up to 2% to margin improvement. We expect food producers to see equal upside and downside risk depending on their current packaging strategy.

Company impacts/responses

We have seen a range of response from companies and have summarised corporate policies and commitments below:



Business as usual

Kraft Heinz

- Some packaging is not recyclable and the company has not set any targets

Starbucks

- The company has withdrawn from its earlier commitments to sustainable packaging



New initiatives

Whitbread

- Launched new recycling scheme with suppliers in the UK

McDonald's

- To make all its packaging from renewable or recyclable sources by 2025 (10% recycling penetration currently)

Wetherspoons, Wagamama and Pizza Express

- Have all taken steps to reduce plastic waste, starting with a ban on plastic straws

Unilever

- Commits to 100% recyclable plastic packaging by 2025

P&G

- To ensure 90% of its packaging is recyclable by 2020 (other 10% is plastic film and sachets which are more complex to recycle)



Sector leaders

Coca Cola

- To collect and recycle equivalent of all its packaging usage in Western Europe by 2030 (120 billion bottles used currently) and to ensure all its bottles have an average 50% recycled content by 2030

Danone

- To make all Evian brand water bottle from recycled plastic by 2025

Iceland (UK frozen food retailer)

- To eliminate plastic packaging from its own-brand products by 2023

Source: Schroders. Companies are for reference only, not a recommendation to buy/sell.

Packaging companies – choosing the right alternatives

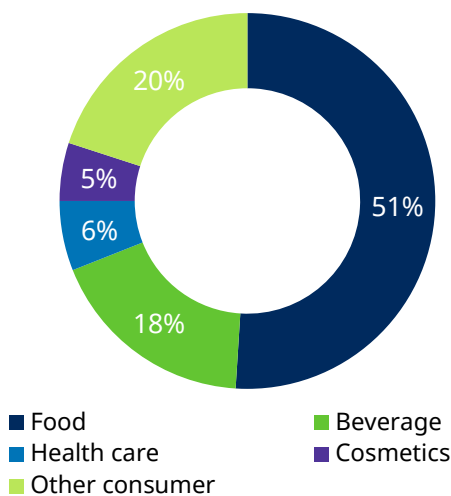
Shifting trends

Paper and plastic currently make up respectively 34% and 37% of the consumer packaging market. We believe the **plastic packaging value chain is facing a transition away from traditional fossil-based plastic consumer packaging**. Trending away from plastic towards paper has limitations, so we foresee profound impacts on the plastic packaging subsector, which will need to innovate its products and rethink business models.

We have focused here on the impacts on companies providing mainly plastic consumer packaging. While the impact from initial regulations and plastic reduction efforts have had very little effect on total volumes, if that pressure continues to translate into action across the plastic packaging spectrum, the impacts could be significant. We have observed several potentially disruptive trends:

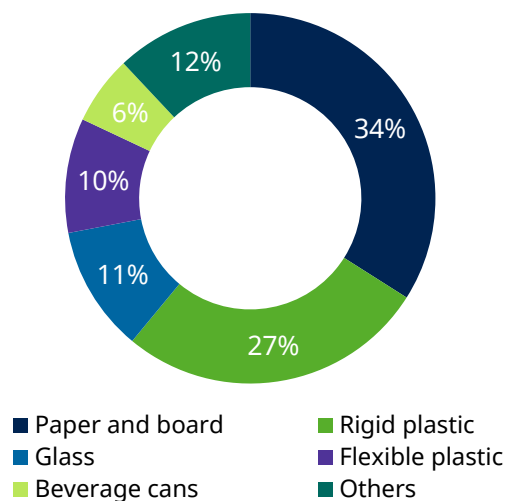
- i. **Increase in bio-based feedstocks, and rising scrutiny.** The bioplastic market is set to grow at 30% CAGR to 2030 (from 2013), compared to an average of 3% growth for fossil-based plastic. The EU is looking to define bioplastic (currently both 'bio-based' and 'biodegradable' are known as 'bioplastics', but both have different meanings), and companies need to ensure their strategies and communications are rigorous. Compostable products also need better definition: most still lack the infrastructure to compost them and currently end up in landfill/incineration.
- ii. **Emphasis on recycled feedstocks.** Currently incur higher costs and issues around quality and consistency particularly when used in food packaging, but costs are coming down. Strictly regulated for food packaging.
- iii. **Increased demand for genuinely recyclable end-products.** Most materials are already recyclable but many do not get recycled – they end up as litter, landfill or incineration. Companies using polymers that are difficult to recycle (see table below, 'Not all plastics are created equal') will either have to invest to change the technology they use, or risk the future of that product.
- iv. **Reduce plastic via efficiencies in packaging.** e.g. using less material to make the same packaging, or using renewable energy to make the manufacturing process greener. This could impact the raw materials companies (i.e. petrochemicals).
- v. **Transition to paper/glass/metal packaging has its limitations.** Whereas certain plastic uses can easily be replaced, often plastic is necessary for safety, shelf life, lightweighting, etc. Producing plastic more sustainably is key.

Global packaging by end market, 2012











Source: EY analysis.







Global packaging by type, 2012



Source: EY analysis.

Not all plastics are created equal: Ease of substitution and recyclability of different plastic types

Plastic type	Non-packaging uses	Packaging/ food uses	Ease of substitution (1-5, 5 being most substitutable)	Recyclability (1-5, 5 being most recyclable)	Comments
<p>1. Polyethylene terephthalate (PET)</p> 	<p>Thermal insulation, tapes, conveyor belts, seat belts. (also known as polyester – used in clothing).</p>	<p>Soda and water bottles, beer bottles, mouthwash. Boil in the bag pouches. Usually clear. Make up 60% of Coca Cola's packaging.</p> 	<p>4 Recycled or bio materials can be a good substitute. Big brands moving towards bioplastics eg Coke. Single-use water bottles likely to fall.</p> <p>PLA (poly-lactic acid) is a corn starch-derived product which can be used to make PET bottles.</p> <p>PEF (polyethylene furanoate) uses biomass and has superior qualities to PET.</p>	<p>5 Easy, picked up by most kerbside recycling schemes.</p> <p>PET waste is processed through food-grade recycling systems. Can only be recycled into another bottle 3 times due to quality. Can also be recycled into fabric.</p>	<p>Volumes of virgin plastic bottles likely to decrease.</p>
<p>2. High density polyethylene (PE) (HDPE)</p> 	<p>Water pipes, dustbins.</p>	<p>Usually opaque – milk bottles, detergent, cereal box liners, shampoo.</p> 	<p>3 Poly resins can be substituted for wood-based products. Recycled materials can be a good substitute.</p>	<p>4 Easily recyclable, collected at kerbside.</p>	<p>Volumes of virgin plastic products to stay flat or decrease over long term.</p>
<p>3. Polyvinyl chloride (PVC)</p> 	<p>Extensive uses in construction industry, electrical insulation, piping.</p>	<p>Cosmetic containers, cooking oil, some cleaning products.</p> 	<p>5 Already subject to phase-out in consumer packaging due to potential health effects, can be replaced by paper/board or other plastics.</p>	<p>1 Not easily recycled</p>	<p>Not affected by new legislation as already in decline. Industrial use persists.</p>
<p>4. Low density polyethylene (PE) (LDPE)</p> 	<p>Electrical insulation, toys, buckets.</p>	<p>Containers, films, plastic bags, bread bags, coating of paper for packaging, cling film, squeeze bottles, bin bags.</p> 	<p>3 Flexible qualities are hard to replicate for certain uses.</p> <p>Plastic bags are relatively easy to reuse or substitute (single use plastic bags already subject to bans).</p>	<p>1 Not currently recyclable at kerbside, few systems for sorting and collecting. Can interfere with recycling sorting machinery. Product info/logos can prevent recycling.</p> <p>Can be recycled into compost bins, panelling, gutters.</p>	<p>Usage likely to be squeezed due to falling demand for plastic bags and low recyclability.</p>

Plastic type	Non-packaging uses	Packaging/ food uses	Ease of substitution (1-5, 5 being most substitutable)	Recyclability (1-5, 5 being most recyclable)	Comments
5. Polypropelene (PP) 	Wide variety of applications including textiles (rope), plastic parts (eg hairdryers), auto parts.	Microwave dishes, straws, ice cream tubs, dip tubs, yoghurt containers, medicine bottles, takeaway containers, straws. 	2 High melting point – can withstand extreme temperatures	3 But rising – Increasingly being accepted by kerbside recycling but a very small proportion is actually recycled. Recycling efforts are on the rise.	Low substitutability, wide industrial use and rising recyclability lead to lower risk of phase-out.
6. Polystyrene (PS) 	CD cases	Meat trays, disposable cups and plates, protective packaging for fragile items, water station cups, plastic cutlery 	5 PS containers and casing already being phased out, easily substituted with other types of plastic or paper.	2 Plastic cutlery can be recycled but not widely done as not cost-effective.	Already less widely used in consumer packaging, further scope to reduce.
7. Others 	Sunglasses, computer cases, nylon, Lego.	Multi-material packaging. Can help extend shelf life. 	1 Often plastics are mixed to increase shelf life without refrigeration. In India, the manufacture of multi-layer plastic has recently been banned.	2 Expensive to recycle as separating types of packaging is difficult. However mixed plastic recycling expected to be improved in the next 5 years.	Hard to phase out for some applications, but pressures to improve recyclability will increase.

(Schroders; Ellen McArthur report; UBS; Berenberg; Natural Society).

Packaging company impacts/responses

Plastic products that are not easily or cost-effectively recyclable, AND not easily substitutable, are likely to be increasingly made from recycled materials or substituted for bio-based materials.

We have assessed the exposure and strategy of five global plastic packaging manufacturers, estimating potential impact on earnings before interest and tax (EBIT).

- We assessed corporate strategies on:
 - Product recyclability targets
 - Bio-materials or recycled materials use
 - Strategy to reduce plastic volume within products
- We have assessed corporate exposure to:
 - Consumer markets and
 - Regions with current or expected plastic reduction strategies (mostly Western markets)

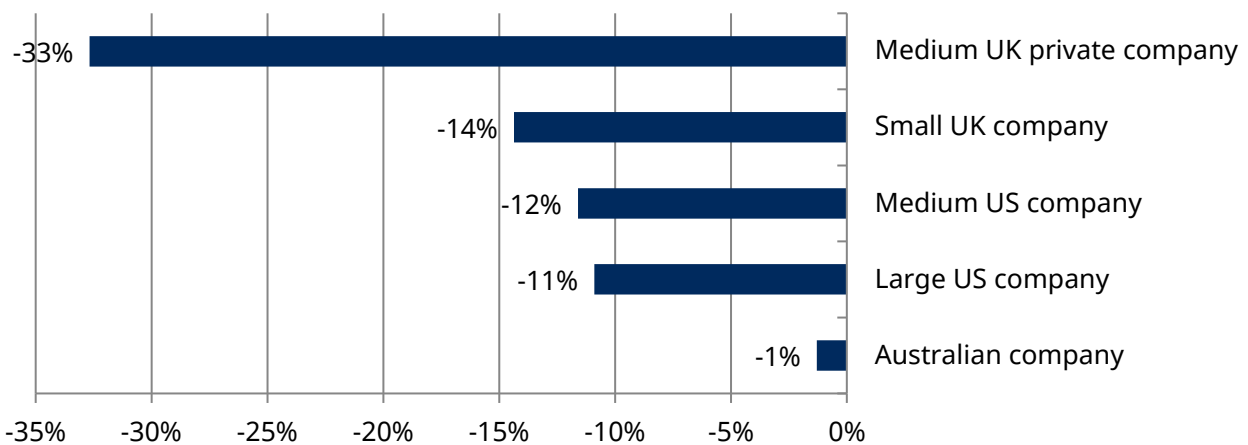
Below is a breakdown of the qualitative scores we attributed to company strategies (based on public reporting, and direct contact). It was interesting to note the companies' focus on single strategies; in order to succeed long term, we would argue that each of the three sustainable packaging pillars ought to be addressed.

Company	Recyclability targets	Bio materials/recycled content innovation	Reduction, reusability, replacement
Australian company	Strong	Weak	Strong
Small UK company	Weak	Strong	Weak
Medium US company	Weak	Neutral	Neutral
Large US company	Weak	Weak	Strong
Medium UK private company	Weak	Weak	Weak

Source: Schroders, 2018.

We have translated the above assessment into EBIT impacts by assuming a 10% hit per 'weak' strategy and 10% increase for a 'strong' strategy, applied to the plastics business of each company. This approach takes into account the potential opportunities in meeting rising demands from their consumer-facing customers.

Estimated EBIT impact for packaging companies



Source: Schroders, 2018.

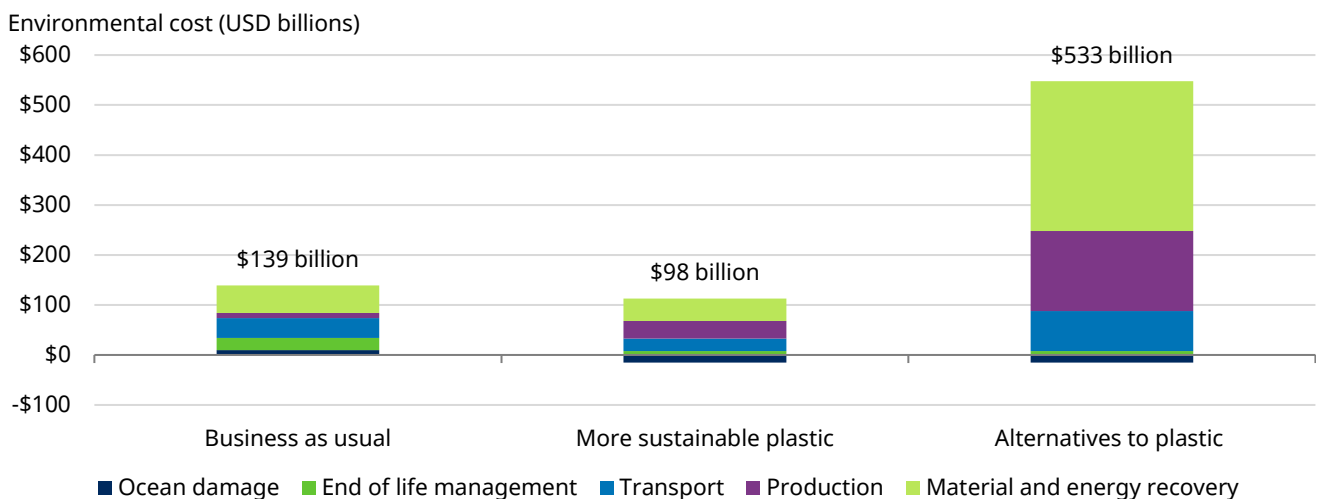
Which materials could plastic packaging shift towards?

A natural assumption is that the paper industry will benefit the most from a shift away from consumer plastic packaging. The evidence is not as straightforward.

We have seen three independent major studies to date, all of which point to an existing role for plastic for select purposes, but with reduced volumes.

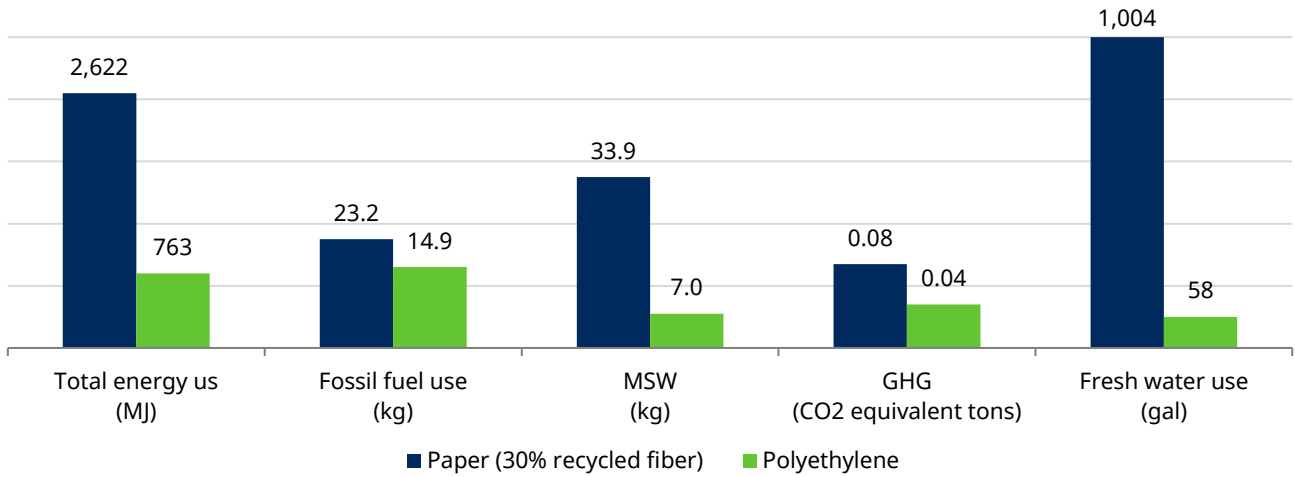
- While the effects vary by type, Trucost argues that substituting plastics with alternatives would have a higher environmental cost, due to the increased volumes needed, so making plastic more sustainably is key
- With regard to recycled and bioplastic, the Ellen MacArthur Foundation argues that producing recycled plastic has a lower carbon impact than producing virgin plastic products, but that it takes more carbon to produce bioplastic
- Boustead Consulting argues that paper grocery bags generate a higher environmental impact than plastic bags, due to their lifecycle impacts on fresh water use and increased energy to manufacture (see graph below)
- Research from Sealed Air Corp, a leader in sustainable packaging, demonstrates one of its plastic meat packaging films provides significant emissions and cost savings over regular meat packaging. It also increases shelf life and reduces food waste

The environmental cost of business as usual plastic, alternatives to plastic, and a more sustainable plastic in consumer goods



Source: Trucost, 2018.

BCAL LCA study: Environment impact comparison between polyethylene and paper grocery bags¹



Source: Boustead Consulting and Associates Ltd., BAML, 2018.

¹The figures represent impacts calculated for carrying equivalent to 1,000 paper bags. Further, it has assumed 1.5:1 plastic to paper ratio equating 1,500 plastic bags for every 1,000 paper bags in terms of their carrying capacity.

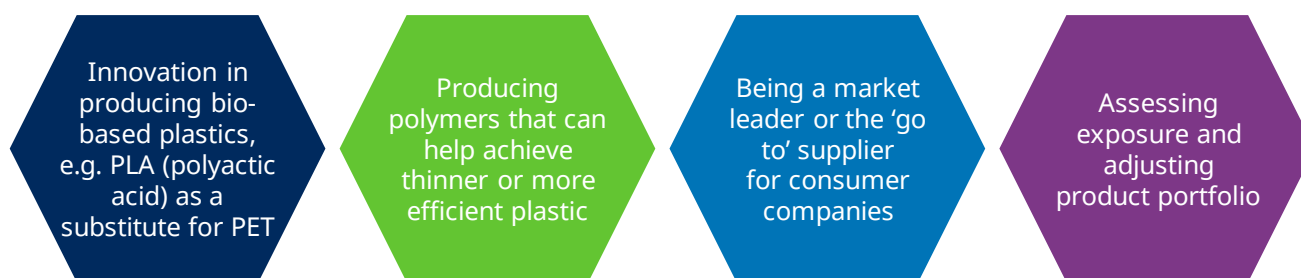
Plastic packaging will not disappear, but has to be produced more sustainably

There is an increased need for producing plastic packaging more sustainably – for example, using renewable energy in production, or producing similar packaging but with less volume of plastic used. Undertaking life cycle assessments (LCA) to understand which packaging material has the most sustainable use will be vital, as well as the need to undertake this assessment product by product.

Chemicals sector – needs to innovate

Companies such as DowDupont and LyondellBasell derive a significant proportion of their revenues from plastics for packaging, and are starting to innovate into compostable, bio-based plastics as well as different types of polymers that can achieve reductions in material used. As well as the polymers themselves, plastics also contain a blend of chemical substances. It is difficult to separate out EBIT derived from consumer-facing plastic packaging, although as manufacturers face pressure from their consumer-facing customers, the more innovative companies are likely to win market share.

How the chemicals sector could navigate the trend



Source: Schroders.

Bio-based plastics – the tide is changing

The key attraction of bio-based plastics is that they are made from renewable sources. However, bio-based plastics are not a silver bullet to the plastic conundrum – they can be hard to recycle, should be made from non-edible sources (i.e. ideally second generation biomass), and currently take more carbon dioxide to make than virgin plastic. They are also poorly defined, with little consistency on what constitutes 'bio-based' – a 'bioplastic' could also mean a plastic that is 'biodegradable' but made from fossil-based polymers. They may not decompose as perceived, and some need a separate recycling infrastructure to break down.

Importantly, they are also not yet available in huge quantities and are more expensive to make, currently 3–4 times the price of using fossil-based polymers.

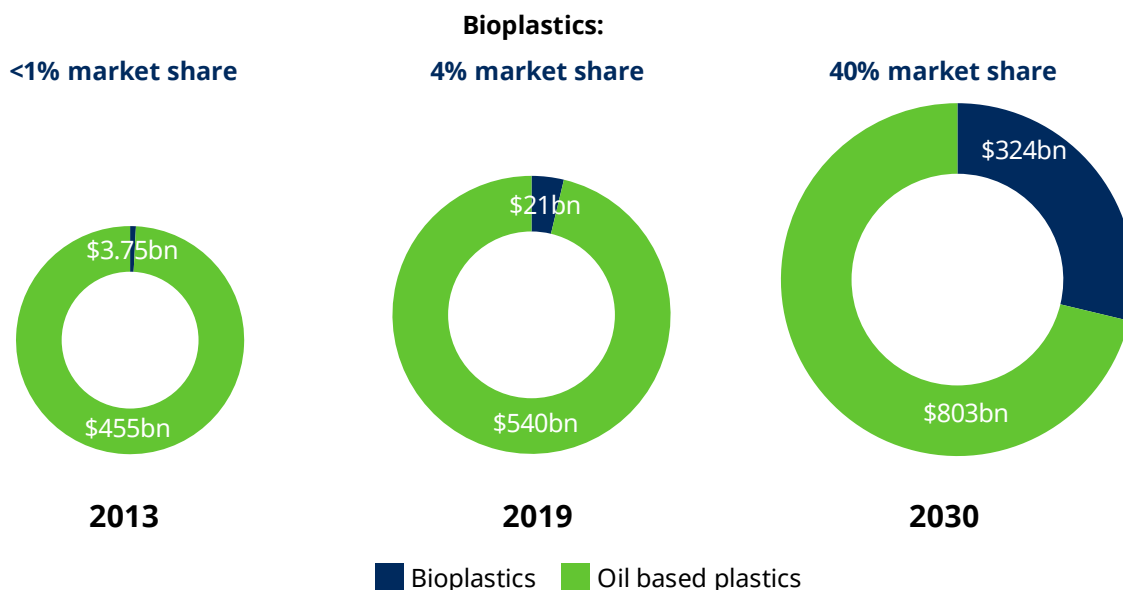
However, improvements in cellulose conversion technology used in the extraction of cellulose from non-food crops such as corn husks, grass and wood is expected to improve the quality and quantity of bioplastics available and reduce their manufacturing costs through yield improvements. Packaging producers and their clients may be prepared to pay more to meet their commitments.

Cellulose waste is the cheapest raw material in the biomass pool of resources and is expected to outrun the petroleum-based polymer market due to its competitive price point.

The bioplastics market is expected to grow

Global plastics market

- Bioplastic market expected to grow at **30% CAGR 2013–2030**
- Traditional plastic expected to grow 3% annually



Source: Grand View Research 2014, European bioplastics 2013, BCC Research 2014, Nexant Inc. 2012.

Some bioplastics may outperform their plastic counterparts

One of the more interesting bioplastics is PEF, which reportedly can reduce non-renewable energy use by 40–50% and greenhouse gas emissions by 45–55% compared to fossil-based PET – overcoming one of the key criticisms of bio-plastics. Major chemical companies are ramping up capacity via joint ventures to capitalise on this growth area.

Oil companies – plastics share of global oil consumption predicted to rise

A brief look at the oil sector revealed that 4–8% of the world's oil production is used to make plastics¹²; roughly half of this is used as material feedstock and half as fuel for the production process. This is equivalent to the oil consumption of the global aviation sector. Therefore, increased pressure on plastics production adds a negative headwind to the challenges already facing the sector, albeit on a modest scale. This research has focused on plastic packaging, but as plastic alternatives become available for other purposes (bio-based toy building blocks or keyboards), there may be further upstream impacts.

¹² [New Plastics Economy: Rethinking the Future](#), Ellen MacArthur Foundation, December 2017.

Waste management – squaring the circle

The economics of recycling has to improve

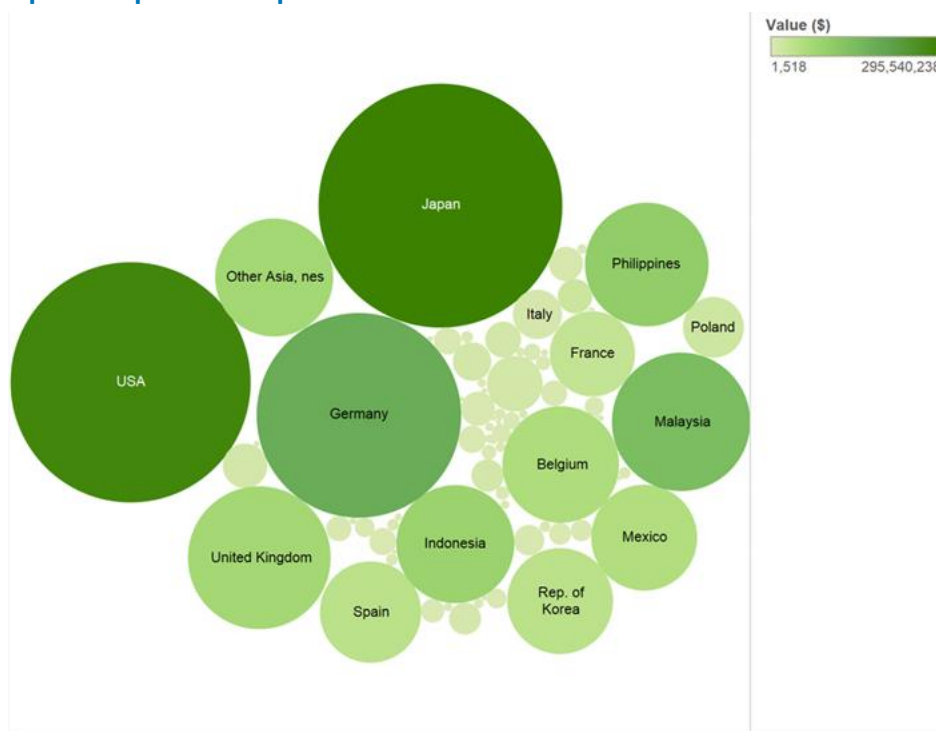
Despite the recent lack of profitability in the waste management sector, the pressures outlined in previous sections have the potential to disrupt sluggish recycling businesses.

We believe the economics of recycling will start to improve. Infrastructure is already starting to be regulated in Europe, and China's recent decision to restrict waste imports (most of which come from the US, Japan and Germany) will lead other regions to invest and innovate to revive their recycling industries. Initially governmental subsidies may be necessary to rejuvenate the industry, and any such announcements will create a clear inflection point.

The Ellen MacArthur Foundation recently estimated that after a short first-use cycle, 95% of plastic packaging material, to a value USD80–120 billion annually, is lost to the economy; it is only a matter of time before this value is recaptured.

Logically, those countries that rely on exporting their waste to China will suffer the highest waste backlogs; it is these regions that should first rejuvenate their waste industries.

Exports of plastic scrap to China 2016

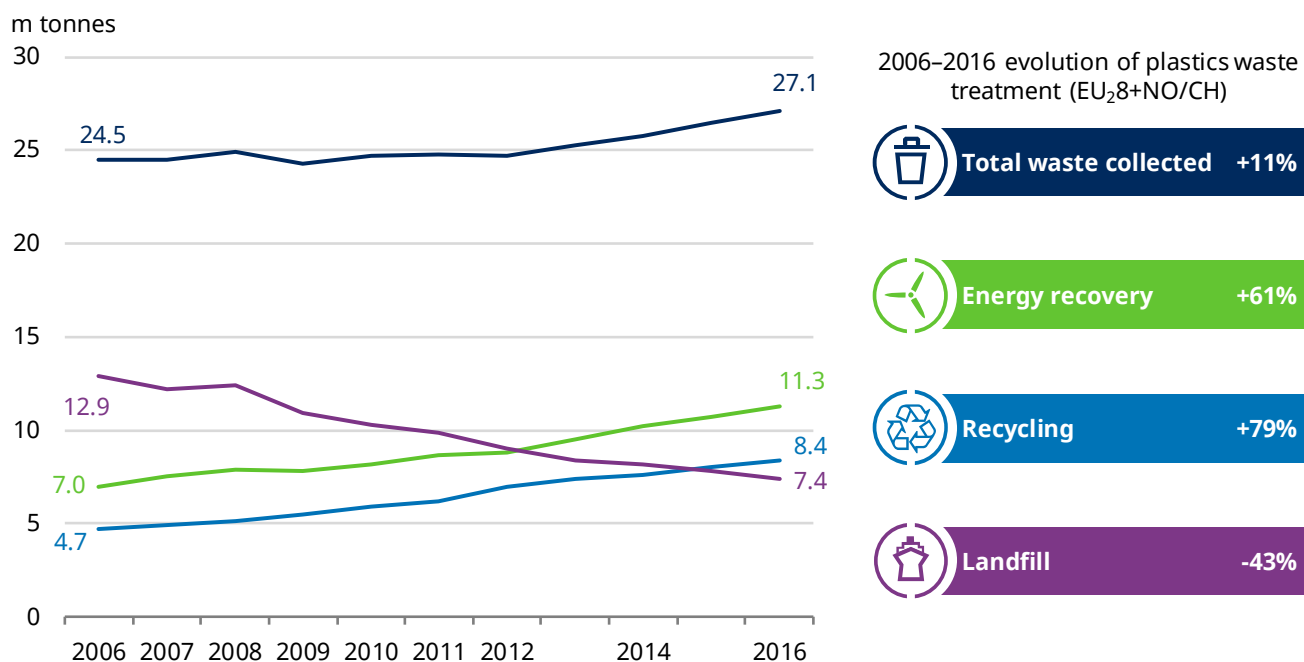


Data from UN Comtrade Database. Colour indicated sum of value in U.S. dollars; size indicates sum of weight in kilograms.

Europe is already relatively advanced in plastic waste recycling, with an almost 80% increase in the last decade, but there is further potential.

In 10 years, plastic waste recycling has increased by almost 80%

From 2006 to 2016 the volumes of plastic waste collected for recycling increased by 79%, energy recovery increased by 61% and landfill decreased by 43%.



Source: Plastics Europe, based on most currently available data.

Fragmented innovation has complicated recycling streams

While innovation in sustainable forms of plastic (e.g. compostable, bio-based) has risen, it has created something of a monster for recyclability. Given the several different types of materials used, all require different labelling, sorting and recycling systems. Product innovation has not traditionally been connected to after-use systems and infrastructure – this part of the economy is ripe for change. New robotic solutions could generate faster progress – for example, automation of recycling plants, new types of colour sorters, recycling robots, and further technological developments will be necessary as waste streams become increasingly complex. According to BAML research, 80% of surveyed industry members in the US expect fully robotic waste sorting and 72% fully robotic recycling plants by 2030¹³. Recycling robots can currently sort c.60 items/minute vs. c.40 items/minute for humans, providing potential for a 50% reduction in costs. Social media is playing an increasingly important role in communicating with customers to ensure accurate waste sorting at source and prevent waste contamination.

Could recycled plastic be a more attractive feedstock than virgin material?

Recycled plastics are not necessarily cheaper than alternatives from primary materials, but pricing is less volatile. With raw materials accounting for around 58% of the cost of producing plastic packaging, stabilising those costs could lead to efficiencies.

Whereas bio-based materials are more expensive, post-consumer recycle (PCR) is a similar price to virgin polymer (unless it has been approved for use in food containers, in which case it is slightly more expensive due to the need for more careful sorting). In theory, the PCR price should remain static as the cost drivers are collection, sorting, cleaning and re-processing, whereas the drivers for plastics are linked to oil, gas and naphtha prices. This naturally means that prices of PCR are high during oil price lows – but the lack of volatility can be helpful in securing stable supply and costs.

Another benefit is the carbon impact – the Ellen MacArthur Foundation report estimates that producing recycled plastic has a lower carbon impact than producing virgin plastic products.

¹³ Waste Primer, Bank of America Merrill Lynch, June 2018, p39.

Corporate exposure

Given fragmentation and localisation in the industry, the winners and losers are widely dispersed and challenging to mark out.

- In Europe, in the market in ‘reverse vending machines’ could proliferate. Such machines are already used widely across parts of Europe – an extension to the UK (and potentially other regions) could make manufacturers of such machines clear winners – although the impacts on kerbside recycling schemes needs to be considered
- There are signals that key European waste operators are starting to innovate in recycling. In the UK, coffee chain Costa has pledged a supplement to waste companies of £70 per tonne of coffee cups collected, and in turn, Veolia has increased coffee cup recycling by 300% over the past 12 months¹⁴. Suez has pledged support for the concept of Extended Producer Responsibility, which has been quickly gaining traction. Paper mill operators such as DS Smith are also benefiting from increased volumes of quality waste fibre from coffee cups, making more cross-sector tie-ups likely
- China will need to localise the sorting of domestic waste; we believe local players are likely to benefit. We are already seeing some food retailers across Asia implementing plastic reduction targets, for example Nestle India, ThaiBev and Hindustan Unilever all have recycling and recyclability commitments, which is likely to bring about increased demand for recycling facilities
- The US is a major exporter of waste to China – we think innovation here is unlikely to come from existing waste management companies which have not displayed much innovation to date, and more likely from small start-ups. Recent announcements from major consumer companies like Starbucks and Walmart are likely to set the ball in motion

We think that recent Chinese waste import restrictions coupled with increased political and regulatory pressure on plastic waste is creating ideal conditions for a more efficient, cost-effective and joined-up recycling industry. New geographies, new applications and new products could lead to market growth of 7-9%.

¹⁴ [Veolia press release](#), August 2018.

How is Schroders responding?

Corporate disclosure has been slow to catch up with the rapid proliferation of political activity, regulation and consumer awareness of plastic packaging. Throughout 2018, we have been contacting companies across the consumer, materials and waste management sectors. This work will continue into the future. A sample of engagement topics for each sector is below, although the exact questions vary according to business structure. Given the global scope of holdings, we are establishing an understanding of regional responses and trends.


Sector	Sample engagement topic
All	<ul style="list-style-type: none"> – Involvement in industry-wide plastic management pacts such as the Plastics Pact – Risk assessment and analysis of trends – Public policy position – Quantification of positive or negative impact of trend on business segments
Beverages, food producers, food retailers	<ul style="list-style-type: none"> – Impact assessment e.g. different types of plastics used; journey to transition – Life-cycle assessments including carbon and water impacts; engagement with suppliers – Involvement in reverse vending, position on 'Extended Producer Responsibility' – Labelling commitments; industry collaboration – Cost analysis of single use plastic bans or taxes – Engagement with customers; understanding consumer demands – Policy on refillables (bottlers only) – Transition from plastic to other packaging types – Quantitative targets on recycled content, recyclability, and reduction in plastic packaging volumes
Restaurants	<ul style="list-style-type: none"> – Targets and commitments, transition to other types of packaging – Cost assessment; cost/benefit analysis of switching – Engagement with customers – Strategy on green/bio-based materials and how these should be disposed of – engagement with waste managers
Packaging companies	<ul style="list-style-type: none"> – Life-cycle analysis of different plastic types (and versus other types of packaging) – Quantitative targets on reduction of plastic volumes; improvements in recyclability; and recycled content – Engagement with suppliers – Identifying products at risk of phase-out; identifying replacements
Chemicals	<ul style="list-style-type: none"> – Analysis of market trends, engagement with customers – Revenues derived from different plastic types and from plastic packaging – Strategy/research on bio-based plastics and life cycle impacts; type of feedstock used; JVs and research partners – Identifying opportunities in product development to reduce plastic use
Waste management	<ul style="list-style-type: none"> – Impact of China waste import ban on business – Review ability to recycle/dispose of different products (e.g. mixed plastic, compostables); future-proofing recycling equipment and facilities – Engagement with the industry and with packaging developers/chemicals companies for a more joined-up/closed loop approach to recycling



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