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Corporate Sustainability Lessons Learned

Going circular: Towards 100% reuse and recycling

PwC in the UK

Second edition
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Our *Lessons Learned* publications are designed to share our experiences of implementing our sustainability strategy, in order to allow others to learn from our successes – and our mistakes.

Our strategy includes actions to alleviate pressure on materials, water and the climate. Having gone 'zero to landfill' in 2012, we're now working towards an aspirational goal to reuse or recycle 100% of our waste by 2017, as well as exploring fully 'circular economy' solutions, in the longer term.

This *Lessons Learned* document, first published in November 2015, is part of a new series focusing on that 'going circular' story. This second edition is updated to reflect new solutions introduced over the past few months, and better data. We hope it will provide a useful resource for others looking to take a similar approach.

What do we mean by the 'circular economy'?

The 'circular economy' (see Chart 1) is a conceptual model used to underpin decision-making for sustainable development. It's intended to replace the existing, linear, 'take-make-dispose', global system of production and consumption, by which we extract resources (by mining or growing them), and then manufacture, transport and use products, before disposing of them. This system has been enabled by a century of declining commodity prices but is no longer viable.

First, the global population is set to rise from seven to nine billion by 2050, putting pressure on global stocks of raw materials. Second, the upstream stages of primary extraction and manufacturing often require large quantities of energy and water (known as embodied carbon and water) which could be avoided by using resources more efficiently. Third, traditional methods of waste management are not always well-regulated and can cause pollution, or – at least – lock materials away in landfill, where they are no longer available to the economy.

In contrast, the circular economy is driven by innovation and entrepreneurship. It involves change at each stage of the value chain:

- Improving extraction and production processes for greater efficiency, or switching to the use of alternative, renewable materials;
- Reducing consumption by, for example, encouraging consumers to buy products that are more durable, or moving away from products towards services (i.e. providing customers access to products when needed rather than having to own them): this shift is being enabled through new technology, and there are already established models for peer-to-peer accommodation, car sharing, and clothing rental via 'sharing' platforms[1];
- Moving to systems where products are repaired, reused or remanufactured to give them a second-life; and
- Improving waste collection and recycling systems so that materials are recovered in a way that enables them to be put back into the economy as useful inputs.

1. pwc.co.uk/issues/megatrends/collisions/sharingeconomy

Chart 1
'Going circular' explained

The circular economy is often depicted as a series of loops, each representing a different way of managing products that are no longer required by their owners (because they are damaged, defective, or simply unwanted). The loops represent a hierarchy. The closer to the centre the loop is, the less waste and environmental pollution created and the more economic value retained in the product or materials.

1. Recycling
Recovering materials from end-of-life products for use as raw materials in another process, excluding incineration to generate energy. May lead to materials of the same quality, lower quality (down-cycling) or higher quality (upcycling). For organic matter may refer to composting or anaerobic digestion.[1]

2. Remanufacturing
Disassembling products at the component level rather than into separate materials, replacing broken or out-dated parts to make a new product for sale or lease. This avoids a new product having to be manufactured.

3. Reuse
Selling or donating a product in its original form, or with little change, which avoids a new product having to be manufactured. May also include redistribution of unwanted food.

4. Maintenance
Extending the life of a product with its first owner, either via a repair service or making it easier for users to repair it themselves. This delays the purchase of a replacement product.

5. Redesign
Developing products that use fewer materials or have a smaller environmental footprint, that are designed to be more durable, or to be offered as a service through a leasing or take-back model. Also includes adaptations to make products easier to repair or disassemble at end of life. Aims to tackle the most material impacts, based on lifecycle analysis.

1. Anaerobic digestion is a process whereby waste organic matter, such as food or garden waste, is converted into digestate (which can be used as a fertiliser on farmland) and biogas (which can be used to generate clean energy)

Why 'go circular'?

The circular economy requires a change in mindset towards 'materials stewardship', focusing on the protection and renewal of resources. It's a timely concept, as it will not only help nations and businesses to improve their resource resilience, but will foster economic growth, and create new jobs. This is true globally, and also in the UK.

But why would PwC want to 'go circular'? Well, there are three main reasons:

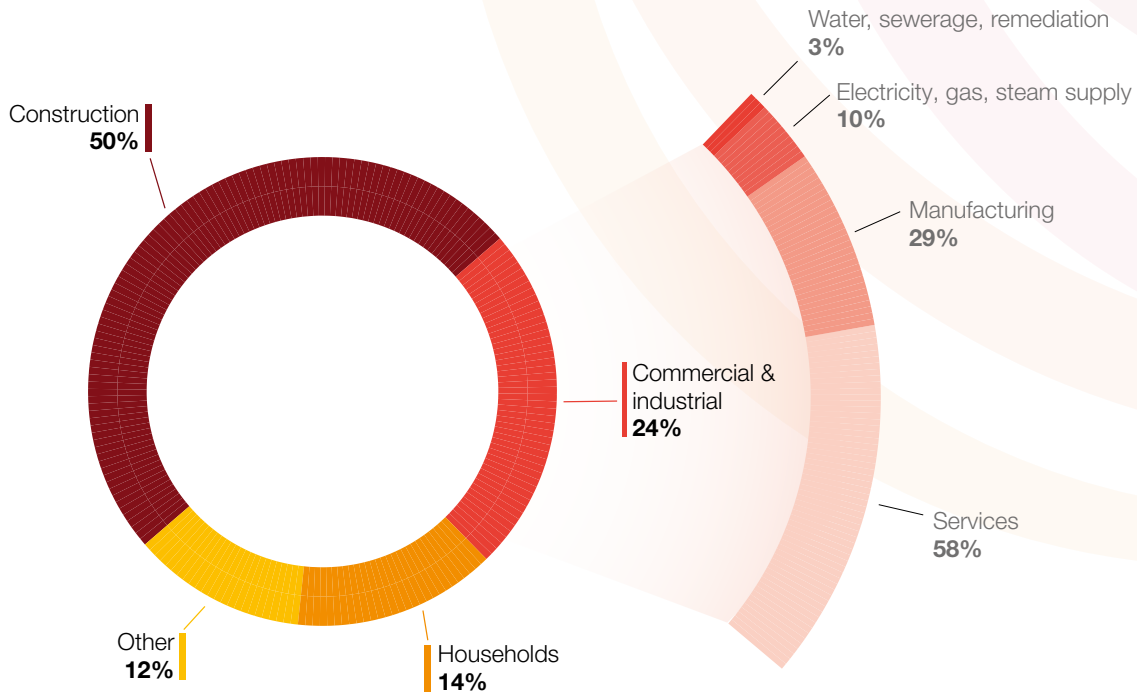
Walking the talk

The circular economy is a compelling vision of the future and an area where business can make a big impact. This means that it's an opportunity for us. Our Sustainability and Climate Change practice includes experts who are helping several leading clients to innovate, adopting circular solutions by incorporating them into their business models and operational processes. Wherever possible, we try to apply the same best practice advice that we recommend to our clients to ourselves, and circular economy principles are no exception.

Tackling environmental issues

Carbon emissions, waste and water are important global issues so our sustainability strategy includes actions to reduce our negative impacts, both in our operations (as measured in our sustainability scorecard[1]) and in terms of our total impact[2]. It's easy to assume that the majority of the UK's waste emanates from households, when in fact that only represents 14% of the total, with businesses (commercial and industrial) accounting for another 24% and construction (much of which is commissioned by businesses) for 50% (see Chart 2). And, even though our sector – professional services – is itself resource-light, we procure services from companies with a bigger waste footprint. As a result, we're able to influence considerable upstream impacts, and feel it's important to play our part, pioneering new processes and contributing to new markets.

Chart 2
UK waste, by type (with commercial & industrial breakdown)



Source: Eurostat 'Generation of waste by economic activity and hazardousness (2012)' dataset

Stakeholder expectations

Our business depends on our people and our reputation, so it's important that we meet the expectations of our stakeholders, wherever possible. Our clients expect us to have high standards in relation to resources and waste, and our people, too, have strong views on the topic: waste is a visible and symbolic workplace issue, which they expect their employer to be tackling. Business is also expected to play its part in achieving government targets, whether at EU, UK or city level, while NGOs expect us – as a big business – to be doing our bit, too.

1. www.pwcannualreport.co.uk/files/PwC-UK-sustainability-performance-and-commitments-2015.pdf
2. 'Total impact' refers to a methodology created by PwC to measure the impact on society, good or bad, by business operations or specific decisions. It includes economic, tax, environmental or social impacts. For more on the methodology, see www.pwc.com/totalimpact. For PwC's own impacts, see www.pwc.co.uk/who-we-are/corporate-sustainability/valuing-our-total-impact.html.

"The professional services sector has relatively low direct impacts, so the challenge is probably to work jointly with others, such as clients or suppliers, to reduce collective impacts."

Dustin Benton, Green Alliance

"I want to do my bit for the environment, so it's important that I can recycle at work."

Adam Blacklay, employee, PwC

Where we've come from and where we're going

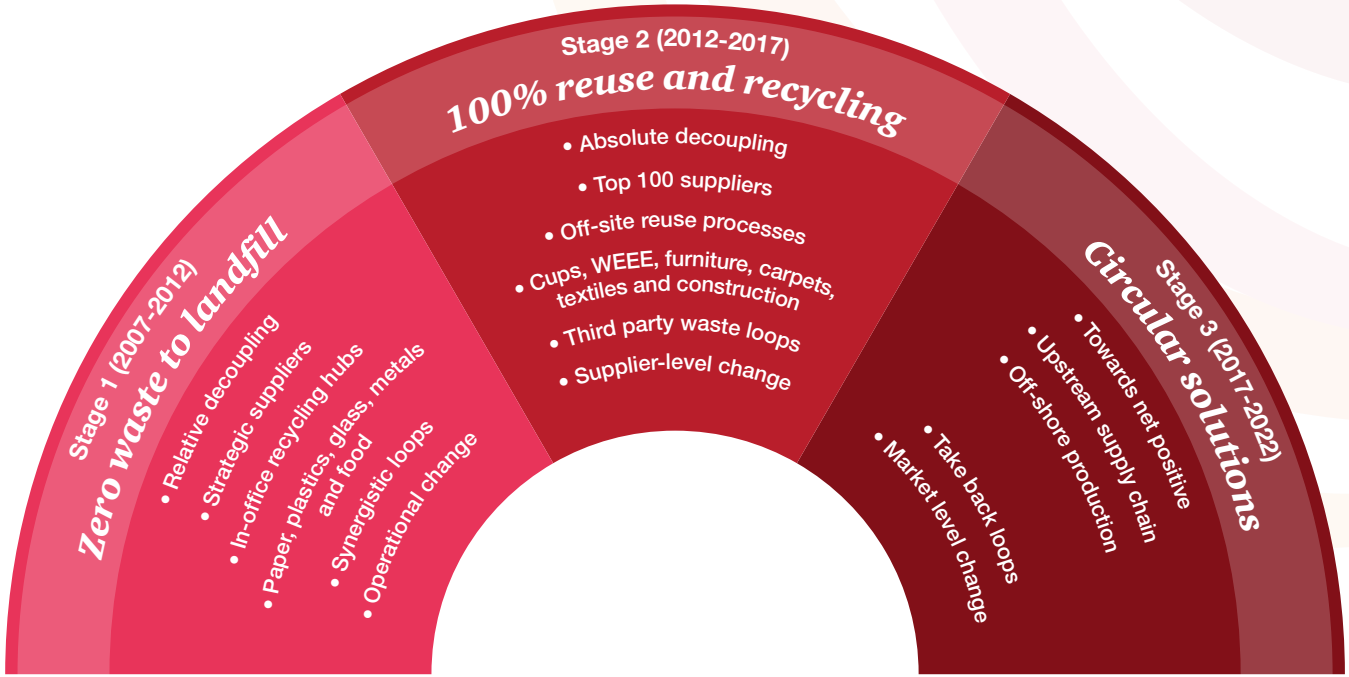
Our work on materials and waste is progressive, and we're evolving our approach over three successive stages as we pilot new solutions and build momentum (See Chart 3).

Stage 1 – Zero waste to landfill
2007-2012 was the period in which we first made waste a real focus area in our sustainability programme. We were unsure what was possible, so set targets to reduce our waste and consumption that were relative to our size, and focused on changes to our 'practice floors' – i.e. the main areas of our offices where all our people work, both internal and client-facing. Removing desk-side bins, we implemented recycling hubs with segregated waste streams, which forced our people to separate out paper, plastics, metals, glass and – later – food waste (see photo on page 6). Our primary goal was 'zero waste to landfill'[1] which we achieved in June 2012, having collaborated with our national waste management provider to source appropriate waste collection and recycling services for all of our c. 30 offices in the UK. We also worked with them to improve our methods for estimating waste volumes and weights, improving our measurement and reporting.

We established a 'waste to energy' solution for materials that couldn't be recycled. We also tested a couple of 'loops', working with suppliers to convert our archive paper into hand-towels for use in our washrooms, and to refine the used cooking oil from our on-site restaurants to make biofuel that we can burn in our tri-generators to generate heating, cooling and power for our buildings.[2]

We shared the lessons from this stage, including the cost savings and tips for overcoming the challenges we experienced, in a previous Lessons Learned document, available on our website.[3]

Chart 3
Our three-stage approach to the circular economy



Stage 2 – 100% reuse and recycling

In 2012, we reset our ambitions and goals. With the confidence that came from our successes of the first five years we moved to absolute decoupling of our growth and our impacts – setting targets to reduce our material consumption (e.g. paper, water) and our waste generation by 50% versus our 2007 baseline. We also set a new, aspirational goal to achieve 100% recycling of our hub waste – a target designed to encourage us to think differently about our operations, and set about finding solutions for the outstanding waste streams.

In parallel, we expanded our work on waste with our suppliers, by engaging the top 100 or so as part of our overall supply chain sustainability programme. We're encouraging them to help us find solutions, and embedding collaboration and innovation in our contractual arrangements.

This document sets out what we've done so far, and what we've learned as a result.

Stage 3 – Fully circular solutions

Even before we reach 2017, however, we're looking ahead to the next stage of our waste strategy. We envisage that it will take a further five years to achieve our long-term aspiration to set up fully circular solutions, engaging with suppliers to comprehensively tackle upstream impacts and identify sustainable designs that can complement or supplant our current, end-of-pipe solutions. We're putting the foundations of this in place, even now, by including circular economy requirements in relevant supplier evaluation and selection processes, as contracts come round for renewal, to identify partners who can help create sustainable solutions even if they are not yet available in the market.

1 Hub waste and waste from on-site catering facilities only.

2 For more on this innovative collaboration, see our video: https://vimeo.com/29806824

3 Lessons learned - Zero waste to landfill: towards 100% recycling. www.pwc.co.uk/who-we-are/corporate-sustainability/downloads.html

Segregated waste recycling hub, collecting plastics, metals, compostable cups, food waste and residual waste to energy. Paper collected for confidential waste shredding in a separate location.

Our stage two story to date – what we've done

Driving waste down, recycling up

Over the past three years, we've taken further steps to reduce our hub waste and increase our recycling. We finished the rollout of centralised, multifunctional devices for printing, copying and scanning, to replace desk-side printers. With secure printing and a default, double-sided print setting, this has been one of the major contributors to reducing our paper consumption by more than half (55%) since our baseline year of 2007, and avoided costs of just over £1m.

Because wax cups[1] used for hot drinks by our staff during the day were a large percentage of our non-recycled hub waste, we'd already found a recycling solution for those generated in our largest offices, in London, during stage one of our Going Circular programme, sending them off to be used in the making of building materials. More recently, however, we decided to replace all the cups and food packaging issued by our main, on-site hospitality supplier with compostable alternatives, so that they can be sent for in-vessel composting or anaerobic digestion, along with any waste food. This has helped increase the proportion of our hub waste that is recycled from 68% to 72% in the last year alone. Because we made this change less than a year ago, we're expecting further improvements in our recycling rates in the coming year.

Overall, we're now generating 48% less hub waste than eight years ago, well on our way to our target to halve it by 2017.

But some items remain challenging. There's no mainstream market solution for composite food packaging from eateries near our offices, for example, yet this now represents a large part of the waste we send to incineration. Meanwhile, stationery items such as staplers and hole punchers, although durable, cannot be easily recycled if they eventually break, because they're made from multiple materials and cannot easily be disassembled. We're trying to identify solutions to both.

Taking stock

This year, however, mid-way through stage two, we took stock to check we were on track. Part of this was to refresh our understanding of what stakeholders expected, interviewing key groups – internal and external.

We conducted research amongst our people to understand their perceptions of PwC's current waste management, and their expectations of the firm, as well as identifying barriers to behaviours that would help us achieve our goals. A couple of lunchtimes stopping people on the way out of the work restaurant and a simple set of survey questions yielded interesting findings that have helped shape an employee campaign (see "Let's talk rubbish" on page 8). We hope this will further increase our recycling rates.

Meanwhile, interviews with around a dozen clients, waste experts and NGOs reminded us that our business is associated with items beyond our operational hub waste. As a result, we've extended the scope of our business-as-usual waste measurement in order to better understand the annual volume of other items we dispose of, including electronic goods such as PCs, laptops, and mobiles, and the furniture and carpets used in our offices. Uniforms worn by suppliers providing services on our sites are also included, in light of the priority being placed on textiles in EU and UK circular economy plans. Our discussions also caused us to expand our horizon to assess the waste impact of our construction projects.

Approximating volumes

Over the past few months, we've interviewed various managers around our business – in the facilities, real estate and IT teams – to gather more information about this non-hub waste.

We already have good practices established in nearly every area, although data has not always been systematically captured. So, we set about collating figures for all our non-hub waste. Where actual data was not available, we estimated the number of units disposed of and weighed items, to be able to aggregate volumes and establish an approximate annual tonnage.

> "Our Going Circular programme is all about showing what's possible – by any business."
>
> *Bridget Jackson, Director of Corporate Sustainability, PwC*

Let's talk rubbish

Research revealed that our people have strong and personal connections with waste, as it's tangible and they interact with it on a daily basis. They have an inherent interest in waste and recycling, and want to do the right thing, but are often confused about what that is, or why particular items need to be disposed of in a particular way.

So, we developed and launched a campaign – called 'Let's Talk Rubbish' – early in 2016, focussed on engaging our people in a dialogue about our waste, as well as clarifying the right way to dispose of waste in our offices.

For example, compositional analysis had shown that, when busy, people sometimes 'bundle' waste items – for example, putting fruit peelings inside crisp packets, and putting both in a coffee cup, inside a lunch bag, and then depositing the whole thing into the 'waste to energy' bin, instead of splitting each item out. So, we gave a bag of mixed rubbish a personality, naming it 'Bertie Bundle' and raising awareness of the fact that it prevents us from recycling the individual items in the bag. We asked our people to say 'bye-bye' to Bertie.

In a similar vein, we found that people do not fully appreciate that leaving food waste on packaging causes contamination of 'dry' recycling and prevents food being recycled through composting or anaerobic digestion.

So, we created a 'Larry Leftovers' character, and asked people to give him a 'new lease of life' by scraping food off their packaging at the end of their meal.

We're also using the same concept to raise awareness of our new compostable coffee cups, and the fact that they now need to be put in the new, compostables bin, unlike their 'wax' counterparts.

Tackling waste behaviours in this fun, light-hearted way has, so far, been well-received and we're monitoring results to see how far the campaign can help us progress towards our recycling goal.

Say bye-bye to Bertie Bundle

When you're juggling waste on the way to the bins, Bertie Bundle lends a hand to carry your rubbish.

But Bertie needs sorting out. Just a few items in the wrong bin could mean the whole lot can't be recycled. And, putting recyclable packaging in the 'waste to energy' bin sends resources that could have been turned into new products up in smoke.

So, make sure you bid Bertie farewell, and sort your rubbish when you get to the bins.

To find out more, and join the conversation about our waste, search Spark places for 'Let's Talk Rubbish'.

Give Larry Leftovers a new lease of life

Sometimes, there's no way of avoiding Larry Leftovers.

But next time you're left with more than a smear or a smudge, take a few seconds to scrape unwanted food into the food waste bin. That way, it can be recycled into fertiliser, so today's leftovers can help grow tomorrow's lunch.

To find out more, and join the conversation about our waste, search Spark places for 'Let's Talk Rubbish'.

All change for Verity Vegware

Meet Verity Vegware. She's happy, because she's made from compostable materials. That means she's got a much smaller carbon footprint than our old wax cups.

Make sure you pop Verity – and any other Vegware items – into the compostables bin, so they can be recycled into fertiliser. Non-compostable cups from outside the office should still go in the waste to energy bin, though.

To find out more about Verity, or to join the conversation about our waste, search Spark places for 'Let's Talk Rubbish'.

We were also able to confirm that, when it comes to treating items at end-of-life, our service owners in the business have well-established processes, ensuring that as many items as possible are reused, and residual items are disassembled to recover all the materials. Sometimes – such as for our IT waste – specialist organisations provide a reuse and recovery service. In other cases – such as our furniture – an employee is responsible for distributing items to charities as part of their job, supported by the Community Affairs team which runs a 'furniture exchange' programme, offering items to social enterprises in the PwC Social Entrepreneurs' Club. In yet other areas – such as our office carpets – we send old products to a take-back scheme run by the original manufacturer, which repurposes what they can for new carpet manufacture, and down-cycles the rest to make other building materials.

One of the few areas where we found we did not have a circular solution in place was the uniforms worn by suppliers' staff in our offices. Disposal of corporate workwear items was left to the individuals who wore them, via municipal waste collection systems. We're now engaging with the suppliers in question to establish a take-back scheme, so that all old items are returned when new uniforms are issued, and we're exploring possibilities for maximising reuse and value retention (see "Textile take-back", inset).

Finally, we also looked at what happened to waste generated during our recent, large-scale real estate projects – our completely new office at London Bridge, and the refit of our existing headquarters at Charing Cross. We decided to treat the waste from construction as project-based rather than as 'business as usual' (i.e. ongoing waste), due to the fact that the schedule of building works is ad hoc. Nevertheless we still view it as our responsibility to influence any construction we commission and encourage the highest standards possible. Here, too, good practice has been followed, with our real estate development partners delivering high levels of recycling of all materials (including significant quantities of gypsum and metals). The overall recovery rate was over 95%, varying according to whether it was strip-out or fit-out waste and depending on

Textile take-back

We have six suppliers that provide services – such as catering, security, hospitality, cleaning, etc. – in our offices. Together, they employ around 675 non-PwC people to work in our buildings, most of whom are issued with uniforms, on our behalf, by their employers. We estimate that this accounts for some 3,300 items of clothing every year, weighing just under one tonne. So, we approached these suppliers to ask them if they would be willing to collaborate on a simple 'take-back system' so we could gather up old uniforms, and find better, more circular, end-of -life destinations for them.

All were receptive and we've already piloted this new system with one of them, taking back just over 300 items from our security team and sending them to a specialist textile recycling company in the Midlands, where they are assessed and categorised according to their condition.

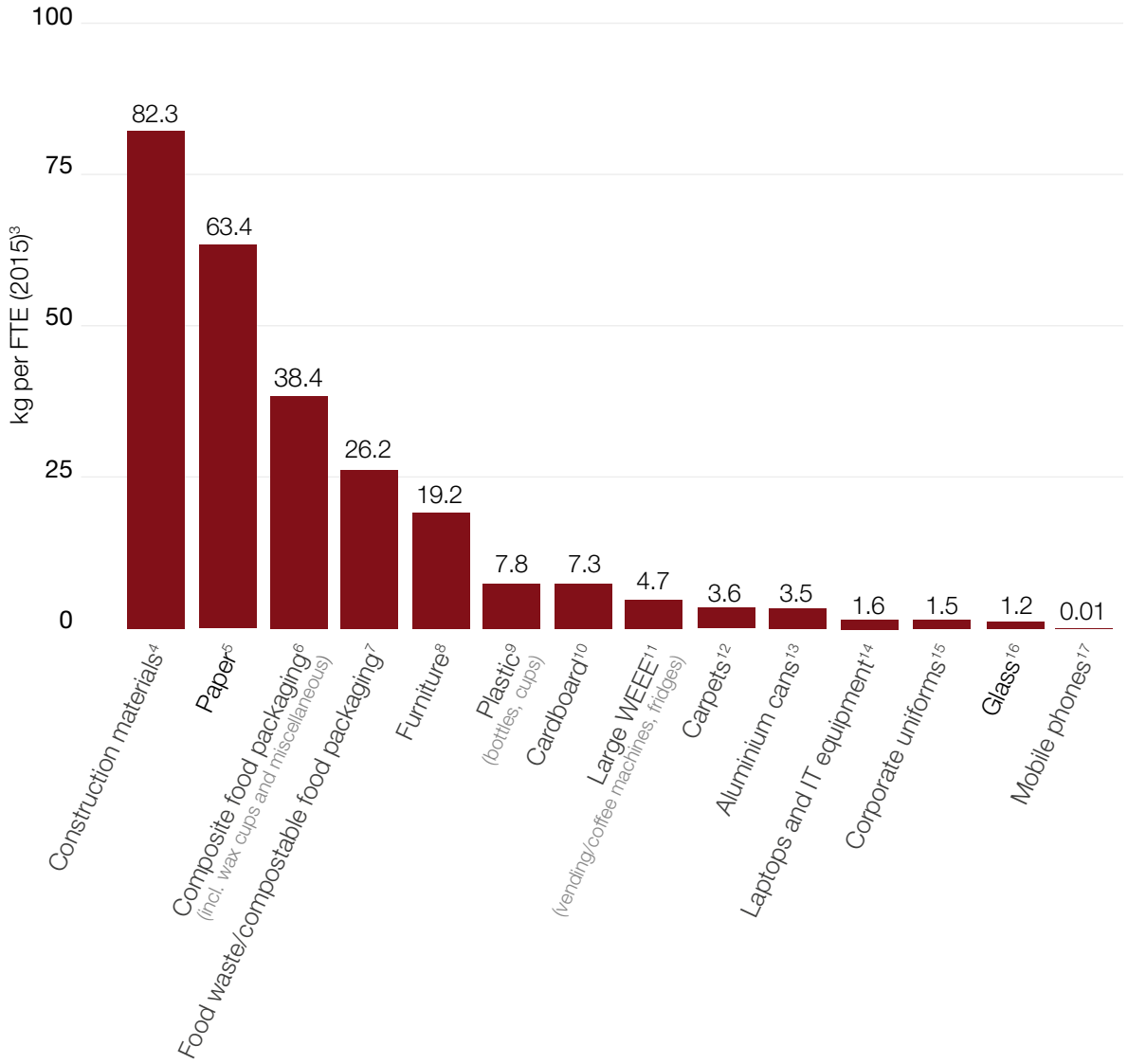
Items in good condition are sent overseas for resale; those that are damaged have cuffs, pockets, etc. removed and are cut into large pieces that can be sold as industrial rags; smaller or damaged pieces of fabric are shredded and become an input to make other products, such as the sound insulation used in the bodies of cars. In addition, buttons and zips are removed and sold for use in clothes manufacturing in Pakistan.

So far, we've learnt that just under 25% of our items can be reused in their original state. Around 60% can be reused as rags. Approximately 15% have to be shredded. All can be used for some other market, reducing environmental impacts by eliminating the need for virgin materials. Moreover, we assessed all the returned items and this provided us with insight about why they can no longer be worn – primarily because wear and tear causes the seams to come away at the seat of the trousers or on the shoulders of jackets, or because buttons drop off. As a next step, therefore, we're hoping to work with the original manufacturers of these garments to see if they can adapt their designs to give the items more durability.

The suppliers' employees who were affected by the new scheme were happy to bring their old uniforms back in, feeling that it was the right thing to do for the environment. And, we used the opportunity to provide them with a leaflet on caring for their new uniform, which encouraged them to wash at 30 degrees and to dry on a line (rather than tumble drying), to help reduce the clothes' in-use environmental impacts. It also gave them tips on how to ensure their uniform stays smart for as long as possible.

Around 675 employees of our suppliers wear uniforms in our buildings, which will now be reused or recycled through our take-back scheme.

Chart 4
Kg per full time equivalent (FTE) by waste stream[1,2]



1. Includes combination of hub and non-hub waste (hub is a term used for the recycling areas on our office floors, which collect glass, aluminium, plastics, food, compostable packaging and paper waste separately, as well as items we don't yet have a solution for, which are sent to incineration with energy recovery). Hub waste is measured and assured as part of our sustainability reporting each year (see www.pwcannualreport.co.uk for details). Non-hub waste is currently estimated only, using the best, most recent data available.
2. FTE relates to PwC employees, except for figures relating to corporate uniforms, for which it relates to the FTE of suppliers' employees working on PwC sites.
3. Annualised estimates used where 2015 data not available or unrepresentative (construction materials, furniture and carpets).
4. Includes gypsum, metals, wood, packaging, general waste etc. Multi-year real estate programme underway in period in question. Figure represents annualised quantity as at end year five. May be lower for organisations with no renewals.
5. Includes shredded paper from offices and archive files. Volume has been reduced by move to multifunctional devices. May be higher for organisations who have not put such programmes in place.
6. Mostly comprises composite consumer food packaging from external eateries.
7. Includes food waste from onsite restaurants/cafes, and post-consumer food waste from meals purchased offsite and eaten in offices. Partial year for compostable packaging, which is expected to increase now we've finished substituting our internal, wax cups and food packaging.
8. Includes desks, chairs, cabinets. Driven largely by rolling, multi-year office renewal and rebranding programme. May be lower for organisations where furniture is only being replaced when broken.
9. Mostly PET bottles, some single-material plastic food packaging, and cups from vending machines.
10. Includes packaging for products used to run our buildings, and post-consumer packaging from e-commerce deliveries to staff at office sites. May be lower if organisation policy does not allow personal deliveries.
11. Offices have coffee machines, vending machines and fridges on all floors and data pertain to period of significant asset renewal. May be lower for organisations without this facility within their buildings or for whom the equipment is earlier in its serviceable life.
12. Some correlation with significant office moves. May be lower for organisations where carpet is only being replaced when worn out or other flooring materials are used.
13. Drinks purchased on site or at external retailers.
14. Includes laptops, PCs, and all peripherals as well as servers. Renewals for laptops every 2-3 years. Other organisations may find volumes are higher or lower if their replacement programme has different schedule.
15. Uniforms for suppliers providing security, welcome, facilities, catering, cleaning and other services on site. Includes footwear, issued to 35% of people with uniforms. Take-back pilots underway.
16. Primarily post in-office hospitality events (e.g. wine bottles) and packaging from on site catering facilities.
17. Programme to issue phones to all members of staff has only recently been initiated, so organisations which already do this may have higher volumes.

the building. Plus, driven by the BREEAM sustainable buildings standard – where both London buildings won the first 'outstanding' rating in their category – innovative practices were deployed to reduce waste in the first place, including offsite, custom, made-to-measure cutting of key materials, such as partition wall plasterboard, flooring and audio-visual cables.

Our non-hub waste mapping exercise was conducted by a full time individual from the sustainability team, over several months, and allowed us to see the relative size of each waste stream (Chart 4) and to conclude that we had a good solution in place for most of our material items. (See Table 1)

1. 'Wax cups' is the generic term used internally to refer to plastic-lined paper cups.

Table 1
Waste quantity (tonnes) and designated treatment[1]

Waste category	Total tonnes (annual, estimated)[2]	Percentage reused	Percentage recycled	Percentage incinerated	Percentage sent to landfill
Construction materials	1,428	-	97%	-	3%
Paper	1,100	-	100%	-	-
Composite food packaging (inc. wax cups and miscellaneous)	667	-	2%[3]	98%	-
Food waste/compostable food packaging	455	-	100%[4]	-	-
Furniture	334	95%	5%	1%	-
Plastic (bottles, cups)	136	-	100%	-	-
Cardboard	126	-	100%	-	-
Large WEEE (vending machines, coffee machines, fridges)	82	99%	1%	-	-
Carpets	62	-	98%[5]	-	2%
Aluminium cans	61	-	100%	-	-
Laptops and IT equipment	27	82%	18%	-	-
Glass	22	-	100%	-	-
Corporate uniforms	1.0	n/a[6]	n/a	n/a	n/a
Mobile phones	0.2	75%	25%	-	-
Total	4,499	9%	75%	15%	1%

1. Some rows may not sum to 100% due to rounding.
2. All waste, including hub (assured), on-site catering facilities (assured) and non-hub waste (estimated).
3. Relates to wax cups prior to switch to compostables.
4. Recycled via a mix of composting and anaerobic digestion, depending on local solution availability.
5. Treatment in line with maximising value and minimising environmental impact. Where split across reuse/recycling is currently unknown, recorded as recycled on a conservative basis.
6. Early pilot implies c. 25% reuse of whole items, c. 60% recycled as industrial rags, and c. 15% shredded and downcycled. Figures will be updated once take-back system rolled out to all suppliers and actual, annual figures are available.

Triple bottom line benefits

Lots of companies are interested in the circular economy, but are unsure where to start, or how to build a business case for action. Over the past few months, therefore, we've revisited our programme to both pull out financial cost-benefit information and to estimate the carbon savings associated with the initiatives we've put in place so far. As a result, we now have a lot more insight on the benefits of going circular, which we've set out in the rest of this section.

There are multiple benefits to be had from making changes to material and waste practices, in line with circular economy principles. The idea originally came from sustainability groups, where a growing global population led to a need to reduce the negative environmental impacts associated with increasing levels of consumption. But, as the idea has been further explored, it's become clear that it also maintains goods at a higher value in the economy (enhancing GDP), and can deliver financial benefits to the businesses adopting its principles, through resource efficiency or innovation. Moreover, many circular solutions generate additional social value, by providing incremental jobs - for example in reuse or recycling. The circular economy, then, is a concept that really does have triple bottom line benefits.

Reducing materials consumption, water use and carbon emissions

It's also attractive because the environmental impacts are three-fold: first, the circular economy keeps raw materials in circulation, and maximises their utilisation; second, it reduces the energy required for upstream processes to source raw materials, and manufacture goods, which – in turn – obviates the associated greenhouse gases; and, it reduces the need for water in the same, upstream processes.

Disposal switches – a key transition step

In the long term, the circular economy will require new business models - for example, with more products being leased or shared. But, many benefits can be derived even with simple changes to end-of-life treatments. If the majority of businesses were to adopt such 'disposal switches', they could, together, make a step-change in material recovery and reuse, and build a better foundation for the more visionary elements of the circular economy. Moreover, their understanding about the challenges relating to better end-of-life treatment could also inform upstream procurement policies, with insight on how products should be designed for reuse, remanufacturing, disassembly, or recovery (see "Textile take-back" on page 9). Thus, they could have a profound influence over whole supply chains.

No-cost solutions

Our experience, at PwC, is that disposal switches can generate revenues and reduce business costs, as well as provide significant environmental benefits.

The most striking of these is the revenue-generating opportunity from refurbishing and reselling old computers and mobile phones: we use a best-practice, approved treatment facility with strong environmental credentials instead of a basic WEEE-compliant facility, thereby achieving over 80% reuse. We estimate that we raise between £50-75 per person per year through reuse of our laptops, and between £25-40 for resale of smartphones (see Table 2 for key assumptions).

Whilst other end-of-life materials do not command such high prices, they still offer modest cost savings, or 'no-cost solutions'. By diverting waste that would attract considerable gate fees[1] if sent to landfill (c. £100 per tonne, including landfill tax[2]) or incineration (c. £99 per tonne), reuse and recycling frees up funds that can easily cover any costs to set them up.

For example, donating our unwanted office furniture to other organisations avoided 80% of the associated landfill costs. We try to find a new home for our furniture within 10 miles of our offices. However, even if we had to transport furniture 20-100 miles to get it to its new home, we estimate that we would still make a net cost saving of £1-2 per person

per annum (see Chart 1 and Table 2 for our volumes and treatment ratios). Similarly, sending our food waste to composting (for which gate fees are typically £46 per tonne) and anaerobic digestion (AD) (c. £40 per tonne) instead of landfill reduces costs by around 40%, with a positive cash impact of £1-2 per head, per year. Switching from standard, plastic-lined coffee cups to compostable alternatives (provided for beverages our people drink throughout the day) was cost neutral, whilst sending them to composting or AD instead of incineration creates a 50% cost reduction (c. 15-20p per person, per year).

The only material, so far, which has been more expensive to reuse and recycle is corporate uniforms, which we estimate cost us 5-15 pence per head per year, even though the textile recycling service is free. This is due to the costs of transporting the old uniforms to the recycler, and the fact that there is no offset through reduced landfill, as

the uniforms were previously disposed of by our supplier employees. We feel that this is a small price to pay to know that uniforms carrying our brand are being securely and responsibly disposed of.

Whilst these numbers are only estimates, and will vary from organisation to organisation, we wanted to share our most up-to-date insight into the cost-benefit of such 'disposal switches' to help other businesses looking to move towards circular economy principles. More details, including key assumptions in each case are set out in Table 2, which we hope will help people to create strong business cases for reuse and recycling of their own waste streams. Overall, we believe our results show cost should not be a barrier to better reuse and recycling.

Environmental benefits for society

We not only wanted to understand the financial implications of better waste management, but we also wanted to get a sense of how much better our 'disposal switches' were for the environment, all other things being equal i.e. assuming that no changes are made to the design, manufacture or in-use aspects of any products, at this stage.

We analysed the impact on the greenhouse gases associated with 'end-of-life waste treatment', based on Defra's conversion factors[3] but – due to the emphasis on material consumption choices in carbon measurement – this only made incremental improvements to our own, operational carbon footprint. That's not to say that there are no climate benefits from better reuse and recycling. Far from it. Rather, the benefits are made on behalf of society, by obviating the need for new items made of virgin materials, and purchased by another organisation. And on that basis, our analysis shows that the overall carbon savings from 'disposal switching' are considerable – ranging between 20% and 100%[4] (see Table 2). Reuse of laptops and smartphones, for example, can reduce associated carbon emissions by more than 90%, as can recycling of food waste. Reusing office furniture can cut emissions by 60%, whilst a switch to eco-friendly coffee cups delivers 35% saving, and even recycling old uniforms can cut carbon by 20%.

Given that it costs next to nothing to make such changes , or can even generate a positive cash flow, we feel that these simple, end-of-life improvements are well worth the effort to set up.

Social benefits

In addition to the financial and environmental benefits of 'going circular', we found that many of our solutions create social value, too, providing valuable resources to charities that might otherwise not be able to afford them, in a period when government funding is being cut.

Or, circular solutions can provide employment to disadvantaged or hard-to-reach groups. For example, our IT waste refurbishment provides work experience to offenders, with training that leads to an NVQ, helping them get back on their feet and reducing reoffending rates once they leave prison.

With such a broad range of benefits, businesses should consider all three categories when shaping their waste management strategies, as it may be possible to collaborate across different departments, drawing on different budgets to get a holistic programme in place.

1. Average from Wrap Gate Fees report 2015. May vary. Cost benefit analysis based on PwC actuals.
2. £84.40 from April 1st 2016.
3. We've focussed on the carbon savings arising from each of the switches we've made, for simplicity and as a first step, although in some cases the main benefits may relate to reduced pollution, protection of scarce materials or minimising the demand for scarce water reserves.
4. Our analysis is based on Defra conversion factors for end-of-life waste treatment and material consumption. It assumes that a switch from waste treatments that lock away materials (landfill and incineration) to treatments that reuse the goods or recycle the materials will benefit society by obviating the need for an item made of virgin materials i.e. it enables a switch from material consumption using virgin materials to consumption of a product with reused/recycled content.

"At PwC, you're light years ahead."

Charlie Devine, Zero Waste Scotland

"I am proud to work for a firm which... cares about the environment."

PwC employee, annual people survey response

Table 2
Financial and environmental benefits of disposal switches

Material	Disposal switch made	Financial impact to business (£, per individual, per annum)[1]	Societal CO_2e benefit (per individual, per annum)	Key assumptions[2,3]	
Laptops	Shredding to reuse[4]	£50 to £75	0.3kg (>90% reduction)	Material	Laptops on 24-30 month contract
				Financial benefits	Revenue dependent on condition of items
				Baseline	Meeting minimum WEEE requirements of 70% recycled, 10% recovered with the rest going to landfill[5]
Smartphones	Shredding to reuse[4]	£25 to £40	0.04kg (>90% reduction)	Material	Smartphones on 24 month contract
				Financial benefits	Revenue dependent on condition of items – considerably higher for newest models in best condition
				Baseline	Meeting minimum WEEE requirements of 70% recycled, 10% recovered with the rest going to landfill[5]
Furniture	Landfill to reuse	£1 to £2 (c. 80% reduction)	12kg (c. 60% reduction)	Material	One desk, chair and cabinet per employee. Sharing other furniture e.g. storage, meeting rooms etc.
				Financial benefits	50% of 'reuse' displaces production of new furniture.[6]
				Baseline	14% office furniture reused, rest going to landfill[7]
Food	Landfill to composting/ anaerobic digestion	£1 to £2 (c. 40% reduction)	13kg (112% reduction – net positive)	Material	Each employee disposes of roughly 20kg of food waste per year into dedicated food waste bins
				Financial benefits	Food waste goes to anaerobic digestion where facilities exist (c.80%) with the rest going to composting.[8] Based on anaerobic digestion obviating need for grid electricity.
				Baseline	Disposal into general waste bins, with c.80% disposed in landfill, c.20% incinerated[9]

[Continued on next page]

Material	Disposal switch made	Financial impact to business (£, per individual, per annum)[1]	Societal CO_2e benefit (per individual, per annum)	Key assumptions[2,3]	
Compostables	Wax cups and landfill/ incineration to ecofriendly cups and composting/AD	£0.15 to £0.20 (c. 50% reduction)	1.2kg (c. 35% reduction)	Material	One cup per working day per employee
				Environmental benefits	As per food waste, c. 80% directed to anaerobic digestion, remainder to composting[8]
				Financial costs/ benefits	Eco-friendly, corn-derived, poly-lactic acid (PLA) lined cup cost comparable with wax/plastic-lined cup[8]
				Baseline	Wax cups c.80% disposed in landfill c.20% incinerated as per mixed, ordinary waste[9]
Corporate clothing	Introduction of textile take-back scheme for reuse/ recycling	£-0.05 to £-0.15	7kg (c. 20% reduction)	Material	Corporatewear worn by supplier employees on site with average of 5 items per employee and mix of logo types (tax tabs, embroidered or no logos). Costs may be lower if fewer items issued.
				Environmental benefits	85% of reuse displaces production of new clothes[10]
				Financial costs	Dependent on distance to recycling facility. Assumes use of pre-existing in-house logistics for first leg, and additional payment for final leg, between 20-100 miles
				Baseline	90% to landfill or incineration[11]

1. Based on full time equivalents throughout, for consistency, except for corporate clothing, which is based on suppliers' employees.
2. See Table 1 for post-switch reuse and recycling rates.
3. Material consumption and disposal CO_2e from Defra 2015 (www.ukconversionfactorscarbonsmart.co.uk).
4. Dispose using a best-practice, approved treatment facility with strong environmental credentials instead of a basic, WEEE compliant facility.
5. Source: UK Government.
6. In line with assumptions in www.wrap.org.uk/sites/files/wrap/Office%20Furniture_final.pdf, Wrap 2011. Production CO_2e based on FIRA Source: "Benchmarking carbon footprints of furniture products", FIRA, 2011.
7. Source: www.wrap.org.uk/sites/files/wrap/Office%20Furniture_final.pdf, Wrap 2011.
8. Source: PwC data.
9. Source: Eurostat 2012 UK treatment data for mixed ordinary waste.
10. Source: http://morerecycling.no/wp-content/uploads/2012/06/Environmental-benefits-from-reusing-clothes.pdf
11. Source: "A review of corporatewear arisings and opportunities", Wrap 2012.

Our stage two story to date – what we've learned

Interim findings

We typically analyse our programmes and publish our insights once they're complete. However, given the market interest in the circular economy, and the desire of our people to know more about our waste practices, we've decided to share our interim findings even though we still have fifteen months to go to our target date. There are some interesting reflections:

- As discussed earlier, some waste streams are surprisingly big – construction, food and furniture, for example – and consequently merit attention.
- Some waste streams can generate significant financial value from reuse and recycling, notably electronic goods, such as laptops and phones.
- It's not as hard as you might imagine to find ways to reuse many waste items, if you're willing to go beyond the traditional solutions, and create a portfolio of providers.
- Like us, other organisations may find that there is good practice underway, but not being measured.
- We also learned that there are no easy, existing, cost-effective market solutions for some hub waste, especially composite materials that are not standardised and of low value (e.g. food packaging, stationery, and corporate merchandise). Solving for these will probably require market level change.
- Existing carbon factors for waste do not incentivise recycling or reuse, but measurement is still valuable, to garner insight for better management of materials in your business and to inform future design of products.

Combining our experience in this phase of our 'Going Circular' programme with that from our first five years, we've summarised a table of lessons which we hope will be helpful for others thinking of starting or accelerating their own journey towards the circular economy. See Table 3.

Next steps

As described in the previous sections, we still have lots of work to do.

The new solutions we've identified mean we're now reconfiguring our office recycling stations, and working to set up processes to capture data on all our waste on a regular and more rigorous basis. We'll continue to test and implement new solutions for outstanding, non-hub waste, and are searching for better quality loops for some items that already have a basic solution in place. And, as we outlined above, we're also engaging our suppliers in readiness for stage three. Finally, we're sharing our thoughts with relevant bodies on how the measurement frameworks relating to business waste need to be refreshed if they are to support the transition to a circular economy.

Our client-facing teams continue to advise and support clients in manufacturing, retail and other sectors to pioneer circular solutions, which we hope we will – in due course – be able to make use of ourselves, such as the use of natural capital accounting to ensure new circular solutions are really better for the environment.

The circular economy is a concept whose time has come, and every business should be actively seeking to implement better practices to safeguard resources, water and energy, and to mitigate climate change. We hope that this document will help many wondering where to get started to do precisely that.

About sustainability at PwC

For more information on our corporate sustainability agenda, visit www.pwc.co.uk/corporatesustainability.

Or, for more details on aspects of PwC's Going Circular programme, search Twitter for #GoingCircular, follow @BridgetHJ, or visit www.pwc.co.uk/goingcircular.

We welcome input from any interested parties, so do feel free to get in touch with our Director of Corporate Sustainability at bridget.h.jackson@uk.pwc.com.

For more on our circular economy work for clients, please visit www.pwc.co.uk/circulareconomy.

Table 3
Lessons learned

Take baby steps	Although the circular economy is a simple concept, its breadth can be overwhelming, making it hard to know where to start, especially when there are so many views about the right thing to do. Businesses should feel comfortable to 'start small', and take pride in each tangible achievement in their journey towards a more circular business.
Estimate the 'material materials' and check what stakeholders think you should focus on	Organisations should focus on their material impacts, of course. But since lifecycle analyses are not easily and cheaply available for all products and services, it's pragmatic to start with waste streams that are likely to be biggest for you. Chart 4 sets out figures for the weight of each waste material generated by our business, per full time equivalent, which other non-manufacturing organisations may find useful to get a first, rough estimate of how much waste they have – just by identifying the materials they know they throw away and multiplying the number of their staff by the per capita weight provided (adjusted, if necessary, for the notes accompanying the chart). In addition, asking stakeholders about their expectations can be quick, and ensure you're covering all bases.
Create a business case by combining waste streams	Whilst reductions in consumption of, or increased recycling and reuse of any items in a business has an environmental benefit, and can generate a positive social impact, not all have a financial value strong enough to merit attention in isolation. By including several waste streams in the same programme, the financial returns of one waste stream can offset the costs of others. That said, many end-of-life recycling and reuse solutions are cost neutral to implement, and easy to do, if you have the will.
Set targets to create momentum	Targets help to focus teams on action and empower individuals to find solutions. Set modest goals for the short term, whilst you test what is possible, and increase the number of targets, or the level of ambition expressed by them, once you gain confidence in what's achievable.
Make circularity part of your contracts	Including service level agreements in key supplier contracts sets an agenda for collaboration, but takes time. Start with the most strategic suppliers, and extend coverage to new categories, progressively. Sustainability teams can have a valuable role helping procurement and facilities with guidance on circular economy concepts and solutions.
'Choice edit' first	It's far easier, and quicker, to make changes for the whole business than to engage employees in behaviour change. Wherever possible, make central 'choices' such as removing unnecessary items to reduce consumption/waste, or substituting others to enable recycling. Focus employee campaigns on the outstanding problems once you've gone as far as you can with these central changes.
Test, then do	Setting up a part of the business as a test environment, where you can assess employee reactions to changes (such as new waste hub configurations, product substitutions etc.) before roll-out minimises resistance when you introduce new initiatives at scale. A test environment also allows you to get basic measurement in place and identify approximate volumes for problem items, which will help in discussions with new, circular solution providers as you seek to set up reuse and recycling arrangements.
Spot synergies	Sometimes the solution just requires connections to unusual parts of the organisation e.g. linking the facilities department to your community team can accelerate reuse by leveraging existing charity relationships.
Tell the story to maximise the business benefits	Employees care about waste: it's a tangible item they deal with every day. Telling them about any recycling achievements builds engagement and pride – delivering business benefits.

About PwC

PwC UK helps organisations and individuals create the value they're looking for. We're a member of the PwC network of firms in 157 countries with more than 195,000 people committed to delivering quality in assurance, tax and advisory services.

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