

## SHAPING THE CIRCULAR ECONOMY: TAXING THE USE OF VIRGIN RESOURCES

### The case for a plastic packaging tax in the UK

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#### HIGHLIGHTS

Assuming the tax cost is transferred to households by packaging producers and retailers, the average impact of plastic packaging tax would be in the range of 7p per week per household

#### KEY WORDS

Circular Economy  
Carbon Tax  
Policy  
Natural Resources  
Resources Tax  
Plastics Tax

## Abstract

The 'circular economy' refers to an economy's ability to grow while resource use is declining; the decoupling of economic growth from resource consumption and pollution. The business case for a transition to a circular economy is compelling both in terms of economic outputs and environmental improvements, but this is not always enough for such a transition to take place. If resources are cheap, the incentive to run a throw-away society is higher, making it difficult to break away from the current polluting economic trajectory to giving materials a second, third and fourth life. Taxes on natural resources can encourage the substitution of secondary and recycled materials for virgin materials.

Here, we consider the case of the proposed plastic packaging tax in the UK that will apply to all plastic packaging with less than 30% recycled content which is manufactured in the UK, as well as unfilled packaging imported into the country. We evaluate the cost of this tax, based on the price difference between recycled and virgin plastic, for all plastic packaging to reach the target of a minimum of 30% recycled content. Assuming the tax cost is transferred to households by packaging producers and retailers, the average impact of plastic packaging tax would be in the range of 16p per week per household (or 7p per week considering projected levels of recycled content in packaging) for all plastic packaging to reach the target. The tax will provide assurance to the recycling value chain and stimulate new investment in domestic recycling infrastructure, as well as an incentive for the packaging sector to look towards green product design and resource security.

## Introduction

In the traditional modern industrialised economy, natural resources are mined and extracted, turned into products in manufacturing systems driven by heavy industrial growth and resource-intensive infrastructure and finally discarded after consumption or use. This “take-make-dispose” approach (Figure 1) results in pollution and waste and puts resource security at risk.

Meeting the needs of a growing world population with a finite resource base on a planet that is already under stress from overconsumption will come down to an economy’s ability to grow while resource use is declining. Emerging scenarios and calculations demonstrate that the benefits delivered from resource efficiency alone will not address the demands of an ever-growing production and consumption of raw materials and energy. These scenarios dictate the need to decouple economic growth from resource consumption (Voulvoulis et al., 2013; Voulvoulis, 2018).

The technological potential for decoupling is large and the business case for a transition to a circular economy is compelling, both in terms of economic outputs and environmental improvements (Schandl et al., 2016). However, despite most circular economy opportunities having a sound underlying profitability, there are often barriers limiting further scale-up and preventing momentum (Kirkman and Voulvoulis, 2017). Policymakers can play an important role in helping businesses overcome these barriers (Voulvoulis, 2015).

For example, environmental taxes directly address market failure by “pricing in” environmental costs. A well-designed tax can increase the price of a product or activity to reflect the cost of the environmental harm that it imposes on others. The cost of the harm to others – an “externality” – is thereby internalised into market prices. Thus, it is ensured that consumers and firms take these costs into account in their decisions (OECD, 2011).

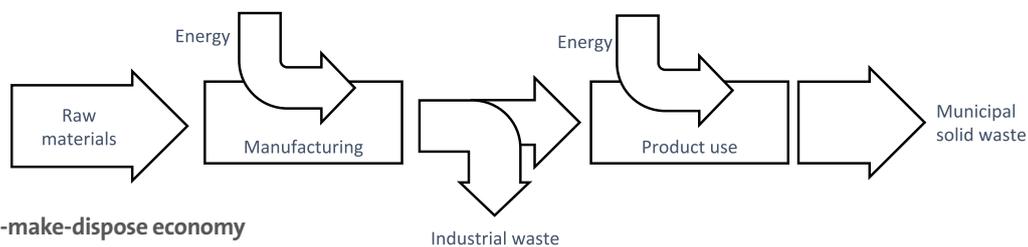


Figure 1. The take-make-dispose economy

### Taxes on virgin natural resources

The use of virgin material taxes can be an efficient method to encourage the use of recycled materials (and ultimately reduce waste and emissions) (Pearce and Turner, 1993; Conrad, 1999; Miedema, 1983). Targeting the relative price difference between virgin and recycled materials can increase the need for recycling and efficiencies in general.

Recycling targets alone do not result in recovery of valuable materials, as collecting materials for recycling does not guarantee they will be used again. Furthermore, policy focus on collection of recyclables does not encourage products to be designed or collected in ways that make recycling viable and straightforward. For a circular economy to become a reality, end markets must be available for the recycled materials that the recycling and reprocessing sector produce, reducing the economy’s dependency on natural resources.

A simple and effective way to achieve this can be based on recycled content requirements. Such mandates, which require that a certain percentage of recycled material be included in certain new products and packaging, have been used in the US and other parts of the world. California’s mandate for recycled content for beverage containers was introduced in 2018 and similar mandates for plastic film used for refuse bags and rigid non-food containers have been in place since the 1990s. Denmark has also applied a tax on the extraction of domestic raw materials such as gravel, stone, clay and chalk since the 1990s, leading to an increase in recycled construction & demolition waste from 12% in 1985 to 94% in 2004. A tax on packaging and raw materials initially introduced in 1978, with several subsequent revisions, also ensures higher rates applied for virgin than for recycled paper & board and plastics in packaging materials (Söderholm, 2011).

### The case for a plastic tax in the UK

Plastics are inexpensive, lightweight and durable materials, which can readily be moulded into a variety of products that find use in a wide range of applications. However, their production, usage and disposal generate several environmental problems. Around 4% of world oil and gas production, a non-renewable resource, is used as feedstock for plastics and a further 3–4% is expended to provide energy for their manufacture (Hopewell et al., 2009). As is widely known substantial quantities of end-of-life plastics are accumulating in the oceans and as debris in the natural environment, resulting in both environmental damage and waste management issues (Geyer et al., 2017). While recycling is one of the most important actions currently available to reduce these impacts, providing opportunities to reduce oil usage, carbon dioxide emissions and the quantities of waste requiring disposal, the more than 1.5m tonnes of plastic packaging used in consumer products in the UK each year are mostly made from virgin rather than recycled plastic. Plastic packaging accounted for 44% of plastic used in 2017 in the UK and 67% of the plastic waste produced (2.26M tonnes).

Given the failure of the market to incorporate the environmental and end-of-life cost burdens into the price of products, commodity prices continuing to stay low and with the ratio of plastic packaging in waste continuing to grow, there is a need to ensure recycling remains both economically and environmentally sustainable. Current policy measures such as the landfill tax, the producer responsibility regime and recycling targets, have to some extent supported the secondary plastics market, but have not produced a stable enough environment to attract the investment needed to develop the market and generate sustained demand or deliver optimum environmental performance (see box 1).

Demand for recyclables is driven by raw material procurement decisions made by product and packaging suppliers and their customers. While using recycled content allows producers to meet corporate social responsibility goals, including greenhouse gas reduction targets, the key variable that determines the amount of secondary material used in production is price. When oil prices are moderate to high, secondary materials are attractive to producers but if the price of energy or raw materials is low, the attractiveness of secondary material inputs diminishes, with businesses going for virgin. It is for this reason that voluntary initiatives among product manufacturers, although laudable and very important, cannot be the sole path towards the greater use of recycled materials. Significant variations in the price of new plastic over time also discourage businesses from committing to using recycled plastic in the long term.

The UK is currently considering the introduction of recycled content targets to support the use of secondary plastic in domestic production and manufacturing processes and a future plastic packaging tax as a flat rate tax on packaging to support this. Under the proposals, the plastic packaging tax will apply to all plastic packaging with less than 30% recycled content which is manufactured in the UK, as well as unfilled packaging imported into the country. Considering that the main reason for not using recycled plastic is that virgin plastic costs less, the proposed tax would have to compensate for their price difference to make recycled plastic competitive. With the price difference between recycled and virgin plastic currently estimated around £500 per tonne, the minimum tax level needed to make costs to industry similar between using 100% virgin plastic packaging and packaging with a minimum 30% recycled plastic content comes to £150 per tonne (0.015 pence per gram).

## BOX 1: THE CHALLENGE OF RECYCLING PLASTICS

Plastics are derived from by-products of petroleum refining and natural gas processing. Therefore, when oil prices dip, the price of plastic resin follows. The price of plastics is volatile – not only because it depends heavily on the price of oil, but also because it's affected by other market conditions, such as capacity constraints and stockpiling by users. Over the past five years, the price of plastic has varied from £850 to £1300 per tonne. These variations have the potential to materially affect the bottom line and directly affect the competitiveness of recycled plastics. In fact, oil prices are currently so low that it's cheaper for manufacturers to buy virgin plastic than it is for them to buy recycled plastic feedstock, despite its lower environmental impacts.

The introduction of "Operation Green Fence" and "National Sword" has led to China only importing uncontaminated and high-quality plastics, which has increased the price of recycled plastic at a time when the price of crude oil makes them even less competitive.

Several recycling companies had already collapsed after being squeezed between a slump in global oil prices and a supermarket price war leading to the price of reprocessed plastic in the open market being between £300 and £500 per tonne more expensive than virgin plastic.

If the tax cost (£230 million – see Appendix 1) was transferred by the packaging producers and retailers to UK households, the average impact of the plastic packaging tax would be 16p per week per household. However, this cost is expected to be even lower, considering that 55% of packaging would meet the 30% recycled plastic content stipulation even without any tax, according to Ernst & Young's analysis for the British Plastics Federation. In this case, transferred to households, the average impact of the plastic packaging tax would be 7p per week per household for all packaging in the UK to meet the target (See Appendix 1).

However, it is unlikely that companies, rather than increase the inclusion of non-virgin materials in their products, would choose not to act and just pass on the cost to consumers. To do so would be an unwise move, as competitors who do jump in with both feet will be offering consumers a better product at a similar or lower price in comparison. In fact, evidence points to the opposite, with many leading brands, retailers, and packaging companies already committing towards 30% average recycled content across all plastic packaging (See Appendix 2).

Ultimately, the problem of plastics is not so much one of waste, but one of production. The solution to a world drowning in plastic refuse requires questioning the need for plastics and reducing their manufacturing in the first place. Increasing the recycled content of plastics exposes the current rhetoric: Blame not the production, for what is produced is of vital importance to the world (especially those in the developing world), but call for everyone to come together in addressing the problem of the waste (Wilkins, 2018). Recyclers did not create the plastic waste crisis, it is the prolific, ever-increasing production of plastics that needs to be addressed. Voluntary industry initiatives are often a common delay tactic for industries wishing to avoid binding regulations. On the contrary, increasing the levels of recycled content in plastic packaging can reduce both the need for manufacturing plastics and the amount of plastic wastes produced. The future plastic tax will be a key part of the solution as it is expected to enable an additional two million tonnes of plastic packaging to be recycled in the UK and to fulfil 71 per cent of UK manufacturing's raw material demand (Peake et al., 2018). It should also drive the UK circular economy by creating several thousands of jobs in the recycling industry.

## References

- Baker, R. (2017) Reformation or Re-formation? Richard Baker's Blog. May 6 2017. <https://bakerbalham.wordpress.com/2017/05/06/reformation-or-re-formation/> [Accessed: 15 August 2017]
- Conrad, J.M. (1999) Resource economics. Cambridge University Press.
- Ellen MacArthur Foundation (2015) Delivering the Circular Economy: A Toolkit for Policymakers. [https://www.ellenmacarthurfoundation.org/assets/downloads/publications/EllenMacArthurFoundation\\_PolicymakerToolkit.pdf](https://www.ellenmacarthurfoundation.org/assets/downloads/publications/EllenMacArthurFoundation_PolicymakerToolkit.pdf) [Accessed: 5 August 2017].
- European Commission (2014) Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Towards a Circular Economy: A Zero Waste Programme for Europe. Brussels, 2.7. COM(2014) 398 final
- European Environment Agency (2015) Decoupling demystified. Resource efficiency. European briefings. 18 Feb 2015
- European Parliament (2015) Opinion of the Committee on Industry, Research and Energy for the Committee on the Environment, Public Health and Food Safety on resource efficiency: moving towards a circular economy. Committee on Industry Research and Energy. (2014/2208(INI) AD\1062519EN.doc
- Frerot, A. (2015) A global carbon tax would create a vital incentive for businesses to work against climate change. CITYA.M Newsletters <http://www.cityam.com/230123/global-carbon-tax-would-create-vital-incentive-businesses-work-against-climate-change> [Accessed: 15 August 2017]
- Geyer, R., Jambeck, J. R. & Law, K. L. (2017). Production, use, and fate of all plastics ever made. *Sci Adv* 3, e1700782, doi:10.1126/sciadv.1700782.
- GOV.UK (2017) Environmental taxes, reliefs and schemes for businesses. Available at: <https://www.gov.uk/green-taxes-and-reliefs> [Accessed: 5 August 2017]
- Hopewell J, Dvorak R, Kosior E. Plastics recycling: challenges and opportunities. (2009). *Philos. Trans. R. Soc. B Biol. Sci.* 364:2115–2126. doi: 10.1098/rstb.2008.0311.
- Miedema, A.K., (1983) Fundamental economic comparisons of solid waste policy options. *Resources and energy*, 5(1), pp.21-43.
- OECD (2011) Environmental Taxation: A Guide for Policy Makers. Organisation for Economic Co-operation and Development. <https://www.oecd.org/env/tools-evaluation/48164926.pdf> [Accessed: 10 August 2017]
- Orange, R. (2016) Waste not want not: Sweden to give tax breaks for repairs. *The Guardian*.
- Peake L., Brandmayr L., Klein B. (2018) Completing the circle Creating effective UK markets for recovered resources, published by Green Alliance, June 2018 ISBN 978-1-912393-08-4
- Pearce, D.W. and Turner, R.K. (1993) Market-based approaches to solid waste management. *Resources, Conservation and Recycling*, 8(1-2), pp.63-90.

- Schandl, H., Fischer-Kowalski, M., West, J., Giljum, S., Dittrich, M., Eisenmenger, N., Geschke, A., Lieber, M., Wieland, H.P. and Schaffartzik, A. (2016) Global Material Flows and Resource Productivity. A Report of the Working Group on Decoupling of the International Resource Panel.
- Söderholm, P. (2011) Taxing virgin natural resources: Lessons from aggregates taxation in Europe. *Resources, conservation and recycling*, 55(11), pp.911-922.
- United Nations Department of Economic and Social Affairs (2015) World population projected to reach 9.7 billion by 2050. 29 July 2015. <http://www.un.org/en/development/desa/news/population/2015-report.html> [Accessed: 6 August 2017]
- Veolia (2015) Veolia calls for corporate carbon tax. Available at: <https://www.veolia.co.uk/media/media/veolia-calls-corporate-carbon-tax> [Accessed: 31 July 2017]
- Voulvoulis, N. Water reuse from a circular economy perspective and potential risks from an unregulated approach, *CURRENT OPINION IN ENVIRONMENTAL SCIENCE & HEALTH*, 2 (2018), 32-45.
- Kirkman, R and Voulvoulis, N. The role of public communication in decision making for waste management infrastructure. *JOURNAL OF ENVIRONMENTAL MANAGEMENT*, 203 (2017), p.640-647.
- Voulvoulis, N. The potential of water reuse as a management option for water security under the ecosystem services approach, *DESALINATION AND WATER TREATMENT*, 53 (12) (2015), 3263-3271.
- Voulvoulis, N, Skolout, JWF, Oates, CJ and Plant, JA. From chemical risk assessment to environmental resources management: the challenge for mining, *ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH*, 20 (2013), 7815-7826.
- Zero Waste Europe (2012) Zero waste & taxes – shift from labour to resource use. Empowering our communities to redesign. <https://www.zerowasteurope.eu/2012/03/zero-waste-taxes-getting-the-prices-right/> [Accessed: 7 August 2017]

### Appendix 1 : Assessment of plastic tax financial impact on UK household

For all plastic packaging to reach the target of a minimum of 30% recycled content, and with the price difference between recycled and virgin plastic currently estimated around £500/tonne (recycled plastic = £1500/tonne ; virgin plastic = £1000/tonne), the revenue that the tax will need to generate can be estimated.

The minimum tax level needed to make costs to industry similar between using 100% virgin plastic packaging and having a minimum 30% recycled plastic used, therefore comes to £150 per tonne (0.015 pence per gram) of packaging produced ((£1500/tonne\*30% + £1000/tonne\*70%) - £1000/tonne = £150/tonne = 0.015 p/g). If the tax cost (£230 million) was transferred by the packaging producers and retailers to UK households, the average impact of the plastic packaging tax would be 16p per week per household for a 30% increase of recycled content in packaging to be achieved<sup>1</sup>.

However, this cost is expected to be even lower, considering the proportion of packaging already using more than 30% recycled plastic today. According to Ernst & Young's analysis for the British Plastics Federation (BPF), the proposed tax would increase the proportion of packaging using at least 30% recycled plastic from a quarter in 2017 to three quarters of all packaging on the market in 2022. With 25% of all plastic packaging produced in 2017 already meeting the 30% recycled content criteria, this was projected to rise to 55% in 2022, even without the new tax being introduced (Figure 2)<sup>2</sup>.

In this case, the minimum tax level needed to make costs to industry similar for the 45% of the industry using 100% virgin plastic packaging to having a minimum 30% recycled plastic used (Figure 3), would cost £150 per tonne (0.015 pence per gram), to a total of £103 million. Transferred to households, the average impact of the plastic packaging tax would be 7p per week per household for a 30% increase of recycled content in packaging to be achieved for the remaining 45% of the packaging in the UK to meet the target<sup>3</sup>.

<sup>1</sup>The total UK plastic packaging POM for consumers in 2017 was 1,532,000t and the number of households in the UK in 2017 was 27.2 million. So, the average plastic packaging consumption per households is 1,532,000t/27.2 mil = 56.3 kgs/year, so the average impact of plastic packaging tax on UK household would be: £8.44 per year or 16p per week.

<sup>2</sup>BPF survey data revealed that 25% of all plastic packaging produced in 2017 already meets the 30% recycled content criteria. If no tax is introduced, this was projected to rise to 55% in 2022. But should the tax go ahead, the figure would leap to 75% by 2022.

<sup>3</sup>If 75% of the sector would not meet the 30% target, the tax would need to raise £173million coming to 12p per week per household, allowing for the tax to cover the price difference for the remaining 75% to reach the target.

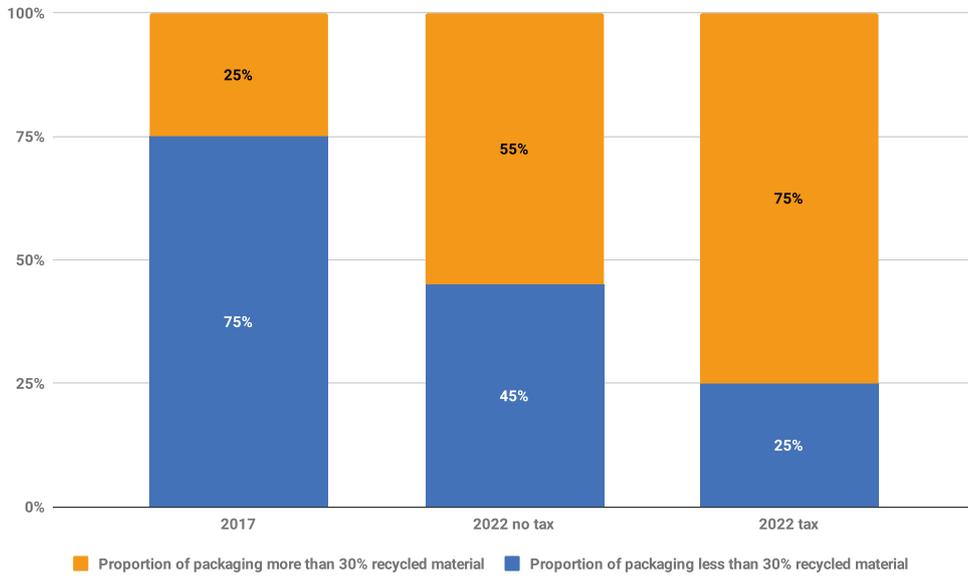


Figure 2. Share of packaging with less and more than 30% recycled content, assuming £500 per tonne tax<sup>4</sup>.

**Total UK plastic packaging POM for consumers in 2022 (at 2017 level)**

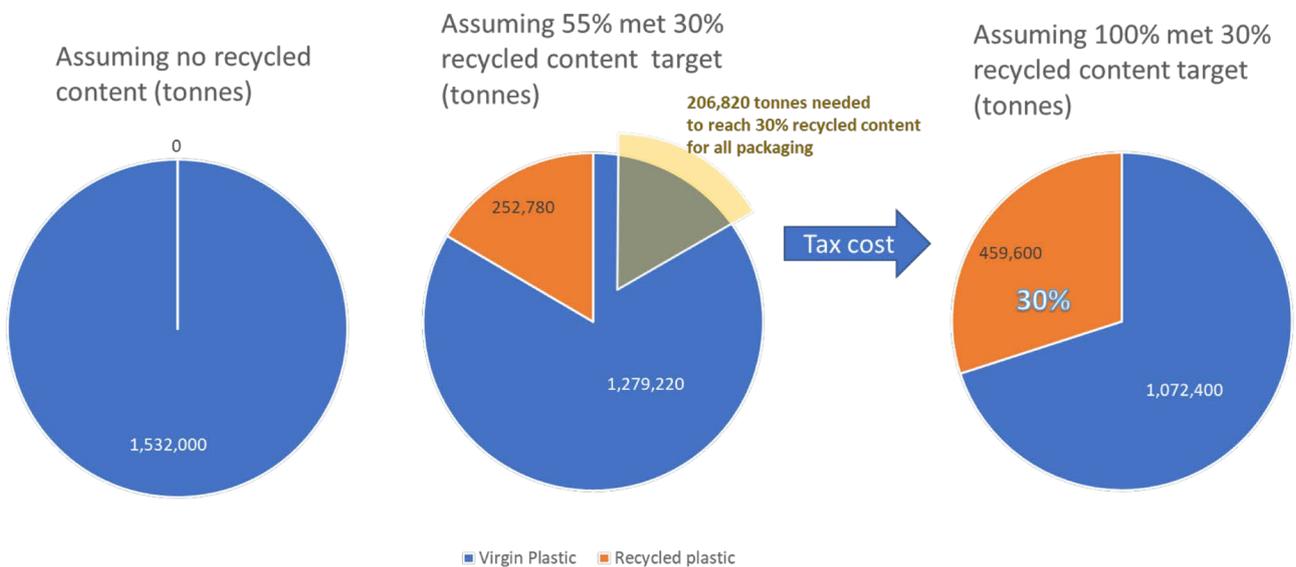


Figure 3. The tax will need to cover the cost of 206,820 tonnes been sourced from recycled plastics in order to meet the target in 2022.

<sup>4</sup> Slide from Ernst & Young's presentation to the British Plastics Federation. <https://unearthed.greenpeace.org/2019/05/10/industry-calls-on-philip-hammond-to-weaken-his-planned-plastics-tax/>

**Appendix 2 : Rising Demand in Recycled Content (rPET) and examples of leading brands, retailers, and packaging companies' commitments and achievements towards 30% average recycled content across all plastic packaging**

COMPANY	COMMITMENT / GOAL
Procter & Gamble	Goal to have 99% of all hair care bottles sold in Europe converted to include 25% post consumer recycled content by the end of 2018
Danone/ Evian	Announced that it will make all of its plastic bottles from 100% recycled plastic by 2025
Ecover	Has set a goal to use 100% recycled plastic in all bottles by 2020 and to introduce recycled content into its caps from 2018
Nestle	Goal to increase its use of recycled plastics, including the use of 25% rPET in its bottles across Europe by 2025
Coca Cola	Goal to have 50% recycled content in its packaging by 2030
Unilever	Goal to increase use of recycled plastic content in its packaging to at least 25% by 2025 (compared to 2015)
Werner & Mertz	Has committed to use 100% recycled plastic in at least 70 million bottles/year as of 2017

### Achievements

- In January 2018 Ecover launched a new 100% recycled plastic (PCR), recyclable, washing-up liquid bottle. The bottle is made from transparent, 100% recycled PET and mostly comes from used soft drink or water bottles. The rest of Ecover's bottles are made from 25% recycled plastic (either PET or HDPE) and 75% plant plastic, which is made from renewable sugarcane.
- In October 2018 Ecover trialed recycled plastic in its caps for the first time. Introducing 50% post-consumer recycled polypropylene plastic in 200,000 of its caps in Europe in October 2018. Most caps are made from virgin polypropylene plastic. By starting to use recycled polypropylene, Ecover wants to help create an economic demand for recycling it.
- All Innocent bottles contain a minimum of 30% recycled plastic and their new smoothie bottle contains 50% recycled plastic and 15% plant plastic. This is their next major step towards having a completely renewable bottle (made only of recycled and plant plastic) by 2022.
- Charpak's clear and black recycled PET packaging contains 50% post-consumer waste and up to 40% post industrial waste.
- In 2017, Procter & Gamble launched the Fairy Ocean Plastic bottle made 100% from post-consumer recycled plastic and ocean plastic. Over 320,000 Fairy Ocean Plastic bottles were made in this material.
- Highland Spring has launched a trial bottle made from 100% recycled plastic.
- Aldi have saved 139 tonnes of virgin plastic per year by using 95% recycled plastic in their pasta pots.
- Tesco flavoured water bottles have been reduced in weight and now have a 25% recycled content (rising to 51% soon). Over 540 tonnes of plastic per annum have been removed.