Whilst some local authorities in England operate food waste recycling schemes[88], the majority of food waste ends up in residual waste. Extending separate food waste collections to more households should increase recycling and composting rates by about 5 percentage points over current levels[89], and divert waste from incineration or landfill. Separate food waste collection also leads to higher yields of food waste collected than if it is captured mixed with garden waste[90].

Food waste treatment

Anaerobic digestion (AD) represents the best environmental outcome for food waste that cannot be prevented[91] or be redistributed to others or, if this is not possible, used as animal feed. It provides both low carbon renewable energy and digestate, which can be used as fertiliser, compost, or soil improver.

What is anaerobic digestion?

Anaerobic digestion (AD) involves the breakdown of biodegradable material in the absence of oxygen by micro-organisms called methanogens. It is already widely used to treat wastewater in the UK and can also be used to treat other organic wastes, including domestic and commercial food waste, manures and biofuel crops[92].

Since the publication of the Anaerobic Digestion Strategy in 2011, AD growth has been supported by measures such as feed-in tariffs and renewable heat incentives. The number of AD facilities using food waste or farm waste in operation since then has increased from 63 to 420 and energy recovered from anaerobic digestion has increased from 713 GWh in 2013 to 2,470 GWh in 2017. AD also produced 3,500 GWh of heat in 2017. WRAP has estimated that UK food waste sent to AD produces 1,000 GWh[93], enough to power 1 million homes for over one month[94].

88 About 50% of local authorities in England offer a service to collect food waste, albeit only about a third do so separately (http://laportal.wrap.org.uk/)

89 As suggested by our internal modelling.

90 WRAP (2016), Household food waste collections guide. www.wrap.org.uk/sites/files/wrap/HH_food_waste_collections_guide_section_3_how_much_can_be_collected.pdf

91 Parts of food waste that are not suitable for human consumption, such as fruit stones. Cultural context is also important, as what's edible to some may not be to others (vegetable peelings or certain animal parts for example).

92 WRAP (2018) http://www.wrap.org.uk/content/anaerobic-digestion-1

93 WRAP (2017) Estimates of Food Surplus and Waste Arisings in the UK. http://www.wrap.org.uk/sites/files/wrap/Estimates_%20in_the_UK_Jan17.pdf

94 Ofgem (2006), Electricity generation: facts and figures https://www.ofgem.gov.uk/data-portal/electricity-generation-mix-quarter-and-fuel-source-gb https://www.ofgem.gov.uk/ofgem-publications/76160/13537-elecgenfactsfspdf

AD growth has also increased the amount of digestate available to be spread to land to improve soil or as a fertiliser. This helps to reduce dependency on inorganic chemical fertilisers and their higher carbon footprint. Spreading of digestate to land can lead to ammonia emissions, a significant air pollutant which must be properly managed. WRAP has published research on this and we have published a Code of Good Agricultural Practice (COGAP) that provides guidance on reducing ammonia emissions from farms in England[95]. If necessary we will also consider further measures, including regulations, to minimise emissions.

Garden waste

Garden waste sent to landfill can generate greenhouse gas emissions akin to those from food waste[96]. We will consult on the provision of free garden waste collections for households with gardens and seek views on the impacts and costs for local authorities so these can be taken into account in assessment of new burdens. Garden waste can be treated by open windrow composting[97], which avoids landfill and is cheaper for local authorities than landfill disposal. Compost can also be used to generate additional revenue.

We will work across Government on opportunities to promote synergies between food waste and other bio-waste and renewable energy to support decarbonisation of transport, heat and power. We will carry out and publish a review of policies to support bio-waste recycling through anaerobic digestion and composting to ensure we can maximise the benefits of these treatment options whilst managing the risks. We also want to ensure that where appropriate farms continue to use AD as a treatment option for managing on-farm waste and recycling nutrients into energy and digestate that can be applied back to land.

Quality in recycled food and garden waste

Implementing these policies will significantly increase the amount of recycled food and garden waste available for use as fertiliser or compost. This means that we need to ensure what is recycled is good quality, and that contaminating materials such as metals and plastic are kept within recognised limits. Clear communications by local authorities and waste managers can

95 UK Government services and information (2018)Code of Good Agricultural Practice for reducing ammonia emissions. https://www.gov.uk/government/publications/code-of-good-agricultural-practice-for-reducing-ammonia-emissions

96 On a per tonne basis, food and drink waste to landfill generates 627kg of CO_2 emissions whereas garden waste to landfill generates 579kg of CO2 emissions. Greenhouse gas reporting: conversion factors 2018. (2018) https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2018 - Waste disposal tab

97 Windrow composting is used for processing garden waste, such as grass cuttings, pruning and leaves in either an open air environment or within large covered areas where the material can break down in the presence of oxygen.

play a key role in achieving this. It is also important that quality standards for compost and digestate are fully adopted and that they are regularly reviewed to see if they are fit for purpose or can be improved with evidence. **We will work with the Environment Agency and industry to ensure what is put on the market adds value, meets required environmental and quality standards and is applied correctly to minimise environmental impacts.**

3.1.3 Improving urban recycling rates, working with business and local authorities

Recycling rates for urban authorities are often lower than those of rural or suburban authorities. We will work with Metro Mayors, local authorities in urban areas and other relevant organisations and stakeholders to:

- Review collection models for densely populated commercial and residential districts to improve recycling and reduce costs whilst maintaining frequency of collections needed to protect local amenity. This could include piloting shared domestic and business collection rounds or zoned collection services;
- Engage with landlords and estate managers to promote recycling in houses in multiple occupation (HMOs) and other properties where they have responsibility for waste management arrangements;
- Work to align the National Planning Policy for Waste and planning practice guidance with the Resources and Waste Strategy and continue to maintain building regulations guidance to support its objectives;
- Work with transport hubs and other destinations such as hospitals and universities to promote effective and high quality recycling (including on-the-go).

3.1.4 Improving working arrangements and performance between local authorities, especially in 'two-tier' areas

Household waste management arrangements are complex. Around 350 local authorities in England have responsibility for collection and/or disposal of household waste. About 90 of these authorities are responsible for both collection and disposal (Unitary Authorities). The remainder are 'two-tier' authorities where a waste disposal authority (WDA) is responsible for disposing of waste collected by smaller district authorities (waste collection authorities, WCAs).

Both WRAP and Defra's Waste Infrastructure Delivery Programme (WIDP) have demonstrated that efficiencies as well as service improvements can be made through greater joint working between two-tier authorities. There is also evidence from other sources such as the Environmental Services Association that shows that collaboration and joint working can deliver significant savings. Better sharing of assets for handling household and commercial waste would drive down treatment costs and could lower the gate fees paid by local authorities.

Agreed minimum standards for waste collection and recycling across England would reduce many barriers to joint working. It would also increase the quality and quantity of the materials collected for recycling and could increase the bargaining capacity of local authorities when selling secondary materials.

We will review the effectiveness of current arrangements for local authority waste management and joint working and make recommendations for improvement. As we leave the EU we also want to widen the performance measures we use and promote waste minimisation and better quality recycling. We will work with local authorities to develop new performance metrics for waste to complement and move beyond current weight-based targets to ones which recognise environmental benefits of sound waste management.

3.1.5 Investigating amending the recycling credit system used by two-tier authorities

The recycling credits system is there to ensure cost-sharing between Waste Collection Authorities (WCAs), which collect waste, and Waste Disposal Authorities (WDAs), which dispose of it. It should mean that savings from avoided waste disposal costs that accrue to WDAs as a result of recycling by WCAs are shared with WCAs to provide a financial incentive to improve recycling. The current system no longer provides sufficient incentive for many WCAs to put in place services to collect materials such as food waste as the payments are too low to support these services. Some two-tier authority areas are using alternative payment methods to better balance cost and rewards of recycling. Depending on how packaging producer responsibility is reformed, recycling credits and two-tier cost sharing more generally will need to be reviewed.

3.1.6 Reviewing the Controlled Waste Regulations and Household Waste Recycling Centres to ensure they are delivering value for money

Local authorities are under pressure to make savings to their waste management budget, and many are looking to achieve this by reducing opening times of Household Waste Recycling Centres (HWRCs) or by introducing charges for non-household waste items such as rubble. We are aware of a disparity of charging and opening hours across the country and of concerns regarding the future viability of sites. Some fear that changes to opening hours or charging may increase fly-tipping. We want to understand these risks, and to ensure that these services continue to be accessible for householders and any charges applied to non-household wastes are fair and transparent.

The Controlled Waste Regulations set out charging arrangements for different categories of waste, including waste delivered to HWRCs. We want to ensure that they continue to be fit for purpose, and to investigate extending the role of HWRCs as necessary to have in place arrangements for the collection of hazardous household waste and textiles by 2025, subject to consultation and assessment of potential for new burdens.

It's important that local residents are able to dispose of their rubbish in a responsible and convenient manner. We will therefore ensure that charging arrangements in the Controlled Waste Regulations are clear, especially in relation to waste arising from small scale DIY construction activities carried out by ordinary householders with no specialist skills, which Government has been clear should not be charged for. We will review Household Waste Recycling Centre services and the Controlled Waste Regulations and, subject to consultation, will amend them to ensure they remain fit for purpose, charges are fairly applied, and that services are accessible, support high levels of recycling, and deliver value for money. Our review will also explore whether setting minimum service standards for HWRCs would be helpful.

Case study: Renescience by Ørsted

Renescience is a first-of-a-kind technology created by Ørsted that greatly increases recycling rates from both sorted and unsorted refuse. The first plant is being commissioned in Northwich, Cheshire. The technology mixes water and enzymes with municipal waste, breaking down all organic material, such as food waste, labels and food that adheres to packaging and cans. The resulting bioliquid is drained and can be sent to an anaerobic digestor to create green gas (biomethane). The technology also breaks down complex materials such as cardboard-plastic composites. The refuse that comes out the other side is put through a mechanical process to allow the materials, such as cans and plastic packaging, to be sorted.

The technology is able to recover high levels of recyclable material and can be used to recycle unsorted waste in areas with low rates of sorting refuse (such as those with high-density housing). It can also be used in areas with sorted refuse as the technology is able to recycle the substantial amount of organic and recycling material that the sorting process is unable to capture.

3.2 Improved waste management

We want waste to be managed in the most appropriate way to ensure that environmental impacts are minimised, and that the resource value extracted is maximised.

Currently England generates around 29 million tonnes of municipal residual waste per annum (Mtpa[98]). We manage this waste in three main ways: sending it for energy recovery, exporting it as a refuse-derived fuel (RDF), and landfilling it. We also attempt to extract recyclables from this waste where the technology exists to do it, although the quality of this material tends to be poor. Landfill is the least preferred option given its environmental impact and long-lasting nature.

Case study: VinylPlus Initiative

VinylPlus is a European-wide Industry voluntary commitment representing the whole value chain of the PVC industry – from producers through to recycling companies that handle PVC at its end-of-life.

The European PVC industry aims to achieve 800 kilo tonnes recycled by 2020 – which would represent a third of all PVC that becomes waste. The UK is making a significant contribution to Vinylplus' 2020 target, having recycled 22% of all PVC recycled in Europe in 2017. Old window frames were the most commonly recycled items, followed by cables.

The main materials recycled are windows, cables, flooring, pipes and fittings, and rigid PVC films. The construction industry uses recycled PVC in windows, pipes and floorings. Where the PVC is mixed with other polymers or – as in the case of cable scrap – residual metals which cannot be completely removed, it is used in horticulture or for traffic management in the form of cones and speed bumps. All of these are recyclable when they get to the end of their lives.

The proportion of local authority collected waste going to Energy from Waste (EfW) plants[99] increased from 9% in 2000/01 to 41% in 2017/18[100]. In 2017 incineration of biodegradable waste produced about 3.4% of the UK's renewable energy[101], offsetting the use of virgin resources.

98 Million tonnes per annum (Mtpa)

99 This process typically uses heat from burning waste to create steam, which then powers electricity turbines. Some plants also use the heat generated through this process to heat nearby residential or industrial facilities.

100 UK Government services and information (2018) https://www.gov.uk/government/statistical-data-sets/env18-local-authority-collected-waste-annual-results-tables

101 BEIS (2018), Digest of UK Energy Statistics (DUKES): renewable sources of energy. https://www.gov.uk/government/statistics/renewable-sources-of-energy-chapter-6-digest-of-united-kingdom-energy-statistics-dukes

Thanks to improvements in recycling and sending more waste to EfW, we are less reliant on landfill –with a 72% reduction by weight of local authority collected waste sent to landfill since 2010/11[102]. But more progress can be made. We will explore moving away from weight-based targets towards natural-capital based targets, but in the meantime are committed to bringing the amount of municipal solid waste sent to landfill down to no more than 10% of the total by 2035.

Actions we will take include:

3.2.1 Driving greater efficiency of Energy from Waste (EfW) plants by encouraging use of the heat the plants produce

England has around 40 EfW plants. Eight operate in Combined Heat and Power (CHP) mode, delivering greater efficiency[103] than solely generating electricity. We want to help the companies that run EfW plants to use the heat produced to improve their efficiency, and to help industry make the right decisions over infrastructure investment.

Work is underway across Government to make the remaining plants more efficient, by assessing and removing barriers to making use of heat produced when incinerating waste[104]. The Department for Business, Energy and Industrial Strategy (BEIS) has a Heat Networks Investment Project[105], with a £320m capital fund, and we are working to ensure that this project helps to utilise EfW plants as a source of heat for district heat networks where possible. As part of the review of the Waste Management Plan for England[106] in 2019, Defra will work with the Ministry of Housing, Communities and Local Government (MHCLG) to ensure that the Waste Management Plan for England and the National Planning Policy for Waste and its supporting planning practice guidance reflects the policies set out in this Strategy. This will consider how to ensure, where appropriate, future plants are situated near potential heat customers.

In addition, we will work closely with industry to secure a substantial increase in the number of EfW plants that are formally recognised as achieving recovery status, and will ensure that all future EfW plants achieve recovery status[107].

102 UK Government services and information (2018) https://www.gov.uk/government/statistical-data-sets/env18-local-authority-collected-waste-annual-results-tables

103 This means that the plants can generate electricity and supply heat to nearby residential and/or industrial buildings. The gross efficiency of electricity-only facilities is about 27%. Much higher efficiency levels – typically of around 40% – can be achieved if EfW plants harness their heat offtake in addition to generating electricity. Many plants are already CHP-enabled but cannot find a customer for the heat that they produce.

Defra (2013) Incineration of Municipal Solid Waste.

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/221036/pb13889-incineration-municipal-waste.pdf

104 UK Government services and information (2018) https://www.gov.uk/government/publications/heat-networks-developing-a-market-framework

105 UK Government services and information (2018) https://www.gov.uk/guidance/heat-networks-overview

106 UK Government services and information (2013) https://www.gov.uk/government/publications/waste-management-plan-for-england

107 'R1' Recovery status acts as a proxy for the energy-generating efficiency of facilities. Facilities which achieve the status are classed as a recovery operation for the purposes of the waste hierarchy and so are a level up from the bottom rung of 'disposal'.

3.2.2 Continuing to monitor England's waste infrastructure capacity and associated infrastructure requirements, intervening where necessary

We cannot increase resource efficiency without the right waste infrastructure[108]. Waste infrastructure is used to extract value from items considered worthless by others and limits the burden that waste places on the environment.

Domestic recycling infrastructure

Through the Waste Infrastructure Delivery Programme, the Government is committed to spending £3bn by 2042 on developing new waste infrastructure. This programme has helped to give the private sector the confidence to invest in waste management projects, including facilities to help improve recycling, such as Anaerobic Digestion plants.

Nevertheless, there is still a need for greater domestic reprocessing capacity – particularly in recycling. Throughout this Strategy, we have committed to taking actions which will help stimulate private investment in reprocessing and recycling infrastructure.

We want to significantly increase UK capacity by both increasing investors' confidence and improving the competitiveness of UK reprocessing through:

1. Providing a large and stable supply of recyclable waste materials;
2. Increasing the quality of the waste materials to be recycled;
3. Improving demand for recycled materials and market stability;
4. Levelling the playing field for UK reprocessors – minimising illegal waste exports.

We will do this through:

- New policies such as Extended Producer Responsibility (EPR) and Deposit Return Schemes (DRS) for drinks containers (on which we will consult), which would help to guarantee that waste products have a value at end of life, increase the quality and quantity of materials available to recyclers, and stimulate demand for secondary materials.
- Raising recycling targets for packaging across a number of materials and waste streams to increase recycling and improve environmental outcomes. Our consultation on packaging EPR will encourage better design for recycling and more recycling of all packaging materials including plastics. And a tax on plastic packaging with less than 30% recycled content will provide a clear economic incentive for businesses to use recycled material in the production of packaging which in turn will create greater demand for this material.
- Exploring options to ensure fair competition for all reprocessors. Chapter 4 sets out our policy intentions for managing waste exports. Our primary aim is to process more waste at home. We also want to ensure, however, that any waste which we do send abroad is fit for recycling, and that it is recycled to equivalent standards as required in the UK. Increased monitoring and enforcement of exports should create a more level playing field for domestic recyclers.

108 In 2016, waste infrastructure in England managed 203Mt of waste, 5Mt of which were hazardous.

- Should wider policies not deliver the Government's waste ambitions in the long-term, we will consider the introduction of a tax on the incineration of waste. Incineration currently plays a significant role in waste management in the UK, and the Government expects this to continue. However, Budget 2018 set out the Government's long term ambition to maximise the amount of waste sent to recycling instead of incineration and landfill. Any consideration would take into account how such a tax would work alongside Landfill Tax and the possible impacts on local authorities.

What is chemical recycling?

In the UK most plastic is currently recycled through a mechanical recycling process, a multistep process in which the chemical composition of plastic is not changed. In contrast, chemical recycling refers to a family of treatment technologies where waste plastic is chemically treated in a way that recovers the base chemical constituents of which it is made.

Our long-term objective is to design 'difficult to recycle' plastics out of the system completely. In the meantime, chemical recycling has the potential to provide a complementary route for recycling such plastics where mechanical recycling is either impractical or uneconomic. In all cases, it is important to consider the overall sustainability of the proposed process, including the environmental, economic and social costs and benefits.

Domestic residual waste infrastructure

England has approximately 10.5Mt of EfW operational capacity dedicated to treating municipal and/or industrial and commercial waste[109], enough to treat around 36% of municipal residual waste at current levels[110]. We expect an additional 2.0Mt[111] of EfW capacity to come on stream by 2020 from plants which are in construction. Greater waste prevention, reuse and a 65% municipal waste recycling rate, delivered through policies in this Strategy, will mean that municipal residual waste is expected to decrease to around 20.0 Mtpa by 2035[112].

Given our projections we continue to welcome further market investment in residual waste treatment infrastructure. We particularly encourage developments that increase plant efficiency, minimise environmental impacts whilst upholding our existing high standards of emissions control, and progress technologies that produce outputs beyond electricity generation where these are demonstrated to be environmentally sound and economically viable. We recognise that there is an ongoing role for landfill in managing waste, particularly for inert waste that cannot be prevented or recycled, but want to see its use minimised as much as possible.

109 Environment Agency (2017), Waste Management England 2016. https://www.gov.uk/government/publications/waste-management-for-england-2016

110 Total waste managed in 2016 was 203mt. Actual throughput to EfW was 9.6mt (out of the 11.4mt capacity).

111 According to Defra internal monitoring.

112 For more detail please see evidence annex page 78.

Case Study: Renal Dialysis Bottle Compacting

Barts Health NHS Trust has succeeded in reducing its waste disposal costs by £2.8million over the past four years. The dramatic savings were achieved after it focused on segregating recyclable materials from domestic waste, working in partnership with Skanska Facilities Services. Innovation was built into its contract as a tender requirement, meaning Skanska was able to focus on innovative ways to handle their waste.

The problem centred on Barts Health's four Renal Units, where over half a tonne of six-litre waste bottles were being generated each month. They took up space in waste areas, failed to crush flat in rubbish compactors (meaning the compactors could not meet their maximum weight/lift load) and had to be moved between two hospital sites on domestic waste carts, increasing transport emissions.

The solution was to design and build a 'reverse vending' machine that compacted the bottles, the first of its kind to be used in a hospital environment. The machine, made by the Reverse Vending Corporation, opened up the material rebate market as a potential revenue-earner for Barts Health as well as making waste clearance itself cheaper and more efficient. They also help the Trust to comply with waste handling regulations.

Two machines are now in place at Renal Units in Whipps Cross University Hospital and Newham University Hospital, both in London. They crush each bottle until it loses 40% in volume – a space-saving that has halved the number of internal domestic waste cart trips. As well as lessening the environmental impact of road transport miles, emissions and congestion, the machines are likely to save £13,000 in lower waste transport costs over a decade. After the first year of operation each machine will be cost neutral, assuming rebates for the virgin material are applied.

3.2.3 Exploring new ways to ease the environmental impacts of legacy landfill sites

Landfilling has been a mainstay of waste management for over a century. Sites vary widely by age and waste composition. Waste already deposited in landfill will continue to pose a risk to the environment for many years.

We commissioned a scoping study into ways we can deal with the issues legacy landfills create and will be undertaking research and analysis to support new approaches to landfill aftercare

management. We are also working with industry, local authorities, and other partners, to provide clarity around surrender criteria[113], explore potential alternative sources of revenue, and optimise passive landfill management technologies.

3.2.4 Making the process for achieving 'end of waste' easier for businesses

The process for turning end-of-life materials into commercially viable products should be made as easy as possible. For a waste material to become a non-waste material, it must undergo a recovery operation such as recycling, complying with certain criteria. The point at which it ceases to be waste is known as 'end of waste.' Businesses depend on clear guidance on end of waste, so that more useable products can be made from wastes. However, the current legal framework is sometimes perceived as burdensome to businesses, and a barrier to achieving end of waste. We are working to improve our processes so that they are proportionate to the risks involved and to increase support for businesses so that they can use more waste-derived products.

Article 6 of the EU Waste Framework Directive specifies when and how end of waste is achieved. This has been amended under the Circular Economy Package[114] (CEP). We will transpose these amendments in a way that causes as little disruption as possible to recyclers and producers of waste-derived products. We will continue to work with industry to ensure that conformity with any new requirements is as simple as possible, and will provide guidance where necessary for any changes to end of waste criteria.

Our current guidance on end of waste is some of the most comprehensive in Europe. According to estimates from the Environment Agency, the 13 technical guidance documents, known as Quality Protocols (QPs)[115], on end of waste that have been published to date, have saved businesses in England, Wales and Northern Ireland, on average, £122 million a year through reduced waste management costs[116]. It is estimated that the QPs generate a further £495 million a year through the sale of waste derived products that would otherwise have remained waste.

For materials that do not fall under the 13 QPs, the newly reopened 'Definition of Waste Service' is helping to clarify end of waste, by providing businesses with case by case decisions at low cost. This is a fee-paying service that businesses can use to request a judgment from the Environment Agency on whether their material is classified as a waste anymore. This service can also be used to determine whether a material is classed as a by-product or as a waste. Businesses may also apply, through the service, for a 'generic framework' – a guidance document, similar to a Quality Protocol, for their specified material. The framework is developed with the Environment Agency, owned by the requestor, and can be used to determine when end of waste has been met for a

113 The Environment Agency (2010) https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/296512/LIT_8220_108e62.pdf

114 The European Commission (2018) http://ec.europa.eu/environment/waste/target_review.htm

115 The Environment Agency (2015) Quality protocols: converting waste into non-waste products https://www.gov.uk/government/collections/quality-protocols-end-of-waste-frameworks-for-waste-derived-products

116 Environment Agency (2018), Turn your waste into a new non-waste product or material https://www.gov.uk/guidance/turn-your-waste-into-a-new-non-waste-product-or-material#definition-of-waste-assessment

specific material or product. We will continue to promote the Definition of Waste Service, and encourage businesses to apply for generic frameworks.

We will review the end of waste criteria and tests that are currently laid out in the Waste Framework Directive. We will review our current Quality Protocols to see where they need to be updated and will continue to update and improve our digital tools to support the digital transformation project to make it easier for businesses to apply for the relevant permit.

We will also publish step-by-step guidance to help local authorities, businesses and charities improve collection facilities, and increase collection for reuse and remanufacture, in accordance with end of waste requirements.

3.2.5 Addressing information barriers to the use of secondary materials as inputs

The waste from one business can be useful material for another. Enabling material flows in this way will increase our resilience to material shortages and price fluctuations as well as keeping costs down and avoiding environmental impacts.

A national materials 'Datahub', as described in Chapter 1, could help address some of the barriers that are preventing this happening. We will draw on the experience of the National Industrial Symbiosis Programme (NISP) and others, and materials databases around the world, to identify effective ways of providing information on the availability of materials, to enable their easy sale and purchase.

We will also explore the introduction of product-related information requirements known as 'product passports'. These could provide information on disassembly, recyclability, and critical raw material content for relevant products.

3.2.6 Encouraging waste producers and managers to implement the waste hierarchy in respect to hazardous waste

We will consult on our approach to transposing the new requirements of the Waste Framework Directive that relate to the management of hazardous waste. We will implement these new requirements in a way that strengthens record keeping mechanisms and furthers the application of the waste hierarchy whilst minimising any additional burdens on businesses.

In addition to this, we will consult in summer 2019 on further ways to encourage hazardous waste producers to implement the waste hierarchy. The development of clear guidance on the Best Overall Environmental Option (BOEO) for problematic wastes would promote the adoption of waste management practices that make sure hazardous chemicals in wastes do not pose a continuing risk to human health and the environment and don't end up

contaminating secondary raw material streams. In our discussions with the waste management industry they argue that there are few or no incentives that encourage the management of hazardous waste at the higher end of the waste hierarchy. Therefore, we will work with producers and waste management companies to explore these issues and consider how we can encourage producers to implement the waste hierarchy in respect to hazardous waste alongside actions to implement the Best Overall Environmental Option for problematic wastes. This may include seeking views on requiring producers of hazardous waste to report annually on how much hazardous waste they produce, send for recycling or recovery, send for disposal and the steps they have taken to drive the management of hazardous waste up the waste hierarchy.

Chapter 4

TACKLING WASTE CRIME

Waste crime damages the environment, causes distress to communities, and costs the taxpayer money to sort out the consequences. It significantly reduces resource efficiency, leading to an over-use of our natural capital, and cannot be allowed to undermine our ambition.

This chapter sets out how we will:

- **Improve the transportation, management and description of waste by reforming existing regulations**
- **Strengthen intelligence sharing and engagement to tackle illegal activity**
- **Prevent illegal activity being hidden through waste exemptions by reforming the existing regime**
- **Mandate the digital recording of waste movements, subject to consultation**
- **Create a Joint Unit for Waste Crime**
- **Toughen penalties for waste criminals**
- **Increase awareness of waste regulations and publicise positive work of enforcement bodies as they tackle waste crime**

Our ambition: to eliminate crime and poor performance in the waste sector

What is waste crime and poor performance?

Waste crime is anything that intentionally breaks the law relating to the handling and disposal of waste. It includes large scale illegal dumping, not complying with the duty of care, and falsifying records for producer responsibility notes. It is more than just small scale fly-tipping. Poor performance is careless or thoughtless practice by the waste sector. While it isn't intentionally breaking the law, people and the environment are put at risk by the failure to comply with rules for transporting, storing or disposing of waste.

The impacts of waste crime and a poor performing waste sector

Waste crime and poor performance damages the natural environment, causes harm to local people and costs the taxpayer money. Illegal and poorly performing waste sites are one example. They can pollute the air, water and land, as well as causing smells, attracting vermin and hosting fly infestations. They can also catch fire, damaging the local environment and disrupting everyday activities. The economic, as well as social costs are high: over £600m a year in England alone in 2015[117]. Fly-tipping is another example. It can cause pollution, attract antisocial behaviour and cost landowners considerable amounts of money to deal with. Local authorities alone dealt with nearly one million fly-tipping incidents in 2017/18[118] . In 2016/17 local authorities spent an estimated £57.7 million clearing up fly-tipping.

Motivators of waste crime and poor performance

The motivators of waste crime are varied, but are often financial. It is often cheaper to dump waste illegally than dispose of it correctly. A waste operator can evade a significant portion of their landfill tax liability by misclassifying waste. A company that produces waste can save money by not checking that their waste will be disposed of properly. People may find the cheapest option is hiring a fly-by-night contractor to take away their waste. They are mostly unaware that failing to exercise their duty of care in respect of waste is breaking the law. Other factors are also at play. It is cheaper and easier to dump an old sofa on a street corner than to take it to the tip, particularly if you don't have a large enough car. People think that they won't be caught so they are not deterred. The low barrier to enter the waste sector and the involvement of organised criminal gangs have recently escalated the rise in waste crime.

117 The Environmental Services Association (2017) Rethinking Waste Crime - http://www.esauk.org/esa_reports/20170502_Rethinking_Waste_Crime.pdf

118 DEFRA (2018) https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/756306/FlyTipping_201718_Statistical_Release_rev.pdf

Actions taken already

Earlier in 2018, we commissioned an independent review into serious and organised crime in the waste sector[119]. The review set out recommendations which we take forward in this Strategy.

Since 2015, six legislative changes have been made to enable the Environment Agency to take tougher and timelier action. For example, the Agency can now restrict access to problem waste sites, by locking gates and barring access.

Local authorities now have the power to issue fixed penalty notices for small-scale fly-tipping, and both the EA and local authorities have stronger powers to seize and destroy vehicles involved in waste crime.

Environment Agency waste crime budgets have risen by £60m, for 2014-22. For every £1 extra spent on tackling crime there is £5 in return[120]. This has started to pay off. The Agency has:

- Closed down more than 820 illegal waste sites in 2016/17 alone
- Prosecuted four companies for a multi-million pound fraud involving misdescribing waste in producer responsibility schemes

Earlier in 2018, we also published a consultation on a number of measures to tighten up the permitting and exemptions regime. This will raise the bar to entry, helping prevent criminals from entering the waste sector, in turn driving up the standards of the sector.

HMRC are tackling landfill tax fraud. From April 2018, the landfill tax includes all material at permitted sites unless expressly exempt and all material at unauthorised sites.

A new strategic approach

We set out here a new strategic approach to tackling crime and low levels of performance in the waste industry. Our aim is to eliminate crime and poor performance in the waste sector. We need to **prevent** it from happening in the first place, we need to **detect** it when it does occur and we need to **deter** would-be criminals and poor performers from engaging again. This strategic approach will target criminal activity across the whole resource chain to tackle all forms and drivers of waste crime and poor performance.

119 Independent review into Serious and organised crime in the waste sector (2018) https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/756526/waste-crime-review-2018-final-report.pdf

120 The Environment Agency (2017) Waste crime intervention and evaluation programme 2014-2016

OUR APPROACH WILL

PREVENT WASTE CRIME

Regulation

Intelligence sharing

We will prevent waste crime and poor performance happening in the first place by ensuring the regulatory framework is robust, driving up standards in the sector and ensuring intelligence is shared effectively.

DETECT WASTE CRIME

Analysis

Data

We will detect waste crime and poor performance when it does happen, and take swifter action to disrupt it by using improved data and analytical techniques.

DETER WASTE CRIME

Promotion

Punishment

We will deter waste crime and poor performance by making sure that those who commit crimes are caught and suitably punished, as well as promoting good behaviour to help people do the right thing in the first place.

4.1 Preventing waste crime and poor performance

Actions we will take include:

4.1.1 Improve the transport, management and description of waste by reforming regulations for duty of care, carrier/broker/dealers, hazardous waste, and international waste shipments

Current regulations have been introduced in a piecemeal fashion over the last 30 years. We will modernise, simplify and harmonise regulations and registers to make them fit for purpose. We will ensure that all waste is only carried, brokered or dealt by bona fide, properly regulated companies. Businesses, from SMEs to large construction firms, will be made more accountable for their waste when it is passed from one waste company to another along the resource chain.

We know these changes are supported broadly across the industry and by a number of other stakeholders[121]. To inform legislative changes, we will launch a consultation on:

- Improving the performance and credibility of the carrier, broker, and dealer regime, and consolidating it under one regulatory system;
- Mechanisms to ensure waste is properly and consistently described through the resource chain;
- Strengthening the responsibilities of businesses along the resource chain, and the links between them;
- Looking at the technical competency requirements of those who transport, manage and describe waste;
- Exploring the financial disincentives and penalties that should be issued for the misdescription of waste;
- Exploring ways to improve the quality of wastes exported for recycling, for example through increased monitoring of international waste shipments, and the introduction of a financial provision system for exports to cover costs of waste repatriation if needed;
- Enabling the Secretary of State to direct waste carriers to collect and transport waste in emergency situations.

We will make it easier for householders to understand and comply with their duty of care. We have also legislated to enable local authorities and the Environment Agency to issue fixed penalty notices (FPNs) to householders who breach their duty of care, for example by passing their waste to unauthorised operators who go on to dump it illegally. The penalties will come into force on 7th January 2019. We have also published guidance for local authorities on the use of the FPN which emphasises the need for proportionate enforcement. In order to get tough on rogue behaviour, it's important that local residents are able to dispose of their rubbish in a responsible and convenient

121 For example: CIWM (2018) https://ciwm-journal.co.uk/new-regime-needed-for-waste-carriers-brokers-dealers/, the recent independent review into serious and organised crime in the waste sector (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/756526/waste-crime-review-2018-final-report.pdf) and the Defra (2018, forthcoming) 'Post Implementation Review of the Waste (England and Wales) Regulations 2011' on legislation.gov.uk.

manner. We will also ensure fixed penalty notices can be varied through legislation to reflect the changing costs of waste disposal.

These measures will implement recommendations of the independent review into serious and organised crime in the waste sector. It will give regulators enforcement powers at all points in the resource chain, allowing them to tackle misdescription, illegal transport and dumping of waste at home and abroad.

4.1.2 Strengthening intelligence sharing and engagement to tackle illegal activity

The independent review into serious and organised crime in the waste sector made it clear that intelligence sharing is vital to prevent and disrupt waste crime. The Environment Agency will strengthen intelligence sharing between organisations, including the police, local authorities, HMRC and the waste industry, to prevent illegal activity. In doing so, the Environment Agency will identify appropriate shared IT platforms, such as the Police National Computer and Police National Database, and explore any requirements for further access so information is shared frequently and rapidly. The Environment Agency is developing an intelligence sharing agreement with the waste industry to tackle illegal waste operators and other criminal activity. The Environment Agency and Police and Crime Commissioners will establish effective relationships to strengthen engagement between the police and Environment Agency. The Environment Agency will also continue to engage with its counterparts in Wales, Scotland and Northern Ireland to ensure coordination across the UK.

4.1.3 Launching a 'fly-tipping toolkit'

Adopting good practice and collaborating with others can make a big difference to preventing, detecting, disrupting and deterring waste crime. Local authorities, police, EA, landowners, landlord and tenant associations, and community groups all have a role to play in preventing fly-tipping, and working together locally makes it more likely to succeed. The 2014 'National Framework for England for Tackling Fly-Tipping through Local Partnerships'[122] already promotes such collaborative working, but the National Fly-tipping Prevention Group report that this sort of collaborative working is not commonplace. There are examples of good practice that can be drawn on, for example the Hertfordshire Waste

122 DEFRA (2014) http://www.tacklingflytipping.com/Documents/NFTPG-Files/20140410%20Fly-tipping%20framework%20FINAL.pdf

Partnership which brought together a range of organisations to agree on a common approach to tackling fly-tipping and sharing intelligence, which saw an 18% fall in incidents between 2016/17 and 2017/18. Evidence suggests that a lack of knowledge and experience sharing is contributing to the problem. We will therefore create a 'fly-tipping toolkit', a web-based tool hosted by the National Fly-tipping Prevention Group to help tackle the issue. It will cover:

- How local authorities can set up and run an effective fly-tipping partnership;
- How to use new technology to report fly-tipping;
- Examples of existing good practice to prevent fly-tipping;
- How to deal with fly-tipping associated with unauthorised encampments;
- How to best share intelligence within a partnership and with other partnerships;
- How to present robust cases to the courts to ensure tougher penalties;
- How to best promote the duty of care for individuals and businesses.

4.1.4 Preventing illegal activity being hidden through waste exemptions, by reforming the existing regime

We will prevent exemptions being used to hide illegal activity by changing the ten waste exemptions most identified with illegality. In line with a recommendation of the independent review into serious and organised crime in the waste sector, we will amend the conditions for operating under exemptions to make it easier to spot and stop illegal activities. Other exemptions will be removed from the regime altogether so that those activities will need a full environmental permit to continue.

4.1.5 Considering the case for introducing tax-registration status checks for people operating in the waste sector ("conditionality")

At Budget 2018, the Government announced that it will consider legislating at Finance Bill 2019-20 to introduce a tax registration check linked to the licence renewal processes for waste carrier, broker and dealer registrations in England and Wales. Applicants would need to provide proof they are correctly registered for tax in order to be granted these licences. This would help to raise regulatory standards and improve tax compliance in this sector.

4.2 Detecting waste crime and poor performance

Actions we will take include:

4.2.1 Mandating the digital recording of waste movements, subject to consultation

All businesses that produce or handle waste are already required by law to complete a written description of waste when they transfer it to someone else. We have listened to stakeholders' views in this area[123], and will consult on our intention to legislate to make these records, including on international waste shipments, digital and mandatory[124]. In doing so, we will implement a recommendation of the independent review into serious and organised crime in the waste sector. We will also ensure that the system is backed by adequate enforcement to ensure compliance. Among other things, digital records will allow the Environment Agency to detect:

- Waste that doesn't reach the next stage, which implies illegal dumping;
- Waste descriptions that change , which implies Landfill Tax or regulatory regime avoidance;
- Strange patterns of waste transfers, which may indicate fraud.

We will fund the development of a proof-of-concept models for the digital recording of waste movements in early 2019, financed through the GovTech Catalyst competition.

Defra's GovTech Catalyst Challenge: Smart Waste Tracking

The GovTech fund[125] is designed to incentivise Britain's tech firms to come up with innovative solutions to public sector problems and improve services for citizens. Tech firms bidding to the fund will have free rein to create and pitch innovative solutions to problems facing Government.

Government has announced the first round of challenges to be tackled through the fund, including Defra's Smart Waste Tracking challenge[126]. The challenge is to track individual movements of waste through the economy so that we know more about the types and amounts of waste generated, what is done to it, where it ends up, and in what form. We will shortly announce the winning bids into this challenge and award up to five companies a maximum of £80,000 to further develop their ideas.

123 These views are reflected in the recent independent review into serious and organised crime in the waste sector and the Defra (2018, forthcoming) 'Post Implementation Review of the Waste (England and Wales) Regulations 2011', legislation.gov.uk.

124 The Government Chief Scientific Adviser's report on the value of waste recommended that building blocks of data gathering and analysis should be put in place to ensure we know the types, amounts and quality of waste, and where it is generated and ends up.

125 UK Government services and information (2018) https://www.gov.uk/guidance/the-govtech-catalyst-challenge-process

126 UK Government services and information (2018) https://www.gov.uk/government/publications/smart-waste-tracking-digital-challenge

4.2.2 Developing data and analytical tools to monitor waste operators so that we can intervene if performance begins to deteriorate

The receipt of streamlined data from waste businesses will allow the Environment Agency to detect issues at regulated waste sites more quickly. Improved analytical and modelling capability will enable Agency analysts to quickly pick up on trends that suggest possible sustained poor performance, allowing the Agency to require sites to improve, or, if necessary, enabling them to suspend or ultimately revoke a permit.

4.2.3 Creating a Joint Unit for Waste Crime

A key recommendation from the independent review into serious and organised waste crime is to create a Joint Unit for Waste Crime. The Unit will gather and share information relating to waste crime and coordinate a multiagency response to the most serious cases. The Unit will sit within the Environment Agency with input from the waste industry, HMRC and the police. A dedicated disruption team will be set up that will use intelligence to take quick action against waste criminals on the ground. The progress and success of the Unit will be reviewed after approximately 12 months.

4.2.4 Equipping the regulator with the powers it needs to pursue and disrupt organised crime

The Environment Agency has powers to regulate the waste industry to protect the environment and local communities. We will consult on our intention to legislate to bolster the Agency's powers further to ensure it is equipped to deal with the threat of serious and organised gangs. The consultation will cover powers to seize evidence and equipment and search premises without delay during investigations. We will separately explore the need for further powers for the Agency to access communications data. We will also explore in due course how to make it easier for the EA to immediately stop activities that are harming the environment and for the police to seize vehicles involved in waste crime.

4.2.5 Developing an abandoned sites action plan

The Environment Agency's abandoned sites action plan will help its staff detect early signs[127] of a site being abandoned so that risks to the environment and communities can be managed properly. The plan will set out how Environment Agency officers should act to mitigate risks from the abandonment of waste sites. This will ensure that it acts quickly and comprehensively, with partners where appropriate, to protect the environment and local communities.

127 Early signs include stockpiling (waste coming in but not going out) and repeated compliance issues.

Additionally, at 2018 Budget we committed £10m across 2019/20 and 2020/21 to deal with certain specific high-risk abandoned waste sites. This will be used by the Environment Agency to pilot an approach to pay for the landfill tax due from clearance of these abandoned waste sites. The Environment Agency will identify the highest priority sites that represent the greatest risk to the public, environment and business.

4.3 Deterring waste crime and poor performance

Actions we will take include:

4.3.1 Tightening the waste permitting regime by introducing financial provision

We will consult on the detail of a financial provision system. It will require an operator to make a payment, the level of which will be based on the risk of the site being abandoned and the potential damage caused by abandonment. This money that will be drawn down if an operator or owner abandons a site.

This will implement a recommendation of the independent review into serious and organised crime in the waste sector. The system will deter an unscrupulous operator from deliberately stockpiling waste and then abandoning the site, and will ensure that barriers to entry are not too low. It will also deter poor performance as operators will be incentivised to meet their permit conditions or risk losing the financial provision.

4.3.2 Toughening penalties for waste criminals

The rise in waste crime suggests that tougher penalties are needed to act as a deterrent. Already there is no limit on the maximum fine available in legislation. But the fines actually imposed for waste crimes, especially in magistrates' courts where most fly-tipping cases are heard, are often low, sometimes even lower than the price of legal disposal. Community sentences for waste offences are also rarely given for more serious offences where fines are not sufficient.

We have previously worked with the Sentencing Council to amend sentencing guidance for magistrates to ensure that they are aware of local fixed penalty levels for these offences. But more can be done to strengthen sentences, especially in magistrates' courts, so fines are higher and more community sentences are given where fines are not sufficient. The most serious waste crimes must continue to attract prison sentences. We will do this by:

- Increasing magistrates' awareness of the prevalence and importance of waste crime;
- Working with the Judicial Office so magistrates are effectively trained in the Environmental Offences: Definitive Guideline on sentencing[128];
- Helping local authorities improve the quality of cases, making a longer sentence more likely;

128 Sentencing Council (2014) https://www.sentencingcouncil.org.uk/publications/item/environmental-offences-definitive-guideline/

- Working with the Sentencing Council to ensure the Environmental Offences Definitive Guideline is kept up-to-date. This will help secure higher fly-tipping fines, especially at magistrates' courts;
- Reviewing offences on mismanaging hazardous wastes, including misclassification.

4.3.3 Exploring all options for funding future action on waste crime

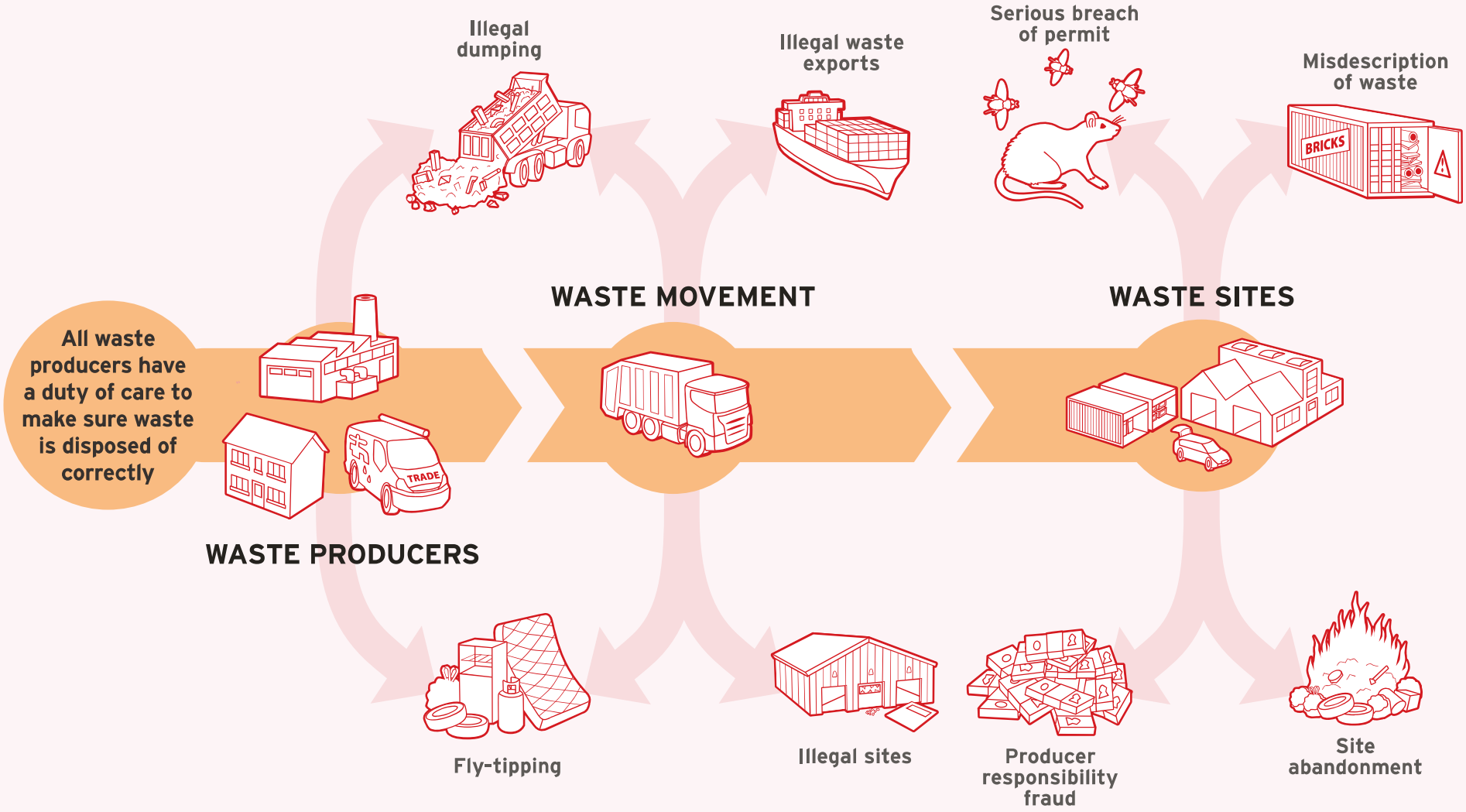
The independent review into serious and organised crime in the waste sector highlighted a number of options to fund waste crime work. This included committing a proportion of Landfill Tax receipts to Environment Agency waste crime efforts, redefining what the charges from the permitting regime can be used for, and placing a voluntary levy on industry. We will explore the options with the aim of ensuring that the Environment Agency is resourced to tackle waste crime and address any legislative barriers to funding regulatory activities, including enforcement.

4.3.4 Increasing awareness of waste regulations, publicising positive work of enforcement bodies as they tackle waste crime, and recognising high performing operators

There is a role for communications in tackling crime. It facilitates the building of knowledge, for example informing people and companies of their legal duty of care to ensure waste is disposed of properly enables them to do the right thing. It can also act as a motivator: for example, naming and shaming waste criminals deters reoffending and stops others offending. And it can set expectations, for example by showcasing good practice. We will:

- Support the waste industry's 'Right Waste, Right Place' campaign;
- Highlight successful prosecutions of waste criminals by the Environment Agency and local authorities;
- Support local authorities to increase householders' awareness of their duty of care;
- Publicise performance data to recognise the best operators of permitted waste sites.

WASTE CRIME AND POOR PERFORMANCE



Chapter 5

ENOUGH IS ENOUGH: CUTTING DOWN ON FOOD WASTE

Nobody likes to see good food go to waste. It's morally wrong, environmentally damaging, and costs money. In the UK alone, an estimated 10 million tonnes of food and drink are wasted annually after the farm gate, worth around **£20 billion**.

The environmental case is clear. If the total global annual emissions from food waste – some 3.3 billion tonnes – were released by a single country, that nation would be the world's third largest polluter behind China and the United States[129]. In the UK alone, the carbon footprint of food and drink consumed is estimated to be equivalent to one fifth of UK emissions[130].

The UK has long recognised the need to tackle food waste, and is an international leader on the issue. Since 2007, we have approached the problem from numerous angles, including through a series of voluntary agreements that have reduced per capita food waste by 14%. The latest agreement, the Courtauld Commitment 2025, aims to reduce per capita UK food waste by a further 20%, between 2015 and 2025.

We are also fully committed to meeting the UN Sustainable Development Goal 12.3 target, which seeks to halve global food waste at consumer and retail levels by 2030. Together, these commitments support our broader ambitions to eliminate avoidable waste by 2050 and to work towards eliminating food waste to landfill by 2030.

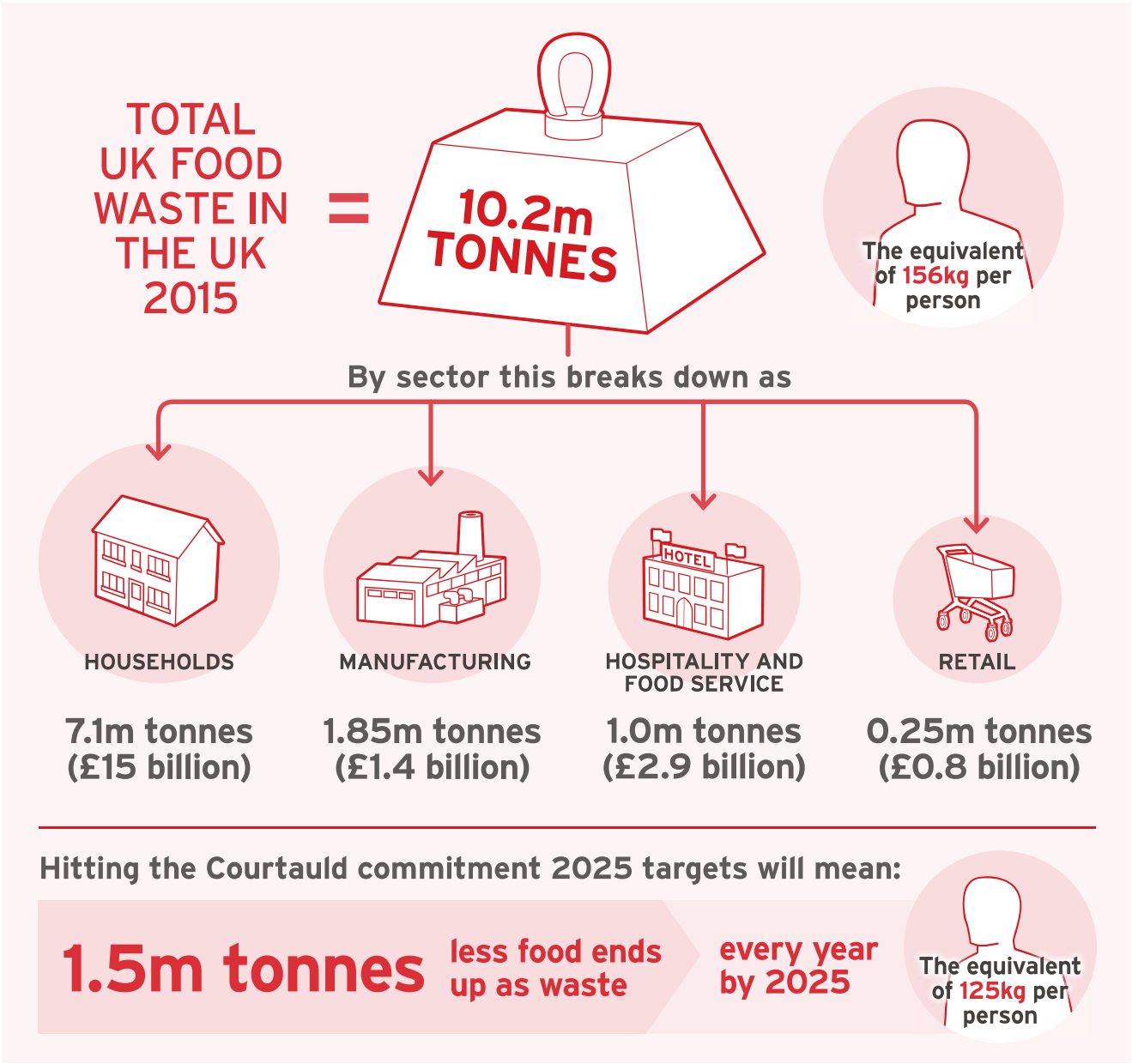
Our determination to cut food waste has not been matched by progress, which in recent years has plateaued. A new approach is needed.

This chapter sets out how we will:

- **Reduce food waste through a £15 million pilot fund**
- **Consult on annual reporting of food surplus and waste by food businesses**
- **Consult on legal powers to introduce mandatory targets for food waste prevention**
- **Publish a new food surplus and waste hierarchy**
- **Promote awareness of the issue by appointing a new Food Surplus and Waste Champion**
- **Support cross sector collaboration through the Courtauld 2025 agreement**

129 Champions 12.3 (2017) The business case for reducing food loss and waste. https://champions123.org/wp-content/uploads/2017/03/report_-business-case-for-reducing-food-loss-and-waste.pdf

130 WRAP and WWF (2011) The water and carbon footprint of household food and drink waste in the UK. http://www.wrap.org.uk/sites/files/wrap/Water%20and%20Carbon%20Footprint%20report%20Final,%20Nov%202011_0.pdf



5.1 Less food waste from businesses

If the UK is to meet its ambitious national and international targets, food companies must do more to make their supply chains more efficient, and prevent food waste from happening in the first place.

To achieve this, actions we will take include:

5.1.1 Reducing food waste through a £15 million pilot fund

Even the most efficient food system in a developed economy will produce a surplus. The best outcome is that this is redistributed before it becomes waste.

WRAP has identified 205,000 tonnes of food that could potentially be redistributed[131] rather than going to waste. A little under half of this – enough food for about 250 million meals a year - is edible and readily available, yet goes uneaten by humans. Instead, it is sent for generating energy from waste, anaerobic digestion, or given to animals as feed.

The Government will set up a pilot scheme to reduce food waste, supported by a £15 million fund. The pilot scheme will be developed in collaboration with businesses and charities and will launch in 2019.

We will continue to monitor how much food is redistributed and report back to the public.

Case study: Food Waste Reduction Fund – successful grant recipients

Eight charities and not-for-profit groups are receiving grassroots grants from the Government's £500,000 **Food Waste Reduction Fund**[132] to expand their operations. Together, the grants – administered by WRAP – will see an extra 2,500 tonnes of quality food redistributed to people in need. The eight organisations are based across England - from Devon in the south-west to County Durham in the north-east- and include:

- **Action Homeless** – which is hiring a part-time food co-ordinator, buying a new vehicle to redistribute food, leasing a shared storage unit and improving its overall facilities.
- **His Church** – which is setting up more programmes for children and families, and developing facilities for food collection and storage.
- **FareShare** – whose pilot to increase freezer capacity will see it distribute more frozen food.
- **FareShare Yorkshire** – which is buying a 7.5-tonne lorry so it can intercept bigger quantities of food that cannot currently be collected, and meeting additional staff costs and training.
- **Feedback Global** – which is setting up a community-led 'gleaning' network – gathering crops left after the harvest - to increase by 36 the number of days they can glean each year[133].
- **Food in Community** – which is opening a Pay-As-You-Feel café, piloting a surplus produce delivery scheme, and promoting gleaning activities and cookery courses.
- **Nuneaton & Bedworth Healthy Living Network** – which can now double to 280 the number of community groups it services, and also double the number of breakfast clubs it runs.
- **REfUSE** Durham – which is creating a food redistribution hub and increasing the capacity of its existing operations by introducing new projects like a Pay-As-You-Feel café and buying a walk-in fridge-freezer.

131 WRAP (2018), Surplus food redistribution in the UK; 2015 to 2017 http://www.wrap.org.uk/sites/files/wrap/Food%20Surplus%20Redistribution%20Estimate%202017%20-%20Information%20sheet.pdf

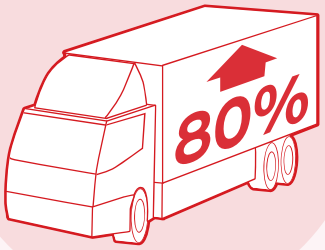
132 WRAP (2018) http://www.wrap.org.uk/content/uk-food-redistribution-increase

133 Gleaning is the act of collecting leftover crops from farmers' fields after they have been commercially harvested.

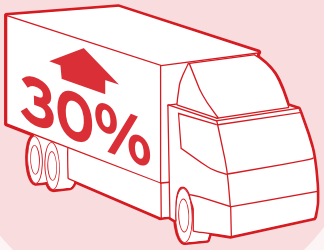
UK SURPLUS FOOD REDISTRIBUTION

Significant increases in redistribution between 2015-2017

Charities



Commercial sector



Combined increase is equal to

2015
28,500 Tonnes redistributed

2017
43,000 Tonnes redistributed

In 2017 surplus food redistribution...

Was equivalent to:

Was worth:

With potential for:

5.1.2 Consult on annual reporting of food surplus and waste by food businesses and on seeking legal powers for food waste targets and surplus food redistribution obligations

The UK was one of the first countries in the world to publish comprehensive data on food waste in line with international best practice. The EU is now following our lead by committing to annual reporting of food waste data. The need to report data is shown to spur companies into taking the necessary targeted action.

To help food businesses do this, WRAP has introduced a Food Waste Reduction Roadmap – so far adopted by 89 companies that have signed up to a range of ambitious milestones. The roadmap gives businesses directions on cutting waste in their own operations, and on how they can replicate this with their suppliers and consumers.

We would like to see larger food businesses use these resources to set a reduction target in line with UN SDG 12.3 and to report their food waste transparently on an annual basis[134]. We will consult in 2019 on introducing regulations to make reporting mandatory for businesses of an appropriate size. We will also consult on seeking powers for mandatory food waste prevention targets for appropriate food businesses and for surplus food redistribution obligations to be introduced subject to progress made by businesses to reduce food waste.

5.1.3 Publishing a new food surplus and waste hierarchy

Our priority is to stop surplus food from becoming waste. We have a tiered approach to managing it which is known as the food surplus and waste hierarchy.

Ideally, surplus food should be redistributed for people to eat. The next best outcome is that it is used in the production of animal feed or for bio-material processing. In both these managed scenarios, the food surplus is not food waste. If neither scenario is possible, food waste should be treated through recycling by anaerobic digestion, or through composting when it is mixed with other bio-waste (such as garden waste). If anaerobic digestion or composting are not possible, it should be treated via energy from waste in preference to landfill.

The new guidance on GOV.UK offers advice on how to comply with the hierarchy and tools to do so[135]. We expect more surplus food to be redistributed as a result, leading to better environmental outcomes. We will review the implementation of this guidance in 2020.

134 Businesses have the option to report their food waste using the online tool Atlas, the world's first universally accessible online tool to capture global food loss and waste data in one place. This offers an option for transparent reporting. WRAP (2018) http://www.wrap.org.uk/content/food-waste-atlas

135 UK Government services and information (2018) https://www.gov.uk/government/publications/food-and-drink-waste-hierarchy-deal-with-surplus-and-waste

Before then, in 2019, the EA will review the current rules around permits for food waste storage facilities. This will support further redistribution of surplus food.

5.1.4 Promoting awareness of the issue by appointing a new Food Surplus and Waste Champion

The Food Surplus and Waste Champion will work with business leaders to ensure that this issue remains at the top of their agendas. He or she will vigorously support the commitments set out in the 25 Year Environment Plan and the policies laid out in this Strategy.

5.1.5 Supporting cross sector collaboration through the Courtauld 2025 agreement

The latest voluntary agreement, the Courtauld 2025 Commitment, aims to reduce per capita UK food waste by a fifth between 2015 and 2025. It supports collaborative action to address food waste across supply chains from farm to fork. As we continue to support Courtauld 2025, we urge business to:

- Identify food waste hotspots across the supply chain and see how they influence each other;
- Understand barriers to reducing food waste and improving resource efficiency;
- Agree practicable solutions, within the context of technical or commercial constraints;
- Develop best practice for industry-wide adoption, and any associated guidance.

Case study: Identifying the biggest opportunities to cut milk waste along the value chain

Fresh pasteurised milk is a staple of supermarket shelves and most homes but too much of it is going to waste – a problem flagged by leading businesses within the Courtauld Commitment 2025. Research showed that they were right to be concerned: waste directly attributable to milk processing and handling amounts to around 330,000 tonnes per year, worth more than £150million. Ten times more milk was wasted in homes than anywhere else across the supply chain.

Work by WRAP has shown that milk waste can be cut by around 90,000 tonnes (or more than £40million) a year[136]. Simply lowering the average temperature of fridges in UK homes will save over 50,000 tonnes of milk that might otherwise have gone off – leading WRAP and industry to develop a 'Chill the Fridge Out' public awareness campaign.

Chillthefridgeout.com[137] is an online tool that helps people set their fridge to the right temperature. Using information from over 20 of the biggest fridge manufacturers, it lets users select their brand and model, and tells them how to set the dial below 5°C. There are also tips on keeping the fridge at the optimal temperature.

136 WRAP (2018) http://www.wrap.org.uk/content/opportunities-reduce-waste-along-journey-milk-dairy-home
137 Chillthefridgeout.com (2018) https://www.lovefoodhatewaste.com/article/chill-fridge-out

5.1.6 Producing and promoting food waste strategies for the hospitality and public sectors

The hospitality sector

Food waste from the hospitality sector amounts to one million tonnes per year, worth some £2.9 billion. We will produce guidance for the sector to support their actions to prevent food waste, including best practice examples such as offering a range of portion sizes and a take-home service for leftovers.

The public sector

Around 30% of hospitality and food service food waste stems from catering in schools, hospitals and other public sector institutions[138]. We are ambitious about improving this, recognising the demand for sustainable, locally sourced, nutritious and palatable food, and the Plan for Public Procurement provides a strong framework[139]. It uses a balanced scorecard which incorporates the government Buying Standards for Food and Catering (GBSF), and is mandatory for use in central government departments[140].

In the future we will work with the NHS Estates and Facilities Team at NHS Improvement to support the creation of a new 'food standard' which will be introduced across NHS hospital trusts in 2019, keeping sustainability and food waste as key priorities. To tackle food waste in schools, WRAP guidance will be developed and widely promoted.

5.1.7 Seeking powers through the Agriculture Bill to protect producers and cut wastage

So far we have focused on food waste after the farm gate. But at the primary production stage of the supply chain there is also significant scope to prevent waste food – and tangible financial, environmental and efficiency benefits to be had. A conservative estimate for the whole sector suggests that around 2.5 million tonnes a year, worth around £800 million, is lost – in some cases through unfair contractual practices.

We are seeking powers through the Agriculture Bill to introduce sector-specific statutory codes of contractual conduct to protect producers from exposure to unfair practices which are often the cause of viable produce going to waste. Practices such as late changes to product specifications, or order cancellations with insufficient notice for a producer to find an alternative commercial outlet for their goods, can mean perfectly good food never even reaches the shop

138 WRAP (2018) http://www.wrap.org.uk/category/materials-and-products/food

139 UK Government services and information (2014) https://www.gov.uk/government/collections/food-buying-standards-for-the-public-sector-the-plan-toolkit

140 UK Government services and information (2014) https://www.gov.uk/government/publications/sustainable-procurement-the-gbs-for-food-and-catering-services

shelf. Furthermore, we have also committed to explore with industry how the collection and dissemination of market data can help drive greater efficiency and therefore prevent food waste, and are seeking powers in the Agriculture Bill to facilitate this.

We are also currently developing a £10 million collaboration fund, open to groups of producers interested in pursuing joint business models: this could include funding for joint initiatives seeking alternative commercial outlets for non-specification goods, or support to establish short supply chains.

Agricultural plastics

Plastic is of concern in the agricultural sector in two main ways:

- Large amounts of plastic film are used by farmers, to protect their crops from bad weather and pests. Attempts to collect this material for recycling have often been unsuccessful, due to high levels of contamination making the recycling process uneconomic.
- Organic household waste such as food and garden waste can be composted or sent to anaerobic digestion, producing a solid compost or digestate (a liquid soil conditioner) respectively. Both of these are potentially suitable for agricultural use. In each case, however, if the household waste included plastic contaminants, these may end up in the resultant end product. Such contaminants need to be minimised if the compost or digestate is to meet the relevant quality standard (PAS 100 and PAS 110 respectively) and provide farmers with a high quality product.

We are exploring how Government policy can address these issues. This includes through WRAP's Food Waste Recycling Action Plan, bringing together industry and trade associations to minimise plastic pollution in compost and digestate.

5.2 Making it easier for people to waste less food

Retailers and food businesses play a key role in influencing household food waste, as well as in their own operations. Government will continue to provide guidance on best practice, and we will check food businesses' progress through regular surveys, the first of which will take place in 2019.

To achieve a reduction in consumer and business food waste, actions we will take include:

5.2.1 Working with industry to determine the most appropriate approaches to labelling

Information is a major influence on consumers, whose decisions on whether to use or dispose of food are swayed by:

- The choice of date that is applied (for example, 'Best Before' rather than 'Use By');
- The length of time between purchase and the expiry date;
- Advice on how long a product can be consumed once it's opened;
- Optimal storage/freezing advice.

Defra, the FSA and WRAP published **food labelling** guidance in November 2017[141] , which we expect to be fully implemented by all food businesses.

In 2019, we will review the current recommendation for most pre-packed uncut fresh produce to carry a 'Best Before' date. Government's expectation is that before the review, industry will provide evidence about changes to fresh produce date labelling (including the removal of 'Best Before' advice), both in store and at home, as a move towards a consistent approach across the sector.

5.2.2 Advising retailers whether to sell fresh produce loose or packaged

The 25 Year Environment Plan sets out our commitment to work with retailers and WRAP to explore introducing plastic-free supermarket aisles in which all the food is sold loose. Aisles such as these are popular with some shoppers – but it is also the case that packaging protects and extends the shelf life of many items. Nonetheless, we believe a balance can be struck which respects both the desire to cut packaging, and the desire to cut food waste.

141 WRAP (2017) http://www.wrap.org.uk/food-date-labelling

WRAP is consulting on a new technical report on the evidence for providing fresh produce loose without significantly increasing food waste. This report will inform future published guidance and is intended to be used alongside retailers' plans to reduce plastic.

5.2.3 Identifying progress made by all retailers and brands to implement best practice

In autumn 2019, the Government, through WRAP, will conduct a survey to assess how far retailers and food businesses have come in implementing key industry guidance and best practice on food waste. The survey will look at their progress on:

- Date labelling;
- Storage advice;
- Pack sizes;
- Functionality and relative pricing;
- Consumer advice;
- Provision of loose produce.

The results of the survey will be published transparently.

5.2.4 Supporting WRAP's strategy to prevent citizen food waste

We have had considerable success in reducing food waste at the household level in the past. Between 2007 and 2012, household food waste fell by 17% but progress has since plateaued[142].

WRAP will continue to engage and help businesses and the public through its platform 'Love Food Hate Waste'. Part of the new strategy is aimed at starting a national conversation about food waste. To support the public WRAP are working with businesses to improve product design to tackle food waste, including through the use of re-sealable packs, and through pack sizing and labelling that helps people plan and use up food sensibly.

We call on food businesses, local authorities and the third and public sectors to:

- Actively support the development and use of WRAP's national messaging to promote food waste prevention among citizens;
- Play an active part in piloting interventions and in scaling-up those pilots which prove most successful.

142 WRAP (2018) http://www.wrap.org.uk/content/courtauld-2025-baseline-and-restated-household-food-waste-figures

Government will play its part by incorporating food waste messages into wider communications on related topics, including health and education[143].

Case study: Lidl Consumer messaging

Lidl UK has made innovative efforts to help its customers waste less food, and value it more. New guidance on labels lets shoppers know how to store products correctly, keeping them fresher and extending their life. It comes after Government urged retailers to use clearer labels, including a 'Little Blue Fridge' icon for items such as apples that people might not realise are best stored under 5C. Motivational messaging on Lidl's fresh produce and bakery packaging, meanwhile, tells customers about their food's journey from farm to fork, piquing their interest in what they are taking home to eat. Lidl has worked with WRAP on best practice labelling, and continues to monitor customer feedback.

"We are passionate about reducing food waste, both at store level and in the home," said Mark Newbold, CSR Manager at Lidl UK. "We hope that this latest innovation will help our customers to make the most of the food they buy, as well as tackling the two million tonnes of food wasted each year from UK homes because it's not used in time. The Little Blue Fridge icon will indicate at a glance if a product should be kept cool. We're also providing information about the journey of food and handy hints to reduce waste. For example, the wheat for our bread takes 10 months to grow, yet 20 million whole slices of bread are binned by UK households every single day - so freezing it for later is a great way to make the most of every slice."

143 For instance the Department for Education has strengthened the requirements on schools to teach children about food, nutrition and healthy eating, how to cook a repertoire of dishes and have a greater understanding of where food comes from.

Chapter 6

GLOBAL BRITAIN: INTERNATIONAL LEADERSHIP

The unsustainable use of resources is a global problem which requires a global solution. With 7 billion people using resources and creating large volumes of waste every day, tackling this issue is vital for global sustainable development. That is why resource efficiency is recognised within the Sustainable Development Goals (SDGs) and is a key driver of success to ensure sustainable consumption and production patterns.

Systems that regulate life on earth – for example terrestrial ecosystems, the world's oceans, freshwater resources and the climate – exist in feedback loops. No environmental issue demonstrates this fundamental truth more visibly than marine plastic pollution. Over 90% of marine plastics originate from land-based sources[144], yet once in the ocean these plastics can circulate widely and pose a grave threat to marine life far from where they entered the ocean.

The UK has long recognised the importance of international coordinated action to address these issues. That is why we work closely with our international partners to enable and encourage action across the board to reduce environmental damage and degradation.

This chapter sets out how we will:

- **Promote the goals of our Resources and Waste Strategy internationally**
- **Drive international political commitments through the ground-breaking Commonwealth Clean Oceans Alliance**
- **Support developing nations to tackle pollution and reduce plastic waste, including through UK aid, private/public partnerships and sharing of expertise**
- **Improve the quality of plastics exported for recycling through the Basel and Stockholm Conventions**
- **Tackle international barriers to a circular economy**
- **Establish cross-government oversight of the UK's natural resource security**

144 Chartered Institution of Wastes Management and Waste Aid (2018) From the Land to the Sea, https://wasteaid.org/wp-content/uploads/2018/04/From-the-Land-to-the-Sea.pdf

6.1 Leading by example

We operate in a global economy where resources are traded internationally to meet demand. Waste generated anywhere on earth can be circulated in rivers and oceans and end up polluting other locations far from where it originated. We want to share our understanding and skills so that the impact of actions we take here in the UK is magnified globally.

New Plastics Economy Global Commitment

In October 2018 at the Our Oceans conference the UK Government, alongside many of the world's largest packaging producers, retailers, recyclers and NGOs, signed the Ellen MacArthur Foundation's New Plastics Economy Global Commitment[145]. It brings Government, cities and businesses together to address the root causes of plastic waste and pollution, with a particular focus on packaging.

In signing up the Government has endorsed a common vision and committed to put ambitious policies in place well ahead of 2025 in key areas: (1) elimination of problematic or unnecessary plastic; (2) encouraging reuse models; (3) incentivising the use of reusable, recyclable, or compostable plastic; (4) increasing collection, sorting, reuse, and recycling rates, and (5) stimulating demand for recycled plastics. **We hope to inspire other countries to follow our lead and commit to action in these 5 areas.**

To achieve this, actions we will take include:

6.1.1 Promoting the goals of our Resources and Waste Strategy internationally through UN Conventions, bilateral partnerships and other opportunities for sharing best practice and information

We will continue to engage actively with our neighbours, sharing experience and best practice. And we will continue to be reliable partners, willing allies and close friends with countries in Europe and around the world, as we work towards increasing resource efficiency and minimising waste for all.

Our leadership is respected in part because of our enduring commitment to high standards, domestically and internationally, and the depth and quality of our scientific and analytic expertise. We will lead by example on the crucial environmental challenges addressed through this Strategy.

145 The Ellen Macarthur Foundation (2018) https://www.ellenmacarthurfoundation.org/news/a-line-in-the-sand-ellen-macarthur-foundation-launch-global-commitment-to-eliminate-plastic-pollution-at-the-source

Securing a Green Brexit

Leaving the EU means we will take back control of environmental legislation. This presents a unique opportunity to design a set of policies to drive environmental improvement and growth tailored to the needs of our country. Our vision is for a green Brexit in which environmental standards are not only maintained, but enhanced. The EU (Withdrawal) Act 2018 will ensure existing EU environmental law continues to have effect in UK law after we leave the EU, providing businesses and stakeholders with maximum certainty. This includes any commitments from the Circular Economy Package (CEP) in relation to waste and recycling that are part of UK legislation when we leave.

The Government recognises that governance arrangements for the environment will change once we leave the EU. We have consulted on a new, independent statutory body to hold government to account on its delivery of environmental law following EU exit; and on the development of a new policy statement on environmental principles. Ensuring that there is transparency and accountability in how we achieve our resources and waste ambitions will be a priority in this work.

Circular Economy Package

The EU's CEP proposals include amendments to six waste-related directives, part of measures to promote a more circular economy. The package includes targets to reduce the amount of waste going to landfill (no more than 10% by 2035) and sets higher targets for recycling of various everyday materials, including plastic, paper, cardboard and glass packaging. Municipal waste recycling targets are set at 55% by 2025, 60% by 2030 and 65% by 2035, with a review clause in 2028. Overall packaging waste recycling targets are set at 65% by 2025 and 70% by 2030. Additionally the package looks to extend separate collection requirements to bio-waste (by 2023) and textiles and hazardous household waste (by 2025).

As we implement and deliver this Strategy we will explore whether more stretching targets, over and above those proposed by the EU, can be developed that will deliver the most effective approach to recycling. These won't just target weight but will also consider the environmental impacts of waste, though in doing so will ensure that the frequency and scope of household waste collections is not undermined. Should they be preferable, we will present proposals to the UK Parliament following the UK's departure from the EU. Further detail is set out in Chapter 8.

6.1.2 Driving forward discussions on the development of metrics for resource efficiency

The shift to a more resource efficient global economy requires countries the world over to be able to measure progress and to use consistent metrics to do so.

We have supported the adoption by the G7 of the "5-year Bologna Roadmap"[146], to advance common activities on resource efficiency. The Roadmap has been adopted as a living document to prioritise actions that advance lifecycle-based materials management across the supply chain.

We will continue to develop our joint capability to measure and monitor resource efficiency outcomes and impacts, building on our domestic work set out in Chapter 8. Building on the expertise of the OECD, the International Resource Panel (IRP), the G7 statistical institutes and other relevant bodies, we will review and share existing practices, identify gaps in measurements as well as develop possible new global, regional and national indicators, and advance existing ones, where needed. This work will inform our domestic project on exploring mandatory reporting by businesses which will be an important step in terms of monitoring on a sectoral and national level. In 2019 the UK will host an international workshop focused on improving resource efficiency metrics, for other signatories to the Bologna Roadmap.

146 G7 (2017) http://www.g7italy.it/en/environment-ministerial-meeting

6.2 Collaboration to solve global waste issues, beginning with a focus on marine plastics and waste management in developing countries

Badly managed resources not only present a serious threat to the world's ecosystems and economies, but also to human health. This is particularly true in developing countries, in which there are an estimated two billion people living without waste collection and three billion people without controlled waste disposal. The impacts of this can be disastrous, for example by facilitating the spread of infectious diseases. Around nine million people per year die of diseases linked to mismanagement of waste and pollutants – twenty times more than die from malaria – 92% of which occur in low and middle income countries[147].

With just twenty countries responsible for over 80% of the plastic debris discarded into the ocean[148], we need to work internationally to solve the problem. Increasing the extent and improving the quality of waste management, particularly in developing countries, is one of the most important immediate steps towards doing so.

Britain is committed to helping the world's poorest – this means taking on global challenges like pollution and climate change, which go hand-in-hand with the fight against poverty.

To achieve this, actions we will take include:

6.2.1 Driving international political commitments through the ground-breaking Commonwealth Clean Oceans Alliance

As Commonwealth Chair-in-Office from 2018 to 2020 the UK is driving forward ambitious action to reduce plastic pollution in our oceans. The ground-breaking Commonwealth Clean Oceans Alliance (CCOA) with our partner Vanuatu calls on Commonwealth countries to pledge action, whether by banning microbeads in personal care and cosmetic rinse off products, committing to cutting down on single-use plastic bags, or taking steps to eliminate plastic waste. With over a third of the Commonwealth pledging support to the CCOA, we have a significant opportunity to drive forward ambitious global action.

Up to £66.4 million of UK Aid has been committed to tackle plastic pollution through the Commonwealth, which will help developing countries stop plastic pollution from entering the oceans in the first place. Working with NGOs and businesses, we will provide technical assistance and share expertise on waste management, work with industry and establish public-private partnerships, and invest in research and innovation to create new solutions.

We expect that through addressing the causes of marine pollution, wider benefits will accrue to populations from better prevention and management of waste.

147 Edugreen (2017) http://edugreen.teri.res.in/explore/solwaste/health.htm

148 "Managing Marine Plastic Pollution: Policy Initiatives to Address Wayward Waste". Environmental Health Perspectives, Vol 123, No 4, 2015.

Our commitment to the Sustainable Development Goals

The Sustainable Development Goals[149] (SDGs) are a universal call to action to end poverty, protect the planet and make sure that all people enjoy peace and prosperity. Delivering the relevant environmental aspects of the UN Sustainable Development Goals (Agenda 2030[150]) for the UK requires cross-government, cross-industry and individual participation.

The UK Government is firmly committed to delivering the goals both at home and around the world. Delivering the aims of this Strategy, including through our international leadership, helps us move closer to achieving these goals. Resource efficiency principles and practices contribute directly to 21 of the SDG targets, and indirectly to 28 additional targets. The strongest contributions are to SDG 6 (Clean Water and Sanitation), SDG 7 (Affordable and Clean Energy), SDG 8 (Decent Work and Economic Growth), SDG 12 (Sustainable Consumption and Production), and SDG 15 (Life on Land). Resource efficiency indirectly helps deliver additional goals, SDG 1 (No Poverty) and SDG 2 (Zero Hunger) and SDG 14 (Life Below Water)[151].

There is a huge socio-economic and environmental dividend to be gained through SDG implementation[152], presenting Government with the opportunity to create the right market conditions for them to be realised. A substantial increase in resource efficiency is essential to meet the SDGs and associated targets and climate goals in a cost-effective manner.

6.2.2 Supporting development of country action plans and investable solutions through the Global Plastic Action Partnership

As part of the funding package, Defra have allocated £2.4 million of UK Aid funding for the Platform for Accelerating the Circular Economy (PACE) Global Plastic Action Partnership, launched in 2018[153]. The project will build an ambitious global public-private partnership to tackle plastic pollution of rivers, deltas and the ocean, and will convert commitments into action by fast-tracking resource and waste solutions in coastal countries.

The first collaboration is with the Government of Indonesia. The world's largest archipelago is suffering a crisis of plastic waste and the government has a national plan to reduce it by 70% by 2025. Collaborations in two other coastal nations (one in West Africa and a small island developing state) will be announced by the end of 2019.

149 UN (2016) https://www.un.org/sustainabledevelopment/sustainable-development-goals

150 DFID (2017) https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/603500/Agenda-2030-Report4.pdf

151 Schroeder, Anggraeni and Weber Journal of Industrial Ecology (2018) https://doi.org/10.1111/jiec.12732

152 The Business & Sustainable Development Commission has estimated that the economic prize to business of implementing the SDGs could be up to US$12 trillion (£9 trillion) globally by 2030.

153 After UK Government investment, the initiative has since received and CAD6 million ($4.6 million) from the Government of Canada. The Coca-Cola Company, Dow Chemical and Pepsico Foundation have jointly contributed more than $2.4 million.

The Partnership aims to have investable solutions in place by 2020, which can then be adapted and implemented in other countries. The Partnership provides an opportunity to mobilise significant private sector effort and finance.

6.2.3 Supporting developing nations tackle pollution and reduce plastic waste, including through UK Aid

Research and innovation to tackle plastics and manufacturing pollution

The Sustainable Manufacturing and Environmental Pollution programme will tackle the problem of pollution and environmental degradation generated by manufacturing processes in DFID priority countries across Africa and Asia.

Over five years (2018-2023) DFID will back a £20 million research programme to generate evidence and practical solutions to address the problem of environmental pollution including plastics from manufacturing sources.

In April, BEIS set out its intention to work with others across the Commonwealth to develop a Marine Plastics Research and Innovation (R&I) Framework and announced that it would contribute £25 million. This Framework will encourage researchers from a broad range of disciplines across the Commonwealth to look at the issue of marine plastics from a scientific, technical, economic and social perspective. It will support interdisciplinary work across a range of relevant issues, including (but not exclusively):

- Developing a circular economy, including upstream solutions, to prevent plastics from becoming waste and getting into the oceans in the first place;
- The development of low carbon sustainable alternative to plastic; and,
- Sustainable options for cleaning up the marine environment.

The Framework aims to drive a step change in evidence to support action on marine plastics and, through sharing new knowledge and solutions, make sure that the whole Commonwealth benefits from this latest thinking.

Build capability and capacity

Working with Commonwealth countries across the full spread of the development spectrum, DFID and Defra will fund up to £10 million and £6 million respectively, to provide bespoke technical assistance and facilitate knowledge sharing. This will help governments across the Commonwealth improve their capability to deliver policies that tackle plastic pollution and improve waste management, as well as support them to develop Marine Litter Action Plans through Defra's £6 million Commonwealth Litter Programme.

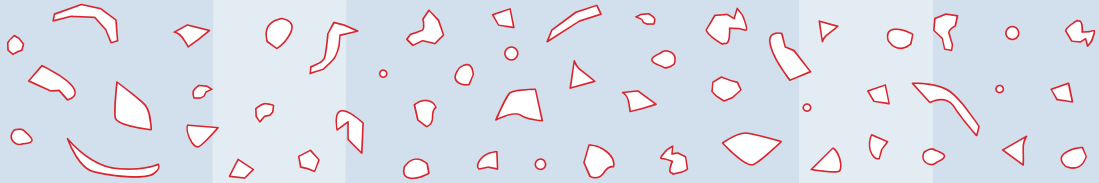
DFID will spend up to £3m of UK Aid on pilot projects in cities in developing countries, including Ghana, Bangladesh and Uganda, with a focus on improving recycling and cost recovery from waste plastics.

Taking advantage of the diversity of the Commonwealth, we will share the successes of this work to act as a blueprint for countries around the world.

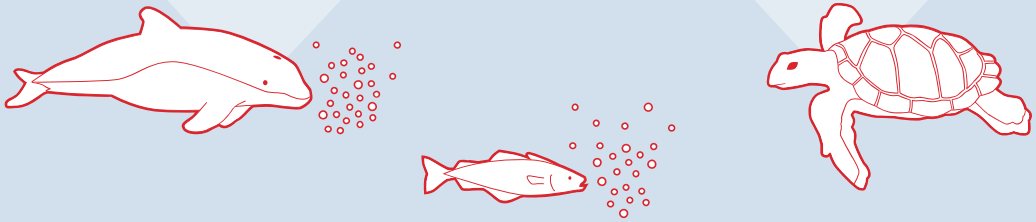
OCEAN PLASTIC BREAKDOWN

Some plastic is lost or discarded at sea...

However, over 90% of marine plastic comes from land-based sources. Littered plastic can be carried by wind or rain into the ocean.....



...where, over time, waves, UV light and oxidation break it up into smaller parts...



...until they eventually become so small that they are indistinguishable from food for marine life.

6.3 Addressing international barriers to a circular economy

Management of resources according to circular economy principles requires co-operation and movement of materials across boundaries. Where we export resources and waste to other countries we must do more to make certain it is fit for recycling and that it is managed in a manner that protects human health and the environment. Different national interpretations of waste regulations for the same material and legal ambiguities around the status of reprocessed materials hamper cross-border trade in secondary resources.

To achieve this, actions we will take include:

6.3.1 Improving the quality of plastics exported for recycling through the Basel and Stockholm Conventions, launching a call for evidence in 2019

We will continue to actively engage in international activities to promote the environmentally sound management of hazardous and other wastes, and compliance with international controls on the shipment of those wastes through the Basel Convention[154]. Undertaking activities to improve legal clarity and address illegal traffic will support implementation of the Convention. By contributing to scientific and technical activities such as the development of technical guidelines on specific waste streams (e.g. persistent organic pollutants and nanomaterials), the UK supports other Parties to manage their wastes in an environmentally sound manner.

6.3.2 Better managing waste to reduce risks from chemicals without hampering the functioning of secondary materials

We will launch a call for evidence in 2019 to inform our Chemicals Strategy and to help us:

- Define substances of concern – under the REACH (Restriction, Evaluation, Authorisation of Chemicals) Regulation hazardous substances of very high concern are identified but these are not the only substances that can create barriers for recycling;
- Identify and track chemicals in products across global supply chains;
- Consider different rules for chemicals in primary and secondary materials;
- Facilitate better communication between recyclers and designers so that hazardous components are designed for easier dismantling, and destroyed to increase safe recycling operations.

154 The Basel Convention addresses the environmentally sound management of wastes and covers many of the issues at the heart of reducing marine pollution from plastic. www.basel.int

6.4 Improving UK and global resource security

Increasing global demand is leading to strains on supplies of some raw materials upon which our economy relies, creating risks in terms of supply chain vulnerabilities. For example, 94% of the global supply of niobium derives from a single mine in Brazil, yet is essential for high-performance steel needed by the UK defence, aerospace, automotive, oil and gas sectors, which supported sales of over £60 billion in 2016.

We recognise the importance of this issue, particularly given its alignment with this Strategy. By using resources more efficiently we can ensure they are reused, re-manufactured or recycled as much as possible. Creating and safeguarding this stream of secondary resources will boost the resilience of UK businesses and enable them to become more competitive in the face of increasing and fluctuating commodity prices.

To achieve this, actions we will take include:

6.4.1 Establishing cross-government oversight of the UK's natural resource security

Several of the actions and commitments made through this Strategy will help safeguard and improve the UK's natural resource security. For example, the creation of a National Materials 'Datahub' could help businesses better understand risks in raw material supply chains and allow them to plan accordingly to mitigate such risks. Furthermore, Extended Producer Responsibility and ecodesign should ensure that valuable materials remain in the economy for longer, thereby increasing resilience to resource security risks.

We want to provide businesses with certainty and the confidence to invest in more resource efficient technology and infrastructure. This means making sure that the economy is resilient against strains to the supply of materials upon which we rely and providing an environment in which businesses are able to understand and address risks. We will do this by establishing cross-government oversight, reinvigorating our Resource Security Action Plan[155] which will involve:

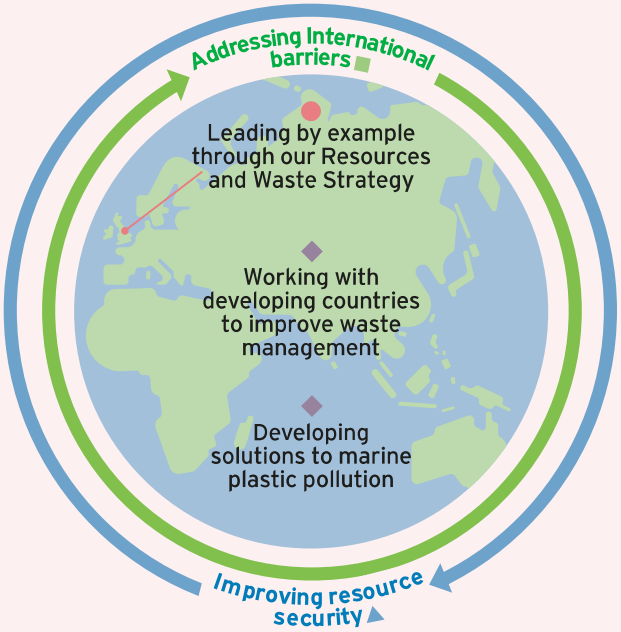
- Oversight of the material supply chains required to meet our wider clean growth targets, such as ending the sale of new conventional petrol and diesel cars and vans by 2040[156], including the capacity to reprocess and manage materials at end of life;
- Oversight of raw materials which are or may become critical to the economy, for which production and/or supply is constrained by technical, environmental and/or geopolitical factors;
- Updating our previous research on 'Future Resource Risks Faced by Business and an Assessment of Future Viability'[157];
- Consideration of the issue of resource nationalism in relation to metal and mineral supplies and implications for the UK.

155 DEFRA (2012) Defra-BIS Resource Security Action Plan https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69511/pb13719-resource-security-action-plan.pdf

156 DEFRA (2018) Draft Clean Air Strategy https://consult.defra.gov.uk/environmental-quality/clean-air-strategy-consultation/user_uploads/clean-air-strategy-2018-consultation.pdf

157 DEFRA (2018) Future Resource Risks faced by Business and an Assessment of Future Viability http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=2&ProjectID=17161

GLOBAL BRITAIN: INTERNATIONAL LEADERSHIP



1. **Leading by example,** magnifying the impact of the UK's actions globally
2. **Working collaboratively to solve global waste issues,** beginning with marine plastic pollution and waste management in developing countries
3. **Addressing international barriers** to a more circular economy
4. **Improving resource security,** both in the UK and globally

world by Adam Wilson from the Noun Project

Chapter 7

RESEARCH AND INNOVATION

"There is a great opportunity for UK businesses to develop innovations and new technologies to support and enhance resource efficiency, becoming market leaders and exporters of expertise to the world".

Report of the Government Chief Scientific Advisor, From Waste to Resource Productivity[158]

Many technologies and solutions already exist to support the move towards a more circular economy. Yet in some cases these readily available technologies and solutions are not taken up at scale. Whilst incentives, behavioural change campaigns and regulation may help overcome such barriers, there are several resource efficiency challenges for which we do not yet have market-ready solutions. This is where there is a key role for innovation – in the development of novel solutions and improvements in the efficiency, cost and/or effectiveness of existing technologies. This requires Government support due to the higher costs for business in developing new products and solutions, the risks and uncertainty involved, and the possibility that individual businesses will not derive the full market benefits from doing so.

This chapter sets out how we will:

- **Support further investment and innovation in resource efficiency, working with UK Research and Innovation (UKRI) on our Areas of Research Interest**
- **Launch a call for evidence on the development of standards for bio-based and biodegradable plastics**
- **Provide Government funding for innovation and seek ways to support further investment in resource efficient technologies, including through the Industrial Strategy Challenge Fund**
- **Support the Waste and Resources Action Programme**
- **Encourage innovative waste treatment technologies that create transport fuels through the Renewable Transport Fuels Obligation (RTFO)**

158 UK Government services and information (2017) https://www.gov.uk/government/publications/from-waste-to-resource-productivity

7.1 Innovation which delivers greater UK resource efficiency faster

Innovation will help deliver new, cleaner technologies at lower cost, create jobs and increase the competitiveness of UK companies. As a Government we cannot be complacent – we want to create the right policy environment for innovation to flourish.

To drive progress, actions we will take include:

7.1.1 Supporting further investment and innovation in resource efficiency, working with UK Research and Innovation (UKRI) on our Areas of Research Interest

Areas of Research Interest (ARIs) give details about the main research questions facing government departments. Defra published an initial set of ARIs[159] in March 2017. We will continue this strategic approach, providing research councils and the wider research community with clear signals regarding policy-relevant research questions which could have high impact outputs. This will ensure that we are making the best use of evidence and research to understand the challenges we face, to underpin proportionate and targeted action.

In partnership with leading academics, including our Science Advisory Council[160], we have identified five further ARIs focused on resource efficiency and waste:

Extended producer responsibility (EPR)

Alongside our consultation (see Chapter 1), we want to encourage examination of UK-specific issues regarding EPR. How could the current UK systems be improved? What alternative models are available and how would they translate to the UK market? Although packaging is a mature area, what are the costs and benefits for other products for which EPR could be suitable, particularly those products with high environmental impacts, such as fishing gear and clothing? We also want to assess the impact of EPR on product design for packaging, and how lessons could be translated to other sectors.

Resource efficiency and the circular economy

While we have reasonable data for individual sectors, we need to increase our understanding of the macroeconomic benefits of increased resource productivity across the UK, and develop metrics and measurement techniques that allow comparison between sectors. This will allow better assessment of the effectiveness of interventions and of the benefits for the UK as a whole. We also want to increase our understanding of methods for increasing the circularity of production, through increased recyclability and durability, especially for small and medium-sized enterprises.

159 UK Government services and information (2017) https://www.gov.uk/government/publications/defra-group-areas-of-research-interest

160 UK Government services and information (2018) https://www.gov.uk/government/organisations/science-advisory-council

Minimising environmental impacts of waste

We need to better understand the composition of the waste we generate, now and in the future, particularly from the commercial and industrial stream and variation between different sectors. This will allow us to target sectors where the biggest improvements can be made. We also need to increase our understanding of future waste infrastructure requirements, including the demand for and viability of alternative waste management technologies, such as biotechnology solutions for treatment of bio-waste[161]. Finally, we need to find innovative ways to reduce the long-term costs and environmental impacts of legacy landfilled waste.

Food waste

Although we have a significant evidence base around food waste reduction, we want to encourage further research into methods of translating increased awareness of the issue into positive action. We are also interested in improving the tracking and reporting of food waste, particularly during the pre-farm gate section of the supply chain, and methods of decreasing the environmental impacts of food production. In light of the increased drive to reduce plastic packaging, we want to encourage further examination of the trade-offs between plastic packaging reduction and increased food waste and where packaging can be reduced without adverse effects on food waste generation.

Plastics

We want to encourage analysis of the issues surrounding reducing the use of plastic and investigation of new alternative materials, including the environmental trade-offs involved in transition. Our call for evidence next year (see below) will explore this. We also want to understand how we can improve plastic recycling through rationalising the range of polymers on the market, improving sorting and separation technologies, including cost-effective analytical tools that identify hazardous chemicals and substances of concern, and by gaining a better understanding of the technical issues surrounding the manufacture and use of recycled plastic.

7.1.2 Launching a call for evidence on the development of standards for bio-based and biodegradable plastics

Producers and packagers have begun to use an array of new plastic materials, to try to address the issues associated with plastic pollution. These are both fossil-based[162] and plant-based, and react differently in distinct environments: there is no one way to use and dispose of them. Were a consumer inadvertently to dispose of them in the wrong waste stream – sending non-biodegradable plastics into bio-waste streams, for instance – it would increase both contamination rates and costs. Concerns also persist about the risks and impact of degradable plastics appearing in new products that include recycled plastic.

161 Biowaste is a form of biomass. It is waste material capable of decomposing under anaerobic or aerobic conditions. Commercial sources of biowaste include forestry and agricultural residues, animal waste and manure, sewage sludge and commercial food waste. Household sources of biowaste include kitchen scraps and garden waste, paper and cardboard, as well as natural textiles.

162 Fossil-based (conventional) plastics are made from petrochemicals. Fossil-based is a generic name for certain synthetic or semisynthetic materials that can be moulded or extruded into objects or films or filaments or used for making e.g. coatings and adhesives.

Innovative new packaging types could help reduce the environmental impact of plastic, if disposed of in the right way. We want to make this easy for people. One potential solution could be to introduce new standards for them. We will work with UK Research and Innovation, and industry, to examine the demand, benefits and implications, starting in 2019 with the launch of a call for evidence.

As this sector is growing fast, we have set out below some key terms which people may find useful.

Biodegradable plastics

Biodegradable plastics are those which are capable, when conditions are right[163], of being broken down through the action of micro-organisms (bacteria and fungi) into simple compounds, such as water and carbon dioxide. Whilst such innovative solutions could help reduce the environmental impacts of plastics if disposed of in the right way, Defra's own research and a number of international studies have concluded that there is currently insufficient evidence to support claims that the widespread uptake of biodegradable plastics will increase resource efficiency or reduce waste. If littered, or otherwise released into the environment in an uncontrolled way, plastics which are claimed to be biodegradable may not degrade quickly[164] or at all, and can only be composted[165] if they meet relevant standards.

The Government is concerned that, in the absence of standards, claims about the biodegradability of plastic-based products cannot be verified. So our call for evidence will explore how this can be rectified, and we are providing support for research and development of biodegradable plastics through the Industrial Strategy Challenge Fund (see 7.2.1). Plastics placed on the market which claim to be biodegradable should be clearly labelled as such so that they can be separated from conventional plastics at end of life and sent to an appropriate treatment option.

Oxo-degradable plastics

These are conventional plastics which include additives designed to promote the deterioration of the material to the point that it becomes brittle and fragments into smaller, microplastic pieces. These fragments may then be biodegradable, as described above. Defra's research and various international studies have concluded that there is currently insufficient evidence to support claims that oxo-degradable plastics will fully biodegrade, or do so within a reasonable timeframe if they are littered, if they are disposed of in landfill, or if they end up in the marine environment[166].

163 Factors such as light, humidity, oxygen and temperature determine the degradation rate: EU Commission (2018) http://ec.europa.eu/environment/circular-economy/pdf/oxo-plastics.pdf (section 2). There is a lack of evidence on how both biodegradable and compostable plastics react under different environmental circumstances, particularly in water.

164 In theory almost all materials ultimately may biodegrade, even in the open environment, though some will do so only after hundreds of years or more. There is currently no consensus as to how quickly a plastic should biodegrade to be considered 'biodegradable'.

165 Compostable plastics are plastics that meet specific composting standards (for example EN13432). Not all biodegradable plastics meet these standards and so can't be sent for composting. Compostable plastics can also be sent to AD, but operators of wet AD systems must include a pre-treatment composting step.

166 EU Commission (2018) https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52018DC0035

Bio-based plastics

Bio-based plastics are made using polymers derived from plant-based sources such as starch, cellulose, or lignin. They can be engineered to be biodegradable, though are not always. They will normally have a lower carbon impact than fossil-based plastics[167], and have the potential to provide a more sustainable alternative to conventional plastics. However, as this is an emerging market, they are generally more expensive than conventional plastics and their market share in the EU is currently small (less than 1%[168]). Further research is needed to evaluate their overall sustainability – for example, whether they will be more sustainable if manufactured from plant waste rather than from plants that would otherwise have been used for food production.

7.1.3 Investing in the development of, and pioneering innovative approaches to, boosting recycling, finding alternative materials, and reducing litter

Government intervention can set direction and make sure innovation delivers better environmental outcomes. The Areas of Research Interest (ARIs) mentioned above, the £20m Plastics Research and Innovation Fund[169], and the £20m Plastics and Waste Investment Fund aim to do just this.

Plastics Research and Innovation Fund

We pledged £20 million to the Plastics Research and Innovation Fund (PRIF – co-ordinated by Innovate UK and EPSRC[170]) which aims to reduce the environmental costs of plastic and litter. Our sights are set on problematic plastics such as cigarette filters and chewing gum, which contain single-plastic polymers, and blight our streets and seas.

The fund will seek to deliver strategic networking and research that will coordinate existing knowledge across the UK, catalysing new ideas and rapid solutions. It will support the polymer, packaging, retail and waste sectors as well as local government responsible for waste collection[171].

UKRI will work with WRAP to network and connect this fund with initiatives across business, government and the research and innovation community, to encourage knowledge exchange, and to identify future research and innovation priorities. Funded activities will be focused around developing solutions to reduce plastics entering our environment, funding for smart waste tracking

167 Understanding plastic packaging and the language we use to describe it, WRAP, July 2018, page 8. http://www.wrap.org.uk/sites/files/wrap/Understanding%20plastic%20packaging%20FINAL.pdf

168 A European Strategy for Plastics in a Circular Economy, European Commission, January 2018, section 4.3, footnote 53.

169 UK Government services and information (2018) https://www.gov.uk/government/news/strong-public-backing-bolsters-fight-against-blight-of-plastic-waste

170 Engineering and Physical Sciences Research Council (EPSRC)

171 Engineering and Physical Research Council (2018) https://epsrc.ukri.org/newsevents/news/plasticsresearchinnovationfund/

data collection, storage and reporting services, for smart local energy systems, and for technology which advances the UK's low carbon automotive capability.

Plastics and Waste Investment Fund

At Budget 2018 we announced a further £20 million of funding. £10 million will complement the PRIF, focusing on research and development to help business transition away from polluting plastics. This will include exploration of new packaging materials, new recycling processes and packaging waste management. The other £10 million will pioneer innovative approaches to boosting recycling and reducing litter. This funding will be made available during the 2019/20 financial year.

Future funding and investment

Innovate UK offer various other funding streams which are open to any innovations, regardless of industry, and we are confident that these funding streams will help any truly game-changing technology to develop and flourish. WRAP's Accelerating Growth Fund also invests in new projects and technologies which will help England to move towards a more circular economy.

We are also investigating possible fiscal incentives for the development of advanced conversion technologies[172] which deliver better environmental outcomes than conventional energy-from-waste technology.

7.1.4 Continuing to support the Waste and Resources Action Programme

The Waste and Resources Action Programme (WRAP) is a UK charity which works with governments, businesses and consumers to deliver practical solutions to improve resource efficiency, both in the UK and across the world.

WRAP's mission is to accelerate the move to a sustainable, resource-efficient economy by:

- Re-inventing how we design, produce and sell products;
- Re-thinking how we use and consume products;
- Re-defining what is possible through reuse and recycling.

WRAP receives the majority of its funding from the UK Government, the Welsh Government and the Northern Ireland Executive. It also works on projects funded by the European Union and other global organisations, as well as the businesses it works with.

Much of WRAP's impact is achieved by working with producers (and others) through voluntary agreements such as the Courtauld Commitment, the Sustainable Clothing Action Plan (SCAP) and the UK Plastics Pact. In each case, WRAP catalyses action by producers to re-design their products for longer life and greater resource efficiency.

172 Technologies that convert waste to energy such as gasification or pyrolysis.

WRAP has also worked with colleagues across Europe through the REBus project to pilot Resource Efficient Business Models, demonstrating their benefits to companies and the wider economy.

In 2018/19 we are supporting WRAP with £9.35m to deliver our priorities on resources and waste in three key programmes:

1. Food and drink focusing on household food waste and the Courtauld 2025 voluntary agreement.
2. Waste and resources management focusing on increasing recycling rates and the quality of recycling, plus work to reduce avoidable plastic waste.
3. Clothing, focusing on driving resource efficiency and waste prevention through a collaborative agreement with the clothing sector (the Sustainable Clothing Action Plan).

With support from Government WRAP has helped deliver campaigns to reduce food waste and packaging, consumer and business advice to support recycling, and encouraged businesses to move to more sustainable products.

By working collaboratively to unlock these benefits, organisations working in the sector can also contribute to the delivery of national targets for waste and recycling, fulfilling UK and international responsibilities to the environment.

7.2 Resource efficient clean growth

Clean growth means growing our national income whilst cutting greenhouse gas emissions. This includes taking action towards increasing the resource productivity of the UK and moving towards a more circular, low carbon economy.

The Government is taking action to accelerate clean growth on a number of fronts. The Clean Growth Strategy is our plan for continuing to decarbonise the UK economy through the 2020s, setting out our commitment to comprehensive action on climate change, resource efficiency and the environment.

Clean Growth is also one of the four Grand Challenges of the UK's Industrial Strategy. Grand Challenges seek to put the United Kingdom at the forefront of the industries of the future. Through the Clean Growth Grand Challenge we will maximise the advantages for UK industry from the global shift to clean growth – through leading the world in the development, manufacture and use of low carbon technologies, systems and services that cost less than high carbon alternatives. This includes growth of our 'bioeconomy' – the use of renewable biological resources from land and sea to produce food, chemicals, materials and energy.

Resource productivity in the bioeconomy

The displacement of fossil fuel-derived resources with renewable biological alternatives could play an important role in the transition to clean growth and a more circular economy[173]. Organic wastes, for example, can be used to create fertilisers and soil conditioners and as a source of energy, chemicals or materials.

We need to make sure the transition from fossil-based to bio-based resources is truly sustainable. Our Bioeconomy Strategy[174] sets out the Government's approach to building a world-class bioeconomy.

The Industrial Strategy also commits to raising the resource productivity of businesses, including through the promotion of recycling and strong secondary materials markets where products are designed with efficiency and recyclability in mind.

There are significant opportunities for UK industries to become global leaders in clean, green technologies. By showing leadership and supporting the development of technologies and

173 Resource Recovery from Waste (2018) https://resourcerecoveryfromwaste.files.wordpress.com/2018/10/rrfw-ppn-the-organic-waste-gold-rush-web.pdf

174 HM Government (2018) https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/761856/181205_BEIS_Growing_the_Bioeconomy__Web_SP_.pdf

solutions that maximise the value we get from resources and minimise waste, we can achieve strategic ambitions more quickly, as well as increase the UK's competitiveness and opportunities for trade as we leave the EU.

To drive progress, actions we will take include:

7.2.1 Supporting further investment in resource efficient technologies, including through the Industrial Strategy Challenge Fund

The Industrial Strategy announced four grand challenges currently facing the UK, including clean growth. To help deliver on this grand challenge, several funds have been set up which include innovations in resource efficiency within their scope. The Industrial Strategy Challenge Fund (ISCF), which has so far invested over £1.7 billion, aims to strengthen UK science and business innovation and take on the biggest challenges that society and industry face today, and we are also supporting sector productivity through Sector Deals.

Through the third round of ISCF funding, two bids, including potentially up to £126m of Government funding, are being developed with industry, which would help deliver this Strategy as well as significant resource efficiency savings.

Smart sustainable plastic packaging

This aims to establish the UK as a leading innovator in smart and sustainable plastic packaging for consumer products, such as biodegradable plastic bags, delivering cleaner growth across the supply chain, with a dramatic reduction in plastic waste entering the environment by 2025. It will aim to develop a new generation of advanced and sustainable plastic packaging, including through academic and industry-led research and demonstrator projects.

Transforming foundation industries

This aims to transform our foundation Industries[175] so that they are internationally competitive in manufacturing products vital for our economy in an environmentally sustainable way. The focus will be on four key themes:

- Developing new recycling technologies that use less virgin materials and improve supply chain resilience;
- Bringing to the market new materials and services that reduce environmental impact;
- Trialling and researching process technologies that reduce resource use;
- Addressing cross cutting themes that affect the industry.

175 These sectors include metals, ceramics, glass, chemicals and cement, and are worth £52b annually to the UK economy, but in doing so are by far the UK's biggest industrial polluters: around 50 million tonnes of CO_2 per year, or 10% of the total CO2 emitted by UK homes and businesses.

7.2.2 Encouraging innovative waste treatment technologies that create transport fuels through the Renewable Transport Fuels Obligation (RTFO)

The Renewable Transport Fuels Obligation (RTFO)[176], administered by the Department for Transport (DfT) is a regulatory tool for ensuring the production and sale of sustainable, renewable fuels for use in transport. Fuel suppliers who produce over 450,000 litres of fuel in the UK each year are obligated to supply a specified amount of renewable fuel. They can meet this obligation by supplying renewable fuels themselves or by trading with specialist suppliers. Between April 2016-2017, 1,541 million litres of renewable fuel were supplied under the RTFO – the greenhouse gas saving of which is equivalent to taking around one million cars off the road. The scheme has been so successful that countries around the world are emulating this model, and DfT are considered world leaders on sustainability and verification of biofuels.

The introduction of the RTFO has driven considerable innovation in finding and processing alternative fuel sources that meet the criteria to be considered renewable and sustainable, such as used cooking oil and food waste. Sustainable waste materials are eligible for double RTFO certificates, meaning that conversion of waste to transport fuel is especially appealing to fuel companies.

The RTFO was revised in April 2018 to build on these successes, specifically to extend the obligation out to 2032. This will see the current volumes of renewable fuel used in transport doubled by 2020, allow renewable aviation fuel to claim support under the RTFO for the first time and place a cap on the use of crop-based biofuels. Furthermore, from 1 January 2019 the RTFO will also include an advanced fuels target for certain fuels that are of strategic importance to the UK. This advanced fuels target is designed to also encourage further innovation in sourcing new waste feedstocks that can be converted into transport fuels. DfT is considering the potential of fuels made from waste feedstocks of fossil origin that cannot be reused or recycled, sometimes known as recycled carbon fuels.

Two competitions in the creation of innovative transport fuels have also been launched. These are made up of a £15m 'Advanced biofuels demonstration' competition and a £22m 'Future Fuels for Flight and Freight' competition (F4C). In the first competition, the two winning projects were Advanced Plasma Power Limited and Nova Pangaea Limited. Construction of the two plants is progressing. These companies will take waste products (residual waste and biomass respectively) and use new and eco-friendly technologies to convert these into transport fuels.

The F4C is split into two stages. There were seven stage one winners[177] all of whom received a share of £2m for project development; this stage ended in November 2018. Stage two, which is only open to successful stage one winners, runs from Spring 2019 to November 2021 and sees £20m available for capital funding.

176 https://www.gov.uk/guidance/renewable-transport-fuels-obligation

177 Energy & Environment, future fuels for flight and freight competition (2017) https://ee.ricardo.com/transport/case-studies/f4c)

Chapter 8

MEASURING PROGRESS: DATA, MONITORING AND EVALUATION

High quality data, information and insight are essential for effective policymaking. This chapter, divided into 3 parts, sets out:

- Our strategic approach to transform gathering and reporting of **data**;
- Our approach to **monitoring** progress;
- Our approach to **evaluating** the success of policy interventions and feeding back learning into future policy development.

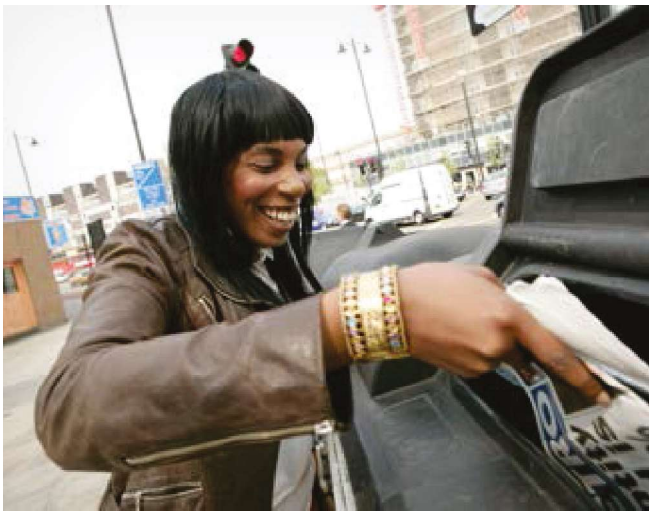
8.1 Data

Data is powerful in our digitally-driven economy. The 2016 report From Waste to Resource Productivity[178] states:

"Data has the power to transform behaviours. Simply making all those in the production and consumer chain aware of the amount and type of waste they generate can unlock important social and commercial dynamics that lead to waste reduction." p.12

But data on materials is currently patchy and unreliable. Although there are pockets of in-depth knowledge[179], there are few systems in place for systematising, collating and converting this knowledge into data.

This situation has changed little in 20 years. It hampers the proper functioning of market incentives and stifles those trying to become more resource efficient. If you can't measure it, you can't manage it – and this lack of basic data prevents us from reaping the benefits of resource efficiency. We have a great opportunity to lead the world in the transition towards circularity, but we need to invest in data to enable it to happen.



We need to quantify the primary and secondary materials we use to make products and deliver services. Once products have been used we need to know where they go and whether they are reused, repaired, recycled or confined to waste. High quality data needs to be collected over time so we can understand changes in how products and materials are used. This data will not only support policy-making in central Government but will help businesses make better investment decisions and tell local planners where additional waste treatment capacity is really needed.

178 The Government Office for Science Report of the Government Chief Scientific Adviser (2016) "From Waste to Resource Productivity" https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/667476/from-waste-to-resource-productivity-final-report.pdf

179 For example, individual waste reprocessors know in great detail how much recyclate they receive, where it comes from and its quality.

Data on waste collected by local authorities has radically improved through the creation of WasteDataFlow. As a result we have been able to set targets for household waste recycling and monitor progress. It has also enabled comparisons to be made of performance in different parts of the country, helping local authorities to make improvements. We now need to make a similar step change to produce data on resource inputs, stocks and flows, and expand our knowledge of commercial, industrial, construction and demolition wastes.

We want robust, effective and transparent systems to collect and report data, to enable everyone to reap the benefits of a move to a more circular economy.

To achieve this, actions we will take include:

8.1.1 Continuing to work with our partners and stakeholders to develop a shared vision and bold new approach to data on resources and waste

Government acknowledges the seriousness of this national deficiency in data, and that a bold new approach is needed. In line with the 'polluter pays' principle, responsibility for collecting and reporting data must lie with those who use resources and produce waste, although parts of that responsibility may be delivered by organisations providing chargeable services to them[180].

The problem cannot be tackled alone. Defra has a role to play in bringing stakeholders and key players together in pursuit of the greater vision. We will:

- Take a stronger leadership and coordination role where that is required to drive progress;
- Work with the Devolved Administrations to ensure efforts are coordinated in order to maintain the functioning of the UK Internal Market;
- Work closely with the Office for National Statistics and others to improve national datasets;
- Work with the Environment Agency and funded bodies such as WRAP to ensure information and knowledge supplied to them by resource users, waste-producing businesses and the resources and waste industry is collected and stored in ways which enable data to be created and shared whilst respecting confidentiality;
- Work with local authorities so they continue to report high quality waste data on behalf of local communities;
- Work with the resources and waste sector to ensure data captured routinely in collecting, treating and disposing of waste can be safely shared without compromising confidentiality or market positioning;
- Facilitate innovation by working with new partners.

180 This might be the Environment Agency for fee-paying regulated businesses, local authorities for Council Tax paying households, and the resources and waste industry for organisations paying for a waste collection service.

8.1.2 Moving away from weight-based targets and reporting towards impact-based targets and reporting, focusing initially on carbon and natural capital accounting

The current focus on weight is a good basis for measuring resource use and waste; after all it is a common currency. But using weight data as the basis for making policy, setting targets and monitoring progress can lead us in inappropriate directions. Some lightweight materials have large environmental footprints, like plastics, while some heavy materials have small footprints, like aggregates. This can encourage behaviours that do nothing to help meet our goals. We will therefore develop new indicators and metrics that help us understand and act more in line with our strategic aims, focusing particularly on greenhouse gas emissions and natural capital; a principle supported by a number of our stakeholders[181]. Some new thinking will be required to achieve this.

8.1.3 Moving away from a focus on waste towards a focus on resources

As set out in section 8.2 below, we will fundamentally shift the focus of monitoring away from waste and towards resources, including a refocusing on measuring waste higher up the waste hierarchy. This will help Government understand how to better support the shift towards a more circular economy in which products and materials are reused, repaired and remanufactured. Importantly, it will also help businesses make better decisions, for example by considering relative carbon emissions from reuse rather than disposal of a product, or from constructing a new, energy-efficient building versus upgrading and repairing an existing building. We have included a new strategic indicator on raw material consumption which marks the start of this journey (see section 8.2).

Reuse, repair and remanufacture are not clearly defined sectors, making it difficult to identify them in national statistics. We will work with stakeholders to identify cost-effective ways of gathering better data on the size of these sectors, the contribution of different facilitators (such as charities) and how much waste they prevent.

We will explore the provision of figures to enable an assessment to be made of the trade-offs between new and reused products. This will build on Defra's on-going work on consumption-related emissions, which already involves reporting on embodied carbon.

8.1.4 Maintaining the coverage and quality of data on local authority collected waste and improving data collection to meet future needs

WasteDataFlow is the existing public dataset on local authority collected waste. When launched in 2004 it represented a major breakthrough in our understanding of how much waste was produced, treated and disposed of. A single online system for this data provides a key source of analysis for industry, local authorities and government. It is also used for statutory reporting of targets.

We will undertake periodic reviews and make necessary improvements to WasteDataFlow so it continues to provide a user-friendly service and valuable data.

181 For example in the Defra (2018, forthcoming) 'Post Implementation Review of the Waste (England and Wales) Regulations 2011' on legislation.gov.uk.

8.1.5 Working with tech firms to develop innovative digital solutions for tracking waste and consulting on options to mandate the digital recording and sharing of waste movement data

As outlined in Chapter 4, Defra has successfully secured GovTech Catalyst funding. This fund will award up to £80,000 to five tech firms to scope out innovative digital solutions for tracking individual movements of waste, including hazardous waste and international shipments. We will use this to identify the best technological solution for tracking waste.

Currently the only business waste data for England comes from a patchwork of sources, including returns from permitted sites, voluntary initiatives and costly one-off surveys. These datasets are time-consuming and challenging to combine because they have different scopes, purpose and coverage. Mandatory digital reporting to tackle waste crime, as described in section 4.2.1, will enable consistent national datasets to be created. We will ensure the consultation takes account of national reporting requirements as well as a focus on tackling crime, so we get the best value from reporting efforts.

8.1.6 Ensuring data on the composition of residual waste is regularly updated

Residual waste is the mixed material that is typically incinerated for energy recovery or landfilled. Much of the products and materials contained in this waste could have been prevented, reused or recycled. This is inefficient not only because materials that hold value are being lost, but also incineration and landfill are the most expensive ways to treat waste. Understanding waste composition is fundamental to the Strategy's objectives of eliminating avoidable plastic waste over the lifetime of the 25 Year Environment Plan, working towards eliminating food waste to landfill by 2030 and eliminating avoidable waste by 2050. It will enable us to estimate the carbon content of mixed waste. Future compositional analyses will be required to monitor progress. We will ensure the dataset is updated regularly and seek to expand it to industrial and construction waste.

We only have a partial understanding of how much value is lost in residual waste because we do not know enough about the composition of the waste. Compositional studies do exist but are neither recent nor comprehensive in coverage. Our current mechanism to fill this data gap only applies to household waste and involves a synthesis of data from recent local authority-based household waste composition analyses. WRAP is commissioning fieldwork to fill gaps for non-household municipal waste and commercial waste. We hope this approach will also incorporate data that waste management companies have promised to share with us.

Going forwards, we will combine data from regularly updated composition studies, the waste tracking system and data collected by the Environment Agency, in the course of its regulatory duties, to generate far more reliable data than ever before on the amounts and types of commercial and industrial waste. This will include, but not be limited to:

- Quantities of waste produced, by type and by sector, including that found in mixed waste;
- Quantities and proportions of waste (by type) managed through different routes, including reuse, recycling, energy from waste and landfill, by sector;
- Recycling, reuse and recovery rates for key materials, for example paper, card, plastics, metals and glass, by sector.

8.2 Monitoring progress

We have developed a suite of indicators to measure progress against the Strategy's objectives. We cannot establish some of these indicators immediately because the data does not yet exist. Part of our bold new approach will include determining how we will get this important data. Also, given the long-term nature of the Strategy, new indicators might become more relevant in future years, for example metrics based on natural capital or other environmental or social impacts. In line with stakeholder requests, we will regularly update and publish progress against the indicators.[182] The first publication will be in 2019.

Figure 8.1 shows the indicators framework, the key strategic indicators, and the metrics that we propose to adopt. The strategic indicators feed upwards into the 25 year goals of the 25 Year Environment Plan, namely 5 (using resources from nature more sustainably and efficiently), 7 (mitigating and adapting to climate change) and 8 (minimising waste). Each Key Strategic Indicator has one or more metrics associated with it, which are described below.

182 For example in the Defra (2018, forthcoming) 'Post Implementation Review of the Waste (England and Wales) Regulations 2011' on legislation.gov.uk.

Figure 8.1: Indicator Framework for Monitoring the Resources and Waste Strategy

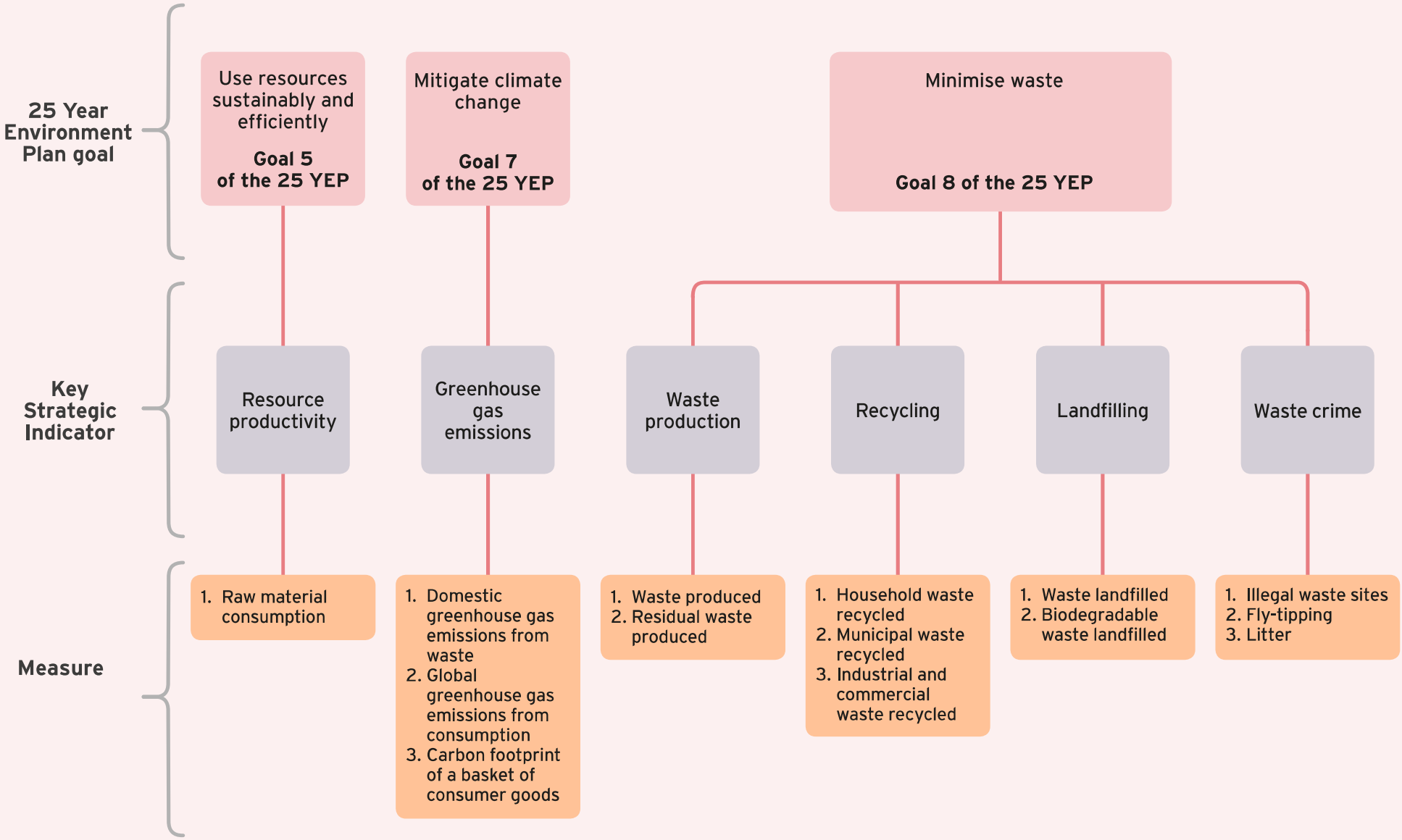


Table 8.1: Indicators of resource productivity

Strategic Indicator	Tells us ...	Why we need to know	Metrics	Desired direction of travel
Raw material consumption	How well we are managing our use of raw materials by using them efficiently and decoupling consumption of them from wealth.	We need to guard against consuming finite raw materials and use them efficiently. This is echoed by the commitment in the 25 Year Environmental Plan to double resource productivity by 2050.	Tonnes per capita £ GVA[183] per tonne	↓ ↑

Table 8.2: Indicators of greenhouse gas emissions

Strategic Indicator	Tells us ...	Why we need to know	Metrics	Desired direction of travel
Carbon footprint of waste (defined in line with carbon budget definitions)[184]	How much domestic waste-related carbon is associated with each unit of wealth the economy generates	We need to ensure that we stay on track to meet the 4th and 5th carbon budgets.	Unit of footprint per capita £ GVA per unit of footprint	↓ ↑
Carbon footprint of consumption	How much global lifecycle carbon is associated with each unit of wealth the economy generates	We need to ensure that we minimise the level of emissions associated with each unit of wealth we create	Unit of footprint per capita £ GVA per unit of footprint	↓ ↑
Carbon footprint of shopping basket of consumer products	How much lifecycle carbon is associated with the products we typically purchase	We need to ensure that the level of emissions associated with what we typically consume declines over time to reflect reductions in the carbon intensity of materials and successful design for longevity and circularity.	Index	↓

183 We can measure a sector's contribution to the economy in terms of its gross value added (GVA), i.e. how much value a sector adds. This is done by taking away input costs from the value of the sector's output. The GVA of a sector can be increased by reducing input costs or finding new, higher value markets for the output of the sector.

184 This includes emissions from landfill, waste-water handling, waste incineration without energy recovery, composting, anaerobic digestion, and mechanical biological treatment. Incineration with energy recovery is excluded from scope not because it is unimportant but because it is covered elsewhere within the emissions inventory.

Table 8.3: Indicators of waste production

Strategic indicator	Tells us ...	Why we need to know	Metrics	Desired direction of travel
Total waste generated	How much waste we are generating	We want to minimise the amount of waste we create because a portion of it will be lost to the circular economy and so have to be replaced by using virgin materials with associated carbon emissions. Or, where it is recycled, it will entail emissions that could have been avoided if the waste had not been generated in the first place.	Tonnes per capita	↓
Total residual waste generated per capita	How much waste we are generating that is treated as residual waste	We want to minimise the amount of residual waste that we create because it is a loss to the circular economy and so will have to be replaced by using virgin materials with associated carbon emissions. Residual waste is also an indicator of avoidable waste in that residual waste will include material that could have been recycled.	Tonnes per capita	↓
Household waste recycling	How well we are doing at increasing recycling from households	Successful recycling results in less raw materials being used and with fewer carbon emissions.	Recycling rate (tonnes recycled as a proportion of all waste)	↑
Municipal waste recycling	How well we are doing at increasing municipal waste recycling	Successful recycling results in less raw materials being used and with fewer carbon emissions.	Recycling rate (tonnes recycled as a proportion of all waste)	↑
Commercial and industrial waste recycling	How well we are doing at increasing recycling.	Successful recycling results in less raw materials being used and with fewer carbon emissions.	Recycling rate (tonnes recycled as a proportion of all waste)	↑

Strategic indicator	Tells us ...	Why we need to know	Metrics	Desired direction of travel
Landfilling	How well we are doing at reducing reliance on landfill	There is an ambition within the 25 Year Environment Plan to divert more waste away from landfill.	Tonnes	↓
Landfilling of biodegradable waste	How well we are doing at reducing landfilling of biodegradable waste	Biodegradable waste is a key driver of methane emissions from landfill. We need to continue to reduce methane emissions from landfill and our ambition in the 25 Year Environment Plan is to work towards no food waste entering landfill by 2030.	Tonnes	↓

Table 8.4: Indicators of crime

Strategic Indicator	Tells us ...	Why we need to know	Metrics	Desired direction of travel
Illegal waste sites	How well we are doing at reducing the number of illegal waste sites.	Illegal waste sites are a key form of waste crime. They can cause considerable environmental damage. The 25 Year Environment Plan says we are seeking to eliminate waste crime over the lifetime of the Plan.	Number of sites	↓
Fly-tipping	How well we are doing at reducing fly-tipping	Fly-tipping causes significant environmental damage, as well as incurring costs for local authorities and other landowners.	Tonnes	↓
Litter	How well we are doing at reducing litter	Litter causes local environmental impacts and costs local tax payers money to remove.	To avoid duplication, we will use the dashboard set out in the litter strategy.	

8.3 Evaluation

The world is complex. Despite our best efforts, we cannot always accurately predict what will happen when we implement policies. As individuals and organisations interact with one another and the policy, unpredictable things can happen. So we will ensure we learn, genuinely and openly, about the effects we have had, and adapt our programmes accordingly.

All significant policies, programmes and projects should be subject to comprehensive but proportionate evaluation[185]. Monitoring is essential for performance tracking and accountability; evaluation provides a higher level of feedback and is useful for learning and improvement. Evaluation findings can identify what works, for whom, and in what context; characterise problems that arise; showcase positive outcomes and good practice; pinpoint unintended and unanticipated results; and demonstrate value for money and return on public investment. Evaluation findings can be fed back into the policy design process to improve future decision-making.

Our evaluation plan

Our plan follows guidance in The Magenta Book and the Cabinet Office's Open Policy Making Toolkit[186]. We have developed simplified theories of change[187] for each of our key policies. We will focus evaluation effort on testing whether these theories are holding once the policy is implemented. Outcomes are likely to be emergent and unpredictable so we will look for unintended as well as intended effects. We will not dogmatically prefer certain methods over others but will use the method most likely to provide insight at an acceptable level of reliability.

Where policies are implemented through regulation, a **post-implementation review** (PIR) is required. PIR is a process to assess the effectiveness of a regulation after it has been implemented and operational for a period of time. A PIR provides the analysis required to establish whether, and to what extent, the regulation has achieved its original objectives, has objectives which are still valid, is still required and remains the best option for achieving those objectives; and can be improved to reduce the burden on business and its overall costs. We will learn from the findings of PIRs as we design new policies and amend existing ones.

We will not restrict our evaluation efforts only to those policies that require a PIR. We have looked across the actions set out in this Strategy and prioritised the key ones. We will focus on evaluating the most important and high profile policies in depth rather than undertaking a cursory and unsatisfactory evaluation of all actions set out in this Strategy.

The table below sets out our headline evaluation plan, the detail of which will be worked up over the coming months as part of a Resources and Waste Strategy Evaluation Plan to be published in spring 2019. The Plan cannot be published sooner because it depends on the outcome of forthcoming consultations.

185 HM Treasury (2011) The Magenta Book: Guidance for Evaluation

186 The Cabinet Office (2016) Open Policy Making Toolkit

187 The way in which an intervention is hypothesised to work, specifically the way in which benefits are expected to be caused.

Policy to be evaluated	Likely approach
The new provisions for extended producer responsibility on packaging waste	Multi-method approach involving process and impact evaluation to feed into the required post-implementation review Initial process evaluation to start 2024, depending on speed of implementation Initial impact evaluation to start 2026, depending on speed of implementation
The new provisions on a deposit return scheme	Multi-method approach involving process and impact evaluation to feed into the required post-implementation review Initial process evaluation to start 2024, depending on speed of implementation Initial impact evaluation to start 2026, depending on speed of implementation
The effectiveness of Resources & Waste Strategy actions on plastic	Wide-ranging, theory-based impact evaluation deploying both qualitative and quantitative methods. It will look across Government at actions targeting plastics to draw conclusions about successes Scoping to take place in 2019. Start date 2026, depending on speed of implementation of key actions
The effectiveness of the requirement for consistent collections	Potential trial-based approach, else theory-based approach combined with possible modelling. This will build on lessons from similar studies carried out by WRAP and others. It will also build on the evaluation of consistency pilots, being carried out currently It will focus on quantitatively assessing the impact of the policy. A quantitative study may be preceded by a more qualitative process evaluation Start date 2025, depending on speed of implementation of key actions
Analysis of the contribution the Resources & Waste Strategy has made to observed changes	Theory-based study utilising contribution analysis or realist impact evaluation techniques. It will focus on describing qualitatively the context, mechanisms and outcomes of interventions included in the Resources and Waste Strategy to devise a contribution story Start date 2028/9

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