environmental services association

A net-zero greenhouse gas emissions strategy for the UK recycling and waste sector

A message from our Chairman

The world is experiencing a climate emergency and urgent efforts are needed to eliminate the man-made greenhouse gas (GHG) emissions that cause global warming. The UK has pledged to achieve net zero emissions across our economy by 2050 and the recycling and waste management sector has an important role to play to achieve this target.

As you will read in this report, the first comprehensive GHG assessment for our sector has shown that our sector's activities, while saving more emissions across the wider economy than they produce, still account for eight per cent of the UK total.

Our sector has made almost unrivalled progress at reducing its emissions over the past thirty years, but we must go further. In recognition of this responsibility, the ESA and its members have produced this ambitious strategy as a blueprint for the recycling and waste management sector to achieve net-zero emissions by 2040.

We believe this target is both credible and progressive and ESA members stand ready to invest billions of pounds over the next decade in the infrastructure, technology and skills needed to scale up our approach and meet this challenge.

To make this possible we will need a positive policy agenda from the Government, supporting investment by the recycling and waste management sector in areas like plastics recycling and carbon capture. The whole supply chain needs to be engaged in improving packaging recyclability in line with the Resources and Waste Strategy. Individuals can also help play their part in creating a recycling society which will contribute towards delivering our net zero ambition.

We hope this report starts the conversation and serves as a catalyst to create the environment that will help us achieve our target. The ESA looks forward to engaging with a wide range of stakeholders to discuss its implications in pursuit of a net-zero emissions future.

Gavin Graveson, Chairman, ESA

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Executive summary

From the packaging keeping our food fresh, to the tyres on our cars keeping us on the road, we all rely on a vast range of products and packaging. But many of the things we use and consume every day have limited lives and eventually become waste. Alongside efforts to avoid and reduce waste wherever possible, recycling and treating the remaining waste in a responsible way is crucial for the health of the planet and its ecosystems. However, this important waste management process creates GHG emissions, which contribute to climate change.

The recycling and waste management sector is proud of its emissions reduction record and we have halved the GHG emissions associated with our activities over the past thirty years by dramatically phasing out landfill and increasing recycling. But as the climate emergency grows ever more pressing, managing the UK's waste still accounts for eight per cent of total UK GHG emissions, so reducing our sectoral emissions further is an urgent issue if the UK is to achieve net zero GHG emissions by 2050.

This strategy therefore sets out our collective ambition to not only become a net zero GHG emission sector, but to achieve this by 2040 – a full decade ahead of the UK's legally binding target. Meeting this stretching ambition requires joint action from our sector, government, our supply chain and our customers – working together to protect the environment, deliver investment in new infrastructure, and create green jobs.

We have reduced emissions more than almost every other sector across the economy since 1990 – but we want and need to do more and to achieve net zero as quickly as possible, but will need the support of others to meet this challenging objective. This strategy sets out what we, the wider sector and our stakeholders can do to help achieve net zero emissions for the recycling and waste sector.

Our sector's critical value to the UK

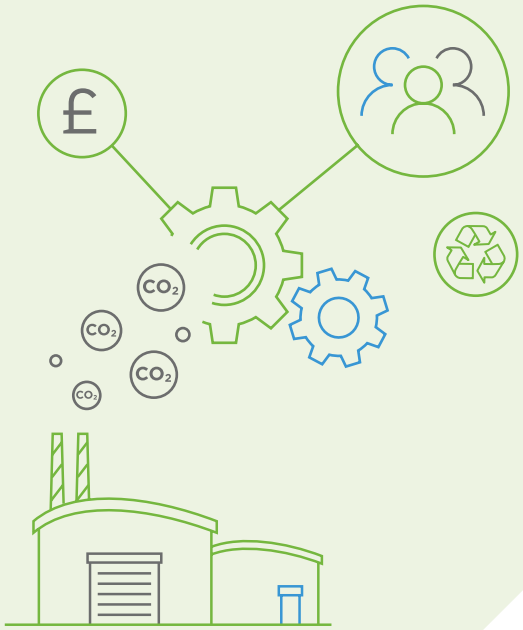
The recycling and waste management sector performs an essential public service and is part of the UK's critical infrastructure. We manage 221 million tonnes of waste produced in the United Kingdom each year, or over three tonnes per person, keeping our streets clean and preventing pollution, while also extracting value from waste materials that would otherwise be lost.

Everything our sector does is driven by the waste hierarchy. Of course, waste is best avoided in the first place, and we must repair and reuse what we can, before recycling and then recovering energy from anything that cannot be recycled – with landfill disposal the option of last resort. By driving waste up the hierarchy and away from landfill we play a key role in conserving resources and reducing the GHG emissions associated with society's waste. In 2018 alone, our sector's activities resulted in nearly 50 million tonnes of avoided CO_2e emissions across the economy, equivalent to taking 10 million cars off British roads. Sorting and recycling operations alone helped avoid around 45MtCO_2e in 2018.

Our significant transformation to date

Over the past two decades our sector has taken far-reaching steps to reduce emissions – investing billions of pounds in world-class, modern waste management facilities. The results are clear and we calculate that our actions have reduced the industry's GHG emissions by 46% since 1990 – the third largest sectoral emissions reduction over this period, behind heavy industry and the energy sector. We have done this by diverting waste from landfill, increasing recycling, and improving the technologies and processes used in waste management, as well as investing in research and training.

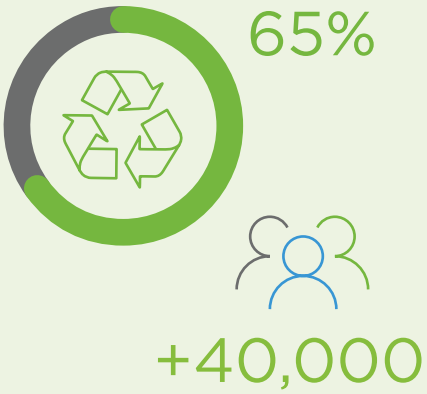
Worth £7.8 billion, our sector also makes a significant contribution to the UK economy and employs 123,000 people, while our investments in innovative solutions for managing waste support new jobs and skills the length and breadth of the UK.



Taking action to deliver impactful change

We know that achieving Net Zero emissions for the sector by 2040 will be challenging and will require everyone involved in the sector to act – including our customers and government at all levels. With the right regulatory and policy framework, we can reduce the impact of society's waste on the climate and drive positive change across every community in the UK. We have outlined a clear roadmap detailing how we plan to achieve this target, but the key priorities for decarbonising our sector will be:

1 Investing a forecasted £10bn in recycling infrastructure over the next decade to make the recycling process more efficient, reduce associated emissions, meet the government's 65% municipal recycling target and create 40,000 permanent jobs



2 Decarbonising non-recyclable waste treatment by removing organics from landfill by 2030 and plastics from energy recovery facilities, while working with government to enable carbon capture, utilisation and storage (CCUS) technology to mitigate remaining emissions

3 Transitioning vehicles and fuel use to zero emission sources

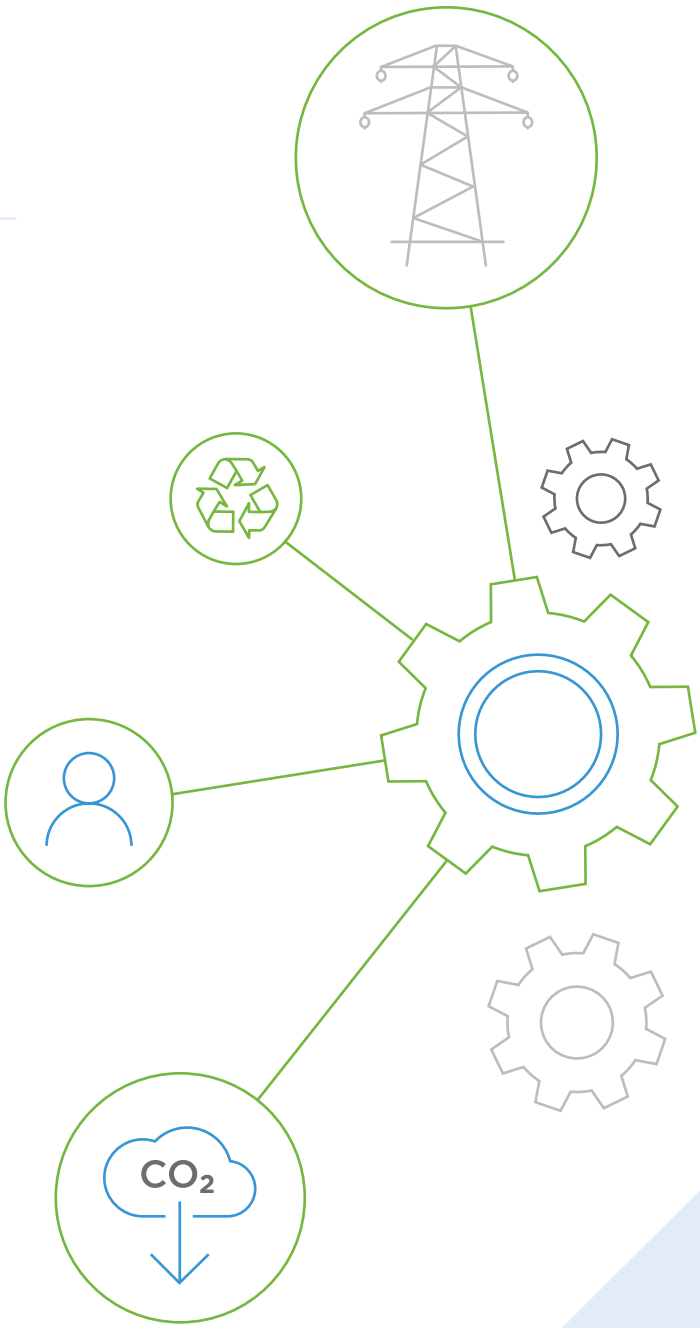
A number of targets and commitments are associated with each of these priorities and are outlined further in this document. We will review these every five years against progress, policy changes and market shifts to ensure they are both achievable and consistently ambitious. We will also review and report performance against this strategy annually via the ESA's Annual Report.

Working together to reduce emissions for the long-term

To achieve our ambitious decarbonisation plans and help the UK meet its net zero target, we need the government to step up and deliver some of the vital technology and infrastructure required. This involves:

- Delivering a zero-emissions grid to power infrastructure processing the waste that we can recycle.

- Introducing regulatory and policy drivers which enable carbon capture technology for our energy-recovery facilities – helping to reduce emissions from the waste we cannot recycle in the shorter term and, in future, unlocking the potential for negative emissions by removing more carbon dioxide from the atmosphere than we emit.



We have set ourselves a bold and ambitious challenge, but this is a huge opportunity to put the UK on the road to Net Zero. Working alongside our customers and government, we are confident that we can meet this challenge – creating new jobs across all skill levels; investing in new green infrastructure; supporting local supply chains and communities and ultimately helping the UK become a world-leader in the fight against climate change.

The UK recycling and waste management sector at a glance

- Employs more than 123,000 people (2018)
- Operates from 6,761 permitted facilities (2018)

2,861 facilities (**42%**)  Transfer Station	**376** facilities (**6%**)  Composting	**1,016** facilities (**15%**)  Material Recovery Facilities	**369** facilities (**5%**)  Landfill
1,731 facilities (**26%**)  Recycling	**109** facilities (**2%**)  Thermal Treatment	**127** facilities (**2%**)  Anaerobic Digestion	**158** facilities (**2%**)  Physicochemical Treatment

- In 2016, the UK produced around 221 million tonnes of total waste[1] (over 3 tonnes per capita)
- Of which:
  - 62% came from construction, demolition and excavation
  - 18% came from commercial and industrial operations
  - 12% came from households
  - 8% arose from other sources
- In 2018, UK households produced 26.4 million tonnes of waste, of which 11.9 million tonnes was recycled (45%)
- In 2019, UK waste management facilities processing organic and residual waste generated 10,330 GWh of renewable electricity, which accounts for approximately 9% of UK total renewable energy[2]

1 DEFRA (March 2020) UK statistics on waste – March 2020 update

2 BEIS (July 2020) Digest of UK Energy Statistics 2020 – main chapters and annexes A to D dataset, table 6.4

Introduction

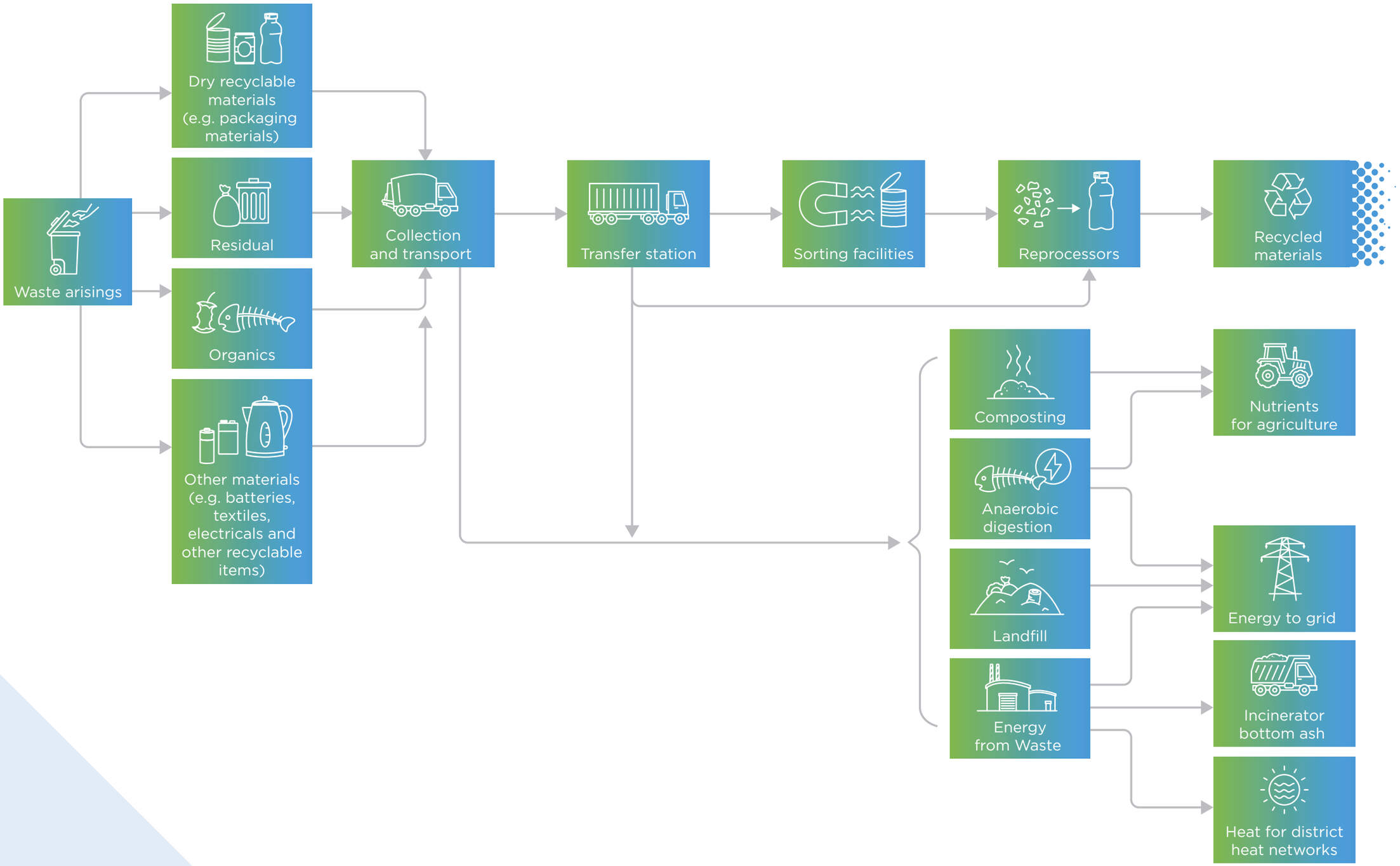
The recycling and waste management sector provides an essential public service and is part of the UK's critical infrastructure, preventing waste from becoming a health hazard and from polluting the wider environment.

This is achieved through the safe and efficient collection, sorting and treatment of waste. Our sector has performed this essential function for over a century, but since the 1990s we have undertaken a dramatic transformation powered by investment in new skills and technology.

This transformation has helped the UK dramatically increase the proportion of post-consumer waste materials that are recycled, avoiding landfill disposal for the waste left over after recycling, by instead using it to generate energy and heat, powering homes and businesses.

The chart overleaf shows a typical journey for post-consumer waste materials – which typically involves initial segregation of materials by the waste producer, before the materials are collected; transported in bulk and treated according to waste type.

The journey of waste in the UK



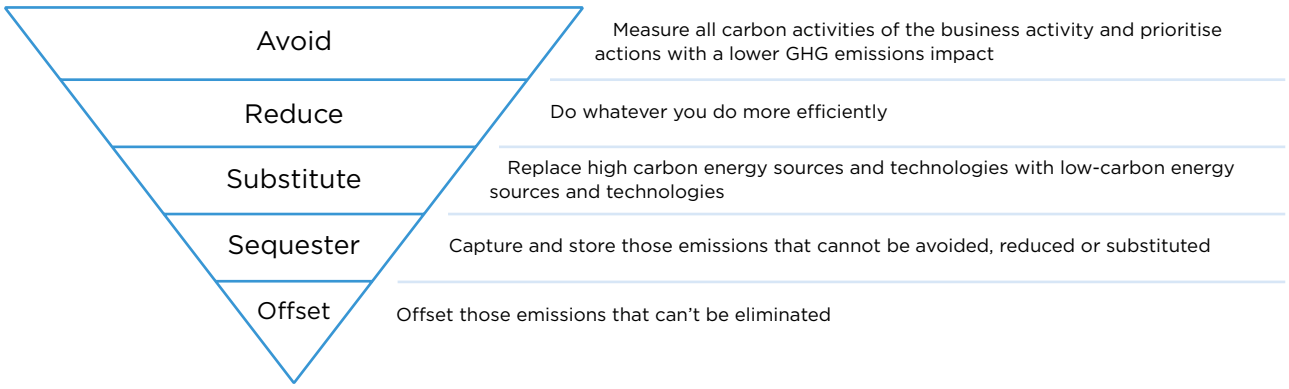
Although this system is helping the UK to become an increasingly resource-efficient society – we recognise that these essential waste management activities create GHG emissions which contribute to climate change.

As a sector we are proud of our emissions reduction record, halving the GHG emissions associated with our activities over the past thirty years by dramatically phasing out landfill and increasing recycling. This is the third largest sectoral emissions reduction over this period, but as the climate emergency grows ever more pressing our sector recognises that it must go further. Continuing to reduce our sectoral emissions in pursuit of net zero is essential if the UK is to achieve its long-term emissions targets.

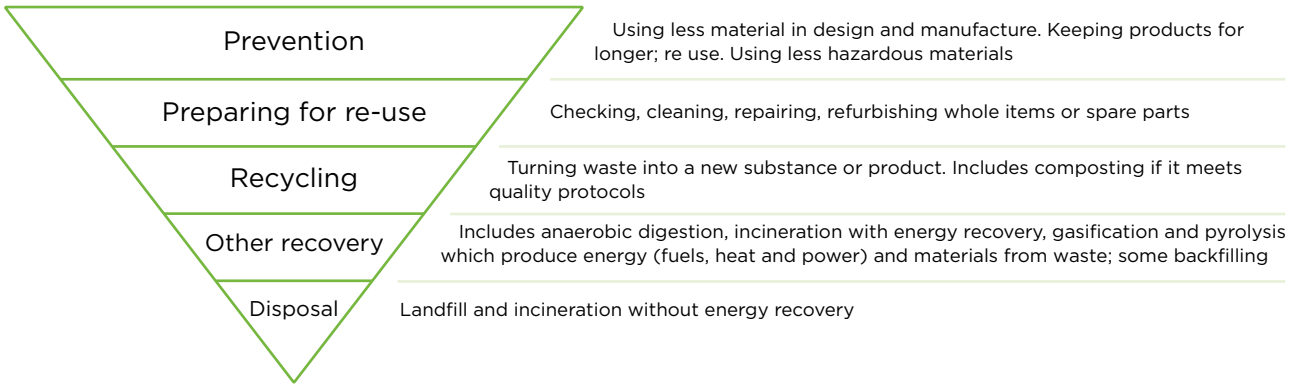
Waste management practices in the UK are guided by the Waste Hierarchy. This policy framework ranks waste management options according to what is best for the environment, positioning waste prevention and reduction at the top of the hierarchy, and waste disposal (i.e. landfill) as the option of last resort. This is enshrined in law and the Waste Regulations (2011) requires organisations that produce or handle waste materials to apply the waste hierarchy to these wastes.

There is broad alignment between both the waste and carbon hierarchies, with both prioritising activities which avoid the generation of waste or emissions - while management of un-avoided emissions and waste materials are presented as the least preferred options.

Carbon hierarchy

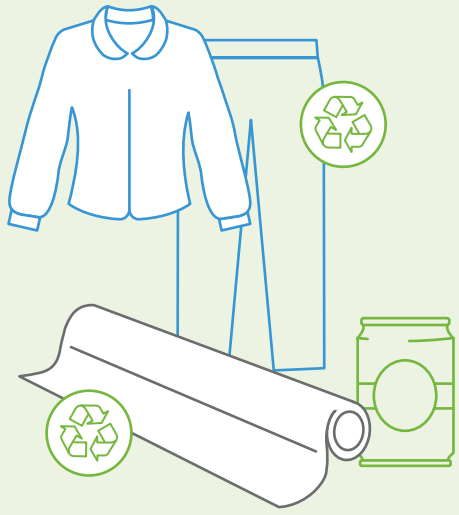


Waste hierarchy



Since 1990, our sector's continual efforts to move material further up the waste hierarchy have reduced GHG emissions from landfill by 77% between 1996 and 2018[3]. In that time we have helped the UK to increase its municipal recycling rate from near zero to 45% (2020), with higher rates still for commercial packaging and other materials. To illustrate the efficacy of the role of recycling in emissions reduction, our sector's recycling activity saved around 45 million tonnes of CO_2e in 2018 (**Appendix 1**) alone. By driving the UK's pursuit of greater resource-efficiency our industry continues to help avoid and reduce GHG emissions across the economy.

Recycling a tonne of textile waste saves 5,828kg of emitted CO_2e, while recycling a tonne of aluminium saves 9,964kg of emitted CO_2e[4]



Our sector's progress on emissions reduction to date has largely been driven by:

- Diversion of waste materials from landfill towards recycling and recovery in Energy-from-Waste (EfW) facilities.
- World-leading landfill engineering, enabling the capture and utilisation of methane in landfill gas (a source of renewable power in the UK).
- Investment in, and deployment of, recycling technology and infrastructure.
- Deployment of new abatement technology enabling significant reductions in NOx emissions from EfW plants.
- Increasing utilisation of heat from EfW plants for industry and heat networks.
- Investment in training and digital platforms which support route-optimisation and improved efficiency in the ways we collect, transport and handle waste materials.

At this critical juncture for the global climate, the ESA's number one priority is decarbonising the industry and maximising our contribution to GHG emissions reduction across the economy, while respecting the waste hierarchy. This net zero strategy therefore reviews our sector's contribution to national GHG emissions and identifies the essential actions necessary to achieve net zero GHG emissions by 2040.

3 BEIS (2020) Final UK greenhouse gas emissions national statistics: 1990 to 2018, 2018 UK greenhouse gas emissions: final figure – data tables

4 Scottish Carbon Metric Factors (2018)

Our strategy

We have developed this strategy in the context of the UK Government's clear ambition to achieve net zero emissions by 2050, and the *Sixth Carbon Budget* produced by the *Climate Change Committee (CCC)*. We have used the term 'net zero' as defined by the Sciences Based Target Initiative, which covers all GHG emissions from our sector, so it is not strictly limited to carbon emissions only.

The ESA has produced this strategy to articulate how we can achieve our ambition for net zero through our members and our members' customer base, committing to:

- Produce a transparent and balanced GHG assessment of our sector.
- Acknowledge and, where practicable, reduce our legacy emissions.
- Avoid, mitigate and, where only strictly necessary, offset any current and future emissions to achieve our vision of net zero GHG emissions across our sector by 2040.

This strategy document will help all organisations across our sector to understand their own challenges and opportunities for reducing GHG emissions, as well as the collaborative measures which will contribute to the sector achieving this net zero target.

A net zero GHG emissions recycling and waste management sector by 2040

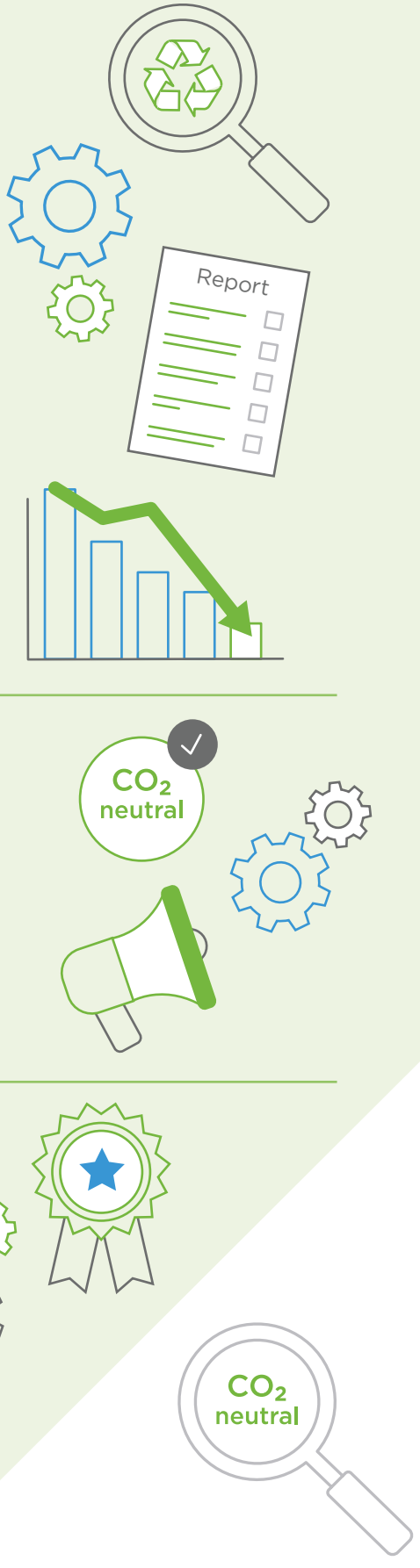
This strategy sets out how we can achieve net zero emissions as a sector by 2040, and how individual organisations across it (and of course the ESA membership) can commit to their own clear and measurable contribution.

We hope that organisations will use this strategy to build their own detailed net zero plans, as well as helping all stakeholders whose actions influence our sector to better understand the emissions associated with their waste materials, behaviours and decision-making – encouraging them to strive for lower emissions options.

Our objectives

In preparing this strategy, our objectives were to:

- Identify and develop a clear and consistent methodology to quantify GHG emissions for the recycling and waste management sector
- Enable accurate sector GHG emissions reporting for all organisations within the sector
- Calculate the sector's impacts upon UK GHG emissions and establish a credible but ambitious target for decarbonisation of our sector
- Define the sector's potential contribution to the national transition to net zero by 2050
- Assess and promote the key actions necessary for the sector to achieve net zero GHG emissions by 2040
- Introduce clear transitional targets and reporting to drive performance
- Measure our contribution to the decarbonisation of the many sectors we serve



Data

To inform this strategy, the ESA commissioned independent environmental consultants Ricardo to produce a *Recycling and Waste Sector GHG Emissions Review*. This study established a comprehensive GHG emissions baseline to help us gain a better understanding of the sector-wide direct (scope 1), indirect (scope 2) and avoided GHG emissions. A full summary of this work and the methodology used is included in **Appendix 1**. The methodology used received the 'built on the GHG Protocol' accreditation and is endorsed by many waste associations around the world. It does not currently account for other indirect emissions (scope 3), however the ESA will seek to measure and incorporate these emissions in future assessments. The key findings are as follows:

- Waste avoidance would have the biggest potential impact on our sector's emissions, however, this is not within our control. Effective waste prevention as part of a functioning circular economy will be essential to support the UK's climate objectives.
- Our major direct and indirect emissions (scope 1 and 2) derive from recycling processing plants, which use significant amounts of energy. These emissions are expected to increase as more materials are collected for recycling over the coming decades. Other significant scope 1 and 2 emissions include those from the landfilling of residual wastes and from waste collection and transport, followed by those from energy recovery operations and transfer stations.
- By increasing material recycling operations, which reduce the need for virgin materials, and through renewable energy generation, which replaces fossil fuel intensive sources, our sector's activities help avoid emissions across the economy. In 2018, the emissions avoided by our services (~50Mt CO_2e in 2018) exceeded our direct and indirect emissions (~36Mt CO_2e in 2018). The challenge for our sector is that most of these benefits are accounted for elsewhere in the economy.
- While our sector has significant work to do to reduce ~36Mt CO_2e to net zero by 2040, these figures demonstrate the major contribution our services already make to reducing emissions across the economy and highlights our potential to help set the UK on its road to net zero by 2050.

Scope

Our sector has limited influence over activities at the top of the waste hierarchy (i.e. waste prevention, reduction and reuse), as these activities take place before products become waste. Moreover, these activities are currently difficult to measure and datasets are subsequently poor. We have therefore not included them in our current assessment of the sector's emissions.

This strategy does, however, acknowledge the important role our sector can play in supporting waste prevention elements of the waste hierarchy. These activities are essential to GHG reduction and will continue to form part of our members' services. The ESA will support the government and other relevant organisations in developing and improving current datasets and methodologies to quantify the carbon benefits of waste prevention and reuse.

The Recycling and Waste Sector GHG Emissions Review (**Appendix 1**) considered the following waste categories:

- Municipal waste
- Commercial waste
- Industrial waste
- Construction and Demolition waste
- Hazardous waste
- Clinical waste.

The sector's activities in the scope of our assessment were:

- Collection and transportation
- Transfer of waste
- Mechanical pre-treatment (dismantling)
- Sorting, recycling and material recovery
- Physico-chemical treatment
- Biological treatment (composting, anaerobic digestion)
- Landfilling
- Thermal treatment and recovery
- Mechanical biological treatment (MBT).

The analysis carried out by Ricardo shows that there is an opportunity to significantly improve current government emissions profiles for our sector.

Formal UK GHG emission accounting currently splits the emissions from our sector's core operations between two sectors – with landfill disposal and related services measured in *'waste management'*, and energy from waste emissions accounted for within the *'energy'* sector. The UK's current accounting also does not include the full emissions impact of recycling. This data underpinning this strategy combines these activities fully for the first time, enabling a holistic view of the recycling and waste management sector's impacts and benefits as we set out a pathway to net zero.

Our targets

The first comprehensive Recycling and Waste Sector GHG emissions review for the UK (**Appendix 1**) has shown that there are clear opportunities to further reduce emissions from our sector. It also demonstrated the significant emissions benefits already delivered through our services and highlights the critical role that our sector will play in achieving a net zero UK.

This assessment confirmed that the target to achieve net zero GHG emissions by 2040, 10 years ahead of the UK's own target, will be challenging for our sector but remains achievable with the right policy and regulatory framework in place.

Three priorities for decarbonising our sector

From this analysis, the ESA and its members have identified three overarching priority actions for reducing emissions from our sector:

1 Invest in new recycling infrastructure to make the recycling process more efficient and to reduce associated emissions, while meeting the government's 65% recycling target for municipal waste. ESA members alone forecast a collective investment of more than £10bn in recycling over the next decade

2 Decarbonise non-recyclable waste treatment by removing organics from landfill by 2030 and plastics from energy recovery facilities, while working with government to enable carbon capture, utilisation and storage (CCUS) technology to mitigate remaining emissions

3 Transition vehicles and fuel use to zero emission sources

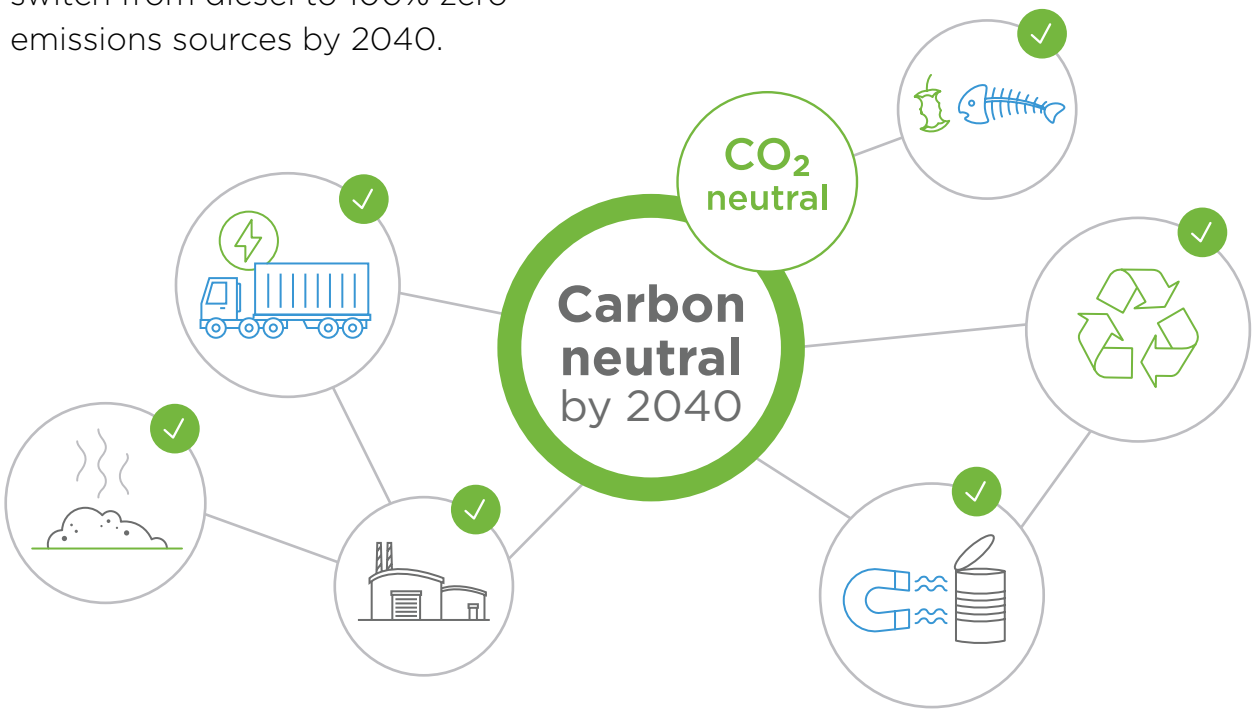
Our targets

With the right regulatory and policy framework in place, our sector can meet the following tangible targets:

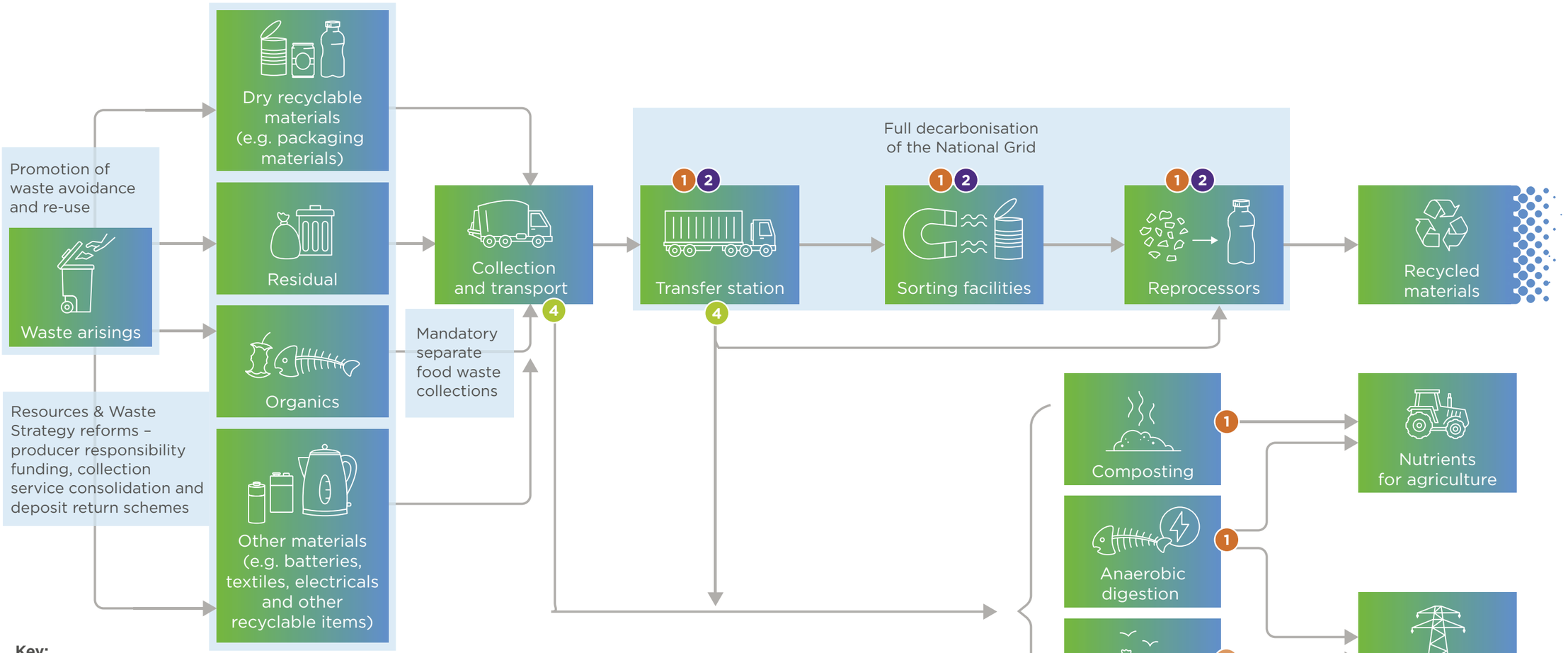
- All on-site fuels used for recycling, at transfer stations, sorting facilities, composting, anaerobic digestion (AD), and EfW facilities to be replaced with 100% zero emissions sources by 2040.
- Implement energy efficiency savings at recycling reprocessing plants and transfer stations to reduce fuel and electricity consumption by at least 2% per year from 2021 to 2040.
- Divert all organic waste from landfill by 2030 to recycling and energy production through composting, anaerobic digestion (AD) and EfW, with the support of mandatory separate food waste collections.
- All waste transport vehicles to switch from diesel to 100% zero emissions sources by 2040.
- Start fitting Carbon Capture, Utilisation and Storage (CCUS) technologies to EfW facilities from 2025, with all plants fitted with CCUS where feasible by 2040.
- Ensure that all new plants are built with CCUS fitted or are CCUS-ready from 2025 onwards.
- Increase capture of methane emissions from landfill to 85% by 2030
- Develop heat networks where feasible to deliver heat from EfW plants from 2021 onwards.

We have set out further detail on each of these targets in **Appendix 2** of this strategy.

These priorities and targets will be assessed and reviewed every five years to take account of internal progress, policy changes and market shifts - ensuring that they remain both achievable and ambitious.



Interventions to support the transition to net zero GHG emissions for the recycling and waste sector



Key:

- Required external policy drivers
- 1 All on-site fuels used for recycling, at transfer stations, sorting facilities, composting, anaerobic digestion (AD), and EfW facilities to be replaced with 100% zero emissions sources by 2040
- 2 Implement energy efficiency savings at recycling reprocessing plants and transfer stations to reduce fuel and electricity consumption by at least 2% per year from 2021 to 2040
- 3 Divert all organic waste from landfill by 2030 to recycling and energy production through composting, anaerobic digestion (AD) and EfW, with the support of mandatory separated food waste collections
- 4 All waste transport vehicles to switch from diesel to 100% zero emissions sources by 2040
- 5 Start fitting Carbon Capture, Utilisation and Storage (CCUS) technologies to EfW facilities from 2025, with all plants fitted with CCUS where feasible by 2040
- 6 Ensure that all new plants are built with CCUS fitted or are CCUS-ready from 2025 onwards
- 7 Increase capture of methane emissions from landfill to 85% by 2030
- 8 Develop heat networks where feasible to deliver heat from EfW plants from 2021 onwards

Working together to reduce emissions

ESA members and the wider sector, their customers, and supply chains, will have a significant and direct role to play in achieving these targets, but the sector will not be able to achieve net zero without the actions of other sectors and stakeholders.

Achieving these targets will be challenging and will require collaboration not just across our sector but also with waste producers, commissioners of waste services, other sectors and government at all levels.

In particular, a full and rapid decarbonisation of the UK National Grid in advance of current projections will be essential to help our sector transition away from fossil fuels and decarbonise the energy we procure to operate our facilities.

Similarly, quickly addressing current technical, environmental and economic challenges around CCUS will also be necessary if our sector is to invest in these technologies and drive down remaining emissions from EfW facilities.

In addition, the Resources and Waste Strategy for England (RWS) and corresponding strategies of the devolved administration should be implemented as soon as possible. In particular, separate food waste collections should be prioritised to divert organic waste from landfill.

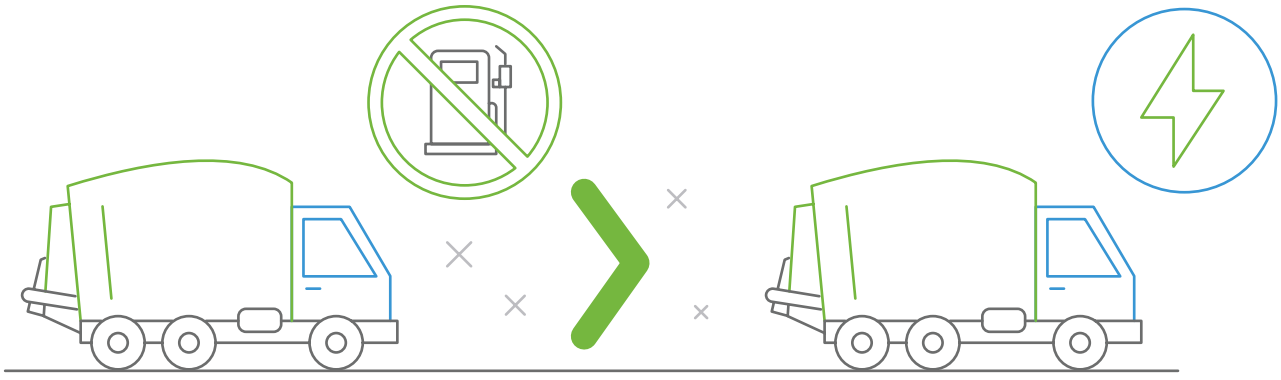
From a policy perspective, the ESA and its members will work with local Government, the UK Government and the devolved administrations to ensure:

- GHG emissions accounting takes a holistic view of the recycling and waste management sector and is not considered in silos.
- Timely implementation of the necessary policy framework to underpin delivery of infrastructure that, in turn, will support our sector's transition to net zero.
- A positive and supportive regulatory framework exists which incentivises and encourages the sector's efforts and investments in a low-carbon and more circular economy.
- A clear timetable for delivery is in place and that the Resources and Waste Strategy for England (and the corresponding strategies in Scotland, Wales and Northern Ireland) are accelerated in their implementation – along with underpinning legislation (e.g. the Environment Bill).

We will work with our members' clients, including local authorities and major corporates, as well as their sectoral trade and professional bodies to:

- Improve the resource-efficiency of other sectors by encouraging waste prevention and avoidance and, where waste remains, by maximising the separation of recyclables and waste collected for beneficial material reprocessing and recovery.
- Inform the design of products for higher levels of recyclability and the expansion of recycling-led services.
- Encourage the adoption of decarbonised waste collection, transport and logistics vehicle fleets and fuel, through the progressive electrification and deployment of renewable and alternative fuels.
- Identify key interdependencies and cross-sector synergies which have potential to accelerate emissions reduction in recycling and waste management.
- Provide guidance on key measures that can be adopted in jointly delivered services and best practice contract procurement, and the role they can play to help the sector deliver a net zero future.

These commitments to collaborative working are further expanded on in **Appendix 3** of this document.



Delivering the Strategy

The high-level timeline below provides a roadmap for delivery of the targets outlined in the preceding section. This will be further developed through our detailed five-year implementation plans.

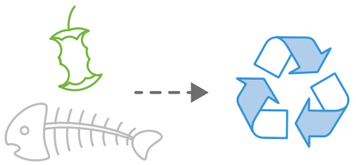
2020 **2025** **2030** **2035** **2040**

2020-2025

* Implement the Resources and Waste Strategy for England and the strategies in Scotland, Wales and Northern Ireland. Begin roll-out of separate collections to drive more waste further up the waste hierarchy.
* Build the necessary EfW, AD and composting infrastructure needed to divert organic and other wastes from landfill.
* Continue to decarbonise the vehicle fleet by switching from diesel to 100% zero emissions sources.
* Develop heat networks where feasible to deliver heat from EfW plants.
* Start replacing all on-site fuels for facilities and machinery with 100% zero emissions sources.
* Start to implement energy efficiency measures at recycling plants and transfer stations to reduce fuel and electricity consumption by at least 2% per year.

2025-2030

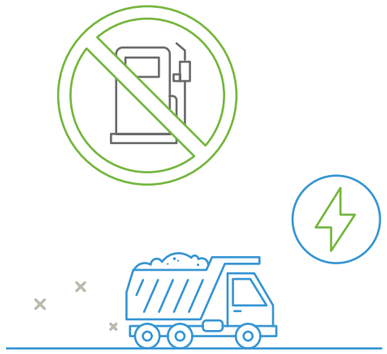
- Complete the roll-out of measures to separate and divert organic wastes from landfill to recycling, nutrient and energy production.



- Complete separation of plastic waste from landfill and energy recovery to recycling.
- Start the deployment of CCUS at EfW facilities.
- Increase average capture of methane emissions from landfill to 85%.
- Ensure that all new plants are built CCUS-ready or are built fitted with CCUS wherever possible.

2030-2035

- Ensure that all new transport vehicles purchased are not powered by fossil fuels.



- Continue replacing all on-site fuels for facilities and machinery with 100% zero emissions sources.

2035-2040

- Complete the switch from diesel to 100% zero emissions sources for all waste transport vehicles.
- Complete the switch of on-site fuels to 100% zero emissions sources for all waste facilities and machinery.
- Complete the roll out of carbon capture at EfW where feasible.

The ESA will provide guidance and resources to help our members design ambitious individual net zero strategies relevant to their own organisations. This will enable us to meet our strategic ambitions through a sector-wide roadmap and member company implementation plans, each containing clear targets.

We will review performance against this strategy annually, and the strategy itself every five years, regularly assessing targets in line with internal progress, policy changes and market shifts to ensure that our targets remain both achievable and ambitious.

Governance and monitoring

The ESA's Board will be responsible for the monitoring of performance against the targets set out in this strategy and in the implementation plan.

The ESA Climate Change Working Group, supported by ESA officers and reporting to the ESA Executive Director and the Board, will oversee delivery of the implementation for each target and the collation and quality control of relevant data.

A full GHG account review for the sector will be conducted every two years from the baseline year. Performance against targets and the sector GHG account will be fully disclosed via the ESA's Annual Reporting.

Contact

Although the ESA and its members have developed this strategy, achieving Net Zero greenhouse gas emissions across the sector will require all organisations involved in recycling and waste management in the UK to act. If you would like to speak to the ESA about any aspect of this report or your organisation's net zero emissions plans, please email **info@esauk.org**

Appendix 1: Recycling and Waste Sector GHG emissions review

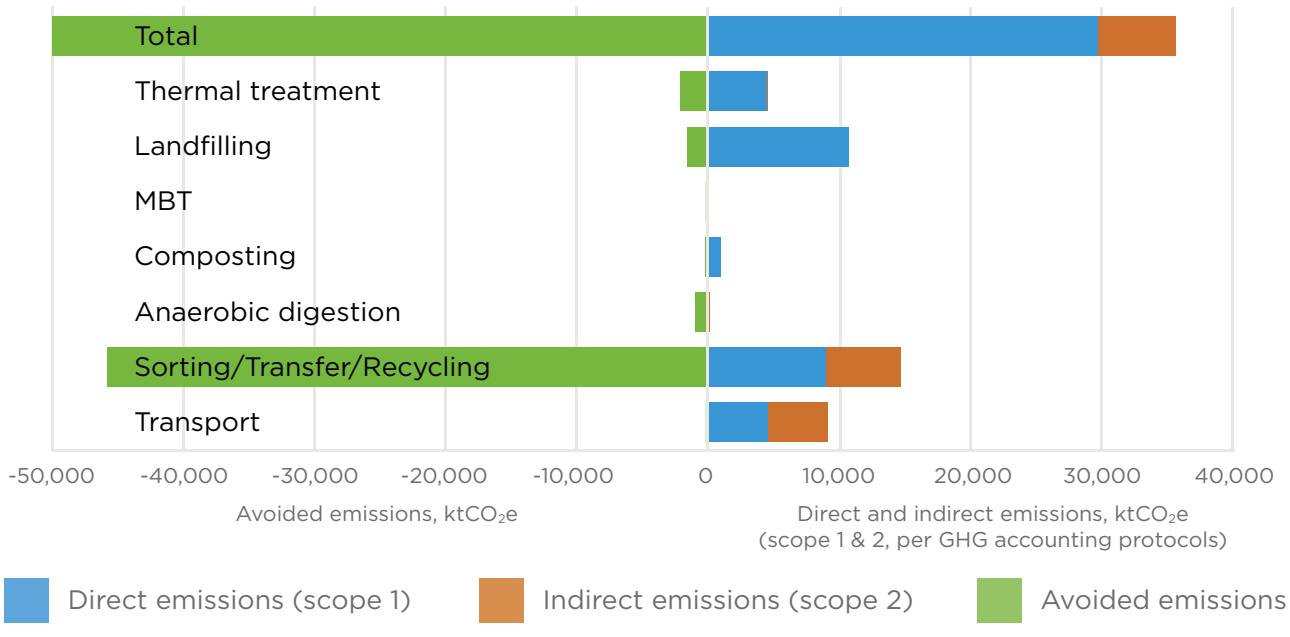
This strategy takes a holistic view of the recycling and waste management sector's contribution to national GHG emissions. The ESA commissioned Ricardo to establish the first comprehensive sector emissions baseline to help us gain a better understanding of the sector-wide direct (scope 1), indirect (scope 2) and avoided GHG emissions. The analysis used an updated version of the *Entreprises pour l'Environmment (EpE) "Protocol for the quantification of GHG emissions from waste management activities" (2013)* to measure the sector's emissions. This methodology is compliant with the GHG Protocol standards as it received the 'built on the GHG Protocol' accreditation and is endorsed by many waste associations around the world[5]. It should be noted that this methodology does not currently account for other indirect emissions (scope 3), however, the ESA will seek to measure and incorporate these emissions in future assessments.

This analysis allowed the ESA to identify opportunities for emissions reductions and the key actions needed to drive our sector to net zero GHG emissions by 2040.

Direct, indirect and avoided emissions (GWP 100 timeframe) – 2018 baseline

The 2018 reference baseline for the sector was produced using a Global Warming Potential time horizon of 100 years (GWP 100).

Direct (scope 1), indirect (scope 2) and avoided GHG emissions



5 For full details on the methodology used, please see Ricardo (2021) Quantification of greenhouse gas emissions from recycling and waste management activities in the UK

The main findings were as follows:

- Sector emissions are mainly attributed to CO_2, primarily from recycling operations, waste transport and thermal treatment; hydrofluorocarbons (HFC) emissions from sorting and transfer operations; and methane (CH_4) mainly from landfilling operations.

- Sector-wide GHG emissions in 2018 (35.8MtCO_2e – **around 8% of all UK GHG emissions**) are higher than UK national accounts' estimates (20.7MtCO_2e)[6]. This is because our assessment combines for the first time the emissions impact of all the services provided by the recycling and waste management sector. The formal UK emissions accounting does not allow for the emissions from recycling operations, and splits the emissions from our sector in two, with landfill disposal and related services attributed to the waste management sector, and energy from waste emissions accounted for within the energy sector. Our assessment does not include emissions from wastewater handling processes, and the composition for residual waste to landfill and EfW differs along with the corresponding emissions generated by residual waste sent to these destinations for final treatment.

- Recycling is the biggest driver of emissions in the sector due to the large number of facilities (representing 26% of all UK waste management facilities and handling 17% of waste arisings in 2018) which generally involve energy-intensive processes. As we divert waste away from landfill and EfW to recycling, these emissions will increase. In line with GHG Protocol Standards, these figures do not account for the significant carbon benefits of recycling.

- Landfilling is the second most significant driver of our sectoral emissions and is the first driver of direct emissions (scope 1). In particular, the decomposition of organic waste in landfill is a significant source of methane, a highly potent GHG with up to 84 times greater global warming potential than carbon dioxide.

- Waste transport and EfW facilities are the sector's third largest source of emissions at 4.6MtCO_2e each - less than half of the emissions generated by landfilling and recycling activities. Emissions from EfW facilities mainly come from the incineration process, which produces fossil CO_2 and N_2O emissions. Again, these figures do not account for the carbon benefits of energy recovery from thermal treatment.

- Most of the sector's scope 1 and 2 emissions come from fuel sources and power, drawn from the National Grid, necessary to collect, process and treat waste materials. Reducing overall waste arisings and improving the energy efficiency of treatment processes will be essential to tackle these emissions.

- A considerable part of scope 1 emissions relates to diesel use, particularly from road transport but also from waste transfer stations; switching from diesel to renewable fuel sources will have a significant impact on emissions.

6 BEIS (2020) Final UK greenhouse gas emissions national statistics: 1990 to 2018, 2018 UK greenhouse gas emissions: final figure – data tables

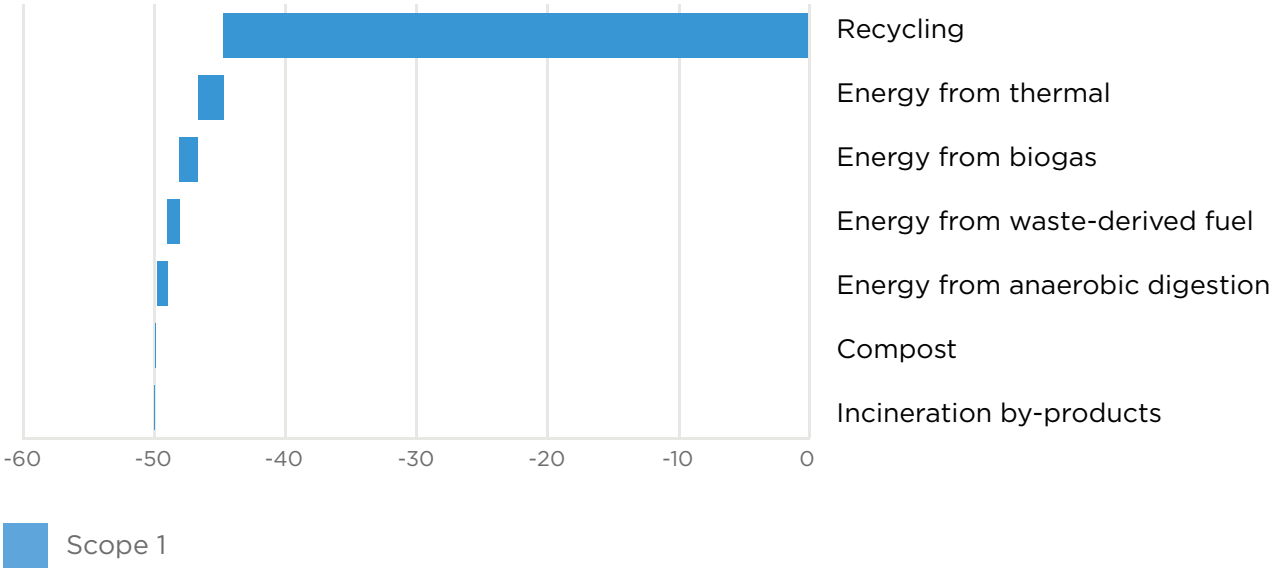
It is important to note that the vast majority of waste managed by the sector is undertaken as a vital service to waste producers. The emissions impacts of the collection, sorting and recycling of waste is attributed to the sector, but the benefits of the secondary resources produced are attributed to those who use them in new products.

Simplistically and within its own system boundary, our sector could therefore minimise its direct and indirect emissions by incinerating all biogenic waste and landfilling all other types of waste – this would reduce emissions from sorting, digesting, composting and recycling operations which are energy and therefore carbon intensive operations. However, this would have significant health and environmental impacts and would increase emissions in other parts of the economy, thereby driving the UK further away from a net zero circular economy. As such, in approaching this work, we have sought to set out not only our direct impacts but also the wider benefits of what we do for society as a whole, by measuring the emissions savings produced by the services we provide.

This analysis shows that:

- The emissions savings achieved by our sector's energy and material recovery operations exceed our direct and indirect emissions. For example, emissions avoided by sorting and recycling operations (44.8Mt CO_2e) are three times higher than the scope 1 and 2 emissions from these processes (14.7Mt CO_2e). The challenge for our sector is that most of these benefits are accounted for elsewhere in the economy.

Total avoided global warming potential (GWP100)/Mt CO_2e



- By decreasing the need for resource extraction and processing, and by recovering low carbon heat and electricity from materials that would otherwise be wasted, our sector already makes a significant contribution to reducing emissions across the economy. This highlights the essential role that our sector will play in achieving a net zero UK.

Direct and indirect emissions (GWP 20 timeframe) – sensitivity analysis

Considering the short timeframe necessary for meaningful action to cut GHG emissions and the global urgency of addressing climate change, we have also measured the sector-wide GHG emissions using a shorter-term Global Warming Potential with a time horizon of 20 years.

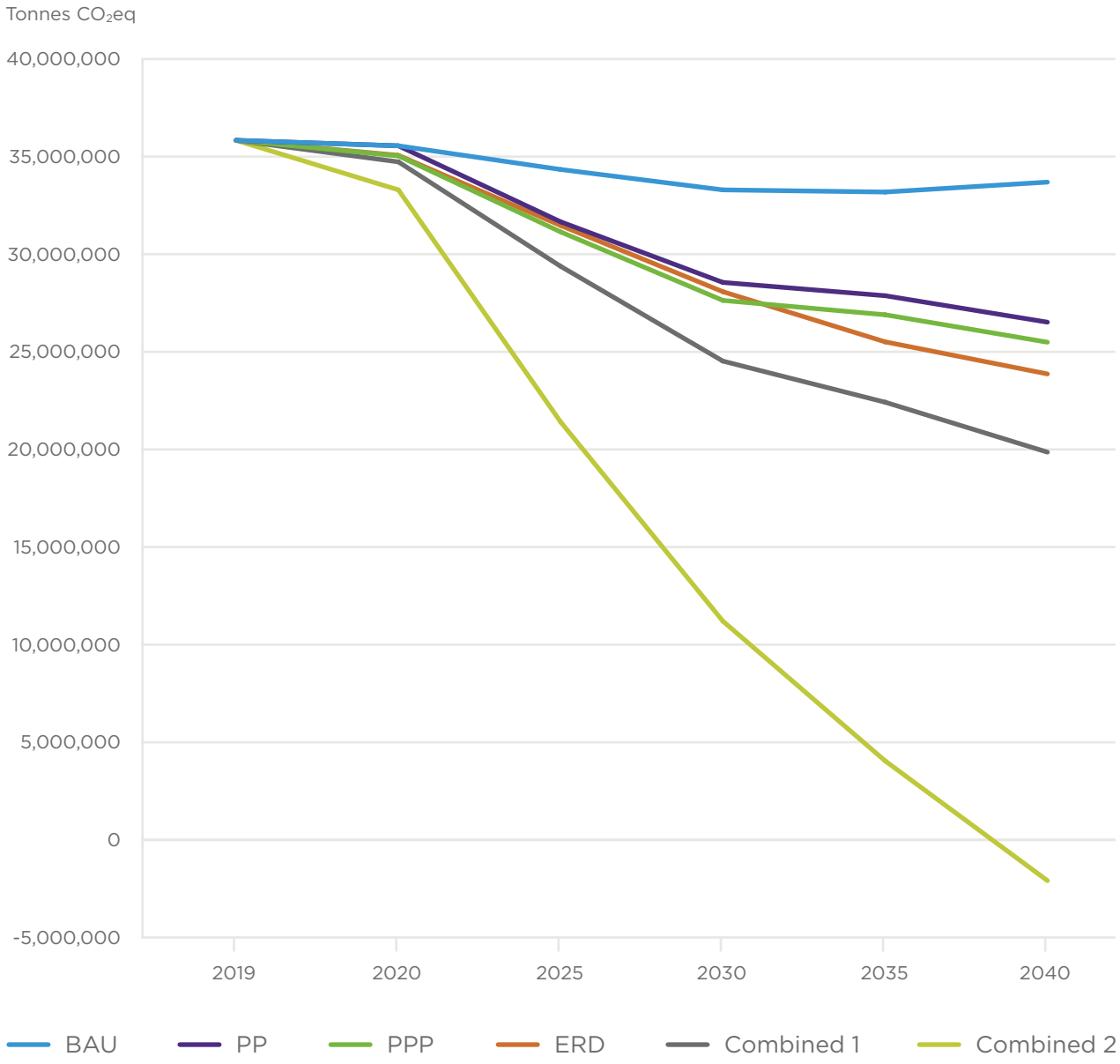
This analysis shows that:

- Landfill, anaerobic digestion and composting emissions increase significantly, as these are the main sources of methane emissions. The GHG impacts of landfilling activities are nearly 2.5 times greater on a 20 years' timeframe (GWP 20) than on a 100 years' timeframe (GWP 100).
- This is because GWP 100 is based on the energy absorbed by a gas over 100 years, while the GWP 20 is based on the energy absorbed over 20 years. As the lifetime of methane is 12.4 years, it is much more potent within a 20 years' timeframe than within a 100 years' timeframe when most of it will have decayed in the atmosphere.
- Given the short timeframe for climate action, these results clearly highlight the urgency of diverting organic waste from landfill. To do so, separate food waste collections should be rolled out as soon as possible before 2025.

Net zero pathways

To understand how our sector could achieve net zero by 2040, we conducted a high-level assessment of a set of various emissions scenarios, which included the impact of the UK's Resources and Waste Strategy for England and key measures from the Climate Change Committee's *Sixth Carbon Budget*. This work therefore included actions and scenarios that minimise waste, promote resource-efficiency and move towards a circular economy, including activities to repair, remanufacture and reuse waste materials, in order to measure the contribution that these activities make towards carbon emissions[7] savings.

Emissions comparison between the baseline and the 5 modelled scenarios



7 For full details, please see Ricardo (2021) Quantification of greenhouse gas emissions from recycling and waste management activities in the UK

Emissions comparison between the baseline and the 5 modelled scenarios

Six different scenarios were modelled:

- **Business as Usual (BAU):** The 'do nothing' scenario – waste management activities continue according to the current baseline. Emissions first decrease due to the decarbonisation of the National Grid but this is cancelled out by the impact of waste growth after 2030.
- **Planned Progress (PP):** Builds on BAU and takes into account the implementation of known recycling and waste management policy and strategy targets and includes measures from the *Sixth Carbon Budget*. In this scenario, a reduction of 26% on 2019 levels of GHG emissions is achieved by 2040.
- **Planned Progress Plus (PPP):** Provides an enhanced version of Planned Progress, through 'stretched targets' and performance, with the objective of modelling more ambitious performance than current targets and policy intend to achieve, and the same measures from Sixth Carbon Budget. In this scenario, a reduction of 29% on 2019 levels of GHG emissions is achieved by 2040.
- **Enhanced Reduction and Diversion (ERD):** Assesses the impact of enhanced energy and waste saving (reduction and reuse) activities and the impact of additional measures our sector could take to reduce carbon emissions. In this scenario, a reduction of 33% on 2019 levels of GHG emissions is achieved by 2040.
- **Combined Scenario 1 (Combined 1):** Combines the PPP and ERD scenarios which contain complementary measures. In this scenario, a reduction of 45% on 2019 levels of GHG emissions is achieved by 2040.
- **Combined Scenario 2 (Combined 2):** Combines the PPP and ERD scenarios with more ambitious assumptions. In this scenario, a reduction of 102% on 2019 levels of GHG emissions is achieved by 2040.

A detailed analysis of the worst (BAU) and highest achieving scenarios (PPP, ERD, Combined 2) shows that the largest emissions from our sector come from:

1. Landfilling of residual municipal solid waste (MSW): increases with waste growth and reduces with actions to divert waste away from landfill to recycling
2. Electricity use at processing plants: reduces in all scenarios due to the impact of the decarbonisation of the National Grid
3. Natural gas: mainly used at waste processing plants, it increases in the PPP scenario as more materials move through processing plants for sorting, recycling and composting
4. Diesel: mainly used in transport and waste transfer stations
5. Thermal treatment of residual MSW
6. Fuel and gas oil used at processing plants
7. Thermal treatment of Construction and Demolition Waste

8. Petrol mainly used in transport
9. AD processing emissions
10. All the rest

Combined Scenario 2 models the most ambitious assumptions and significantly reduces the sector's emissions down to reaching negative emissions in 2040 (i.e. -728,438 tonnes CO_2e). These negative emissions are principally delivered by the wood and the residual MSW sent to EfW fitted with CCUS which capture emissions from the biogenic content of the waste.

To achieve this scenario, the key interventions are:

1. Transition from fossil fuels to 100% zero emissions electricity and electricity-switch to green tariff for all waste processing facilities (i.e. recycling, transfer stations, composting, anaerobic digestion and EfW facilities) (30.2% savings on emissions by 2040)
2. Landfill methane capture (20.9% savings in emissions)
3. CCUS at EfW plants (15.3% savings on emissions)
4. Full National Grid decarbonisation by 2040 at the latest
5. Transition from diesel to 100% zero emissions sources for all waste transport and transfer stations vehicles (7.9% savings in emissions)
6. Energy efficiency improvements at recycling reprocessing plants (7.7% savings in emissions)
7. Food waste collections (6.7% savings in emissions)
8. Diverting plastics from EfW facilities (5.6% savings in emissions)
9. Waste prevention measures (4.8% savings on emissions)
10. Extended Producer Responsibility (0.4% savings on emissions)
11. Deposit Return Scheme (0.3% savings in emissions)
12. Landfill biodegradable ban (0.2% savings in emissions)

This will require significant operational changes from our sector, but will also rely on government regulations, policy, targets, and the associated behaviour change of householders and businesses. In addition, achieving a more ambitious performance than current targets and policy currently intend to achieve will help further reduce emissions from our sector. For example, our most ambitious net zero pathway assumes that the electricity grid will be fully decarbonised by 2040.

It should be noted that measures which may be expected to generate higher emissions savings, for example a ban on biodegradable waste to landfill, are shown to have a small impact in this scenario. This arises from our modelling assumptions. For example, the impact of a ban on biodegradable waste to landfill would be greater if, in this scenario, we had not already diverted biodegradable waste away from landfill through other measures (i.e. waste prevention which generates 4.8% of emissions savings and increased food waste collections which generates 6.7% of emission savings for both household and commercial waste combined).

Appendix 2: Our commitments and targets

In this section we provide further detail about each of the commitments the ESA and its members will make to deliver against the targets outlined in the net zero GHG emissions strategy. We present these initially as a table, for quick reference, and subsequently expand on each with some additional narrative with detailed recommendations.

Priority one: Support the UK's drive towards a circular economy and net zero

Actions	How
Action 1.1 Work together with government, customers, communities and other agents to support their net zero, climate change adaption and circular economy strategies	a) Further engage and collaborate with customers and communities to support their own climate change response. b) Share data, guidance, and other technical information to support other sectors in delivering on the requirements of the Resources and Waste Strategies and relevant UK climate change adaptation and GHG reduction strategies. c) Work closely with government and regulators to ensure policy and regulatory environment supports and enables accelerated delivery of circular economy and sector net zero emissions.
Action 1.2 Invest in new local and regional facilities to move materials up the waste hierarchy	a) Further investment in local and regional recycling, waste treatment and energy recovery infrastructure to enable the ambitions of the Resources and Waste Strategy for England and those in Scotland, Wales and Northern Ireland, and to help reduce reliance on export markets for recycling and recovery of unprocessed waste. b) Monitor waste volumes and trends, and innovation and new technologies to inform fact-based long-term investment decisions in resources and waste management infrastructure.
Action 1.3 Raise awareness on the sector's essential role and services	a) Continue to raise awareness (via disclosed holistic accounts, reporting and engagement) about the recycling and waste management sector's activities and its essential role in safeguarding public health while helping to preserve the UK's resources.

Priority two: Reduce emissions from our operations

Actions	How
Action 2.1 Promote waste prevention and reuse	a) Engage with government and customers/other sectors to promote waste prevention, reduction and reuse activities. b) Share and provide data to inform and support measures on waste prevention, eco-design, reuse/refill. c) Support government and other relevant organisations in developing datasets and methodologies to quantify carbon aspects and benefits of waste prevention and reuse.
Action 2.2 Maximise the carbon benefits of recycling	a) Raise awareness of, and further promote and disclose, clearly defined accounting for the carbon benefits of recycling. b) Enable higher recycling levels via enhanced recovery of recyclable material and the production of high-quality secondary raw materials. c) Further engage with the manufacturing, retail and packaging sectors to improve the recyclability of packaging and materials, and to promote clearer labelling.
Action 2.3 Reduce emissions from Energy from Waste	a) Enhance active waste input management by focusing on upstream methods (e.g., increasing participation and segregation via kerbside or commercial recycling collection systems) rather than less effective 'end-of-pipe' solutions to remove recyclable fossil-origin wastes such as plastics, textiles, rubber, etc. b) Maximise and better quantify the operational efficiency and heat offtake from EfW plants, and collaborate with available stakeholder groups to ensure the deployment of EfW heat. c) Maximise the recycling of residues (i.e. Incinerator Bottom Ash (IBA), Air Pollution Control residues (APCr) and metals) from the EfW process. d) Deploy carbon abatement technologies.
Action 2.4 Reduce emissions from landfill	a) Aim to effectively divert all organic waste from landfill by 2030, by increasing recycling and energy production through composting, AD, and EfW. b) Continue the diversion of residual waste from landfill, increasing the proportion of energy recovery from non-recyclable materials for the production of low carbon and renewable electricity and heat. c) Enhance capture and utilisation of landfill gas. d) Further improve modelling and data collection for landfill GHG emissions.

Continued overleaf

Priority 2: Reduce emissions from our operations continued

Actions	How
Action 2.5 Reduce remaining emissions through carbon offsets and sequestration	a) Enhance carbon sequestration (and define methodology) by protecting and enhancing biodiversity at all sites, especially maximising the potential of major landholdings such as closed and restored landfill sites. b) Consider offsetting the emissions which cannot be further reduced (such as legacy emissions from landfill, or remaining EfW emissions) via widely recognised and leading protocols.

Priority three: Reduce emissions from our buildings, transport solutions and infrastructure

Actions	How
Action 3.1 Reduce emissions from waste transport	a) Decarbonise the waste collections, transport and logistics vehicle fleet and fuel, through the progressive electrification and deployment of renewable and alternative fuels, and implementation of more efficient collection systems. b) Develop local infrastructures, local and sub-regional markets to limit the shipping of waste overseas, and promote responsible handling of waste (e.g. waste tracking, responsible exports), further minimising handling and transport emissions.
Action 3.2 Reduce emissions from buildings and infrastructure	a) Maximising self-sufficiency of power and heat where viable. b) Committing to renewable energy to power the sector's buildings and infrastructure, including offices. c) Minimising natural gas imports in favour of non-fossil fuel heat sources. d) Improve the energy efficiency of all infrastructure including offices and other buildings. e) Committing to sustainable and low carbon construction for new build projects. f) Developing and deploying sustainable transport plans for employees, including electric vehicle charging infrastructure at operational sites (potentially utilising renewable power generated from waste sources)

Priority four: Data collection and reporting: Improve transparency of the sector's impacts on GHG emissions

Actions	How
Action 4.1 Improve data collection	a) Adopt a standardised method to quantify sector-wide GHG emissions to improve the consistency of emissions data in the sector. b) Further improve data collection, tracking and analysis of waste inputs and composition to improve resource efficiency and reduce impacts.
Action 4.2 Improve emissions reporting	a) Monitor and report performance on an ongoing basis. b) Review benefits of formal accreditation of targets/disclosures at sector and member level.
Action 4.3 Improve accuracy and quantification of the carbon benefits achieved outside of the waste sector (recognising the importance of interdependencies and cross-sectoral synergies in the UK's net zero journey)	a) Work with agricultural, manufacturing, energy, and other sectors to improve quality of factors used to account for benefits of recycling, energy recovery, and composting, and support the development of incremental benefit factors, to allow for overall quantification and optimisation of emission reduction activities and efforts.

Recommendations and guidance for the recycling and waste management sector

Each of the actions identified in the tables above is expanded upon in this section to provide more detailed guidance to organisations within our sector.

Priority one: Supporting the UK's drive towards a circular economy and net zero

Action 1.1
Work together with government, customers, communities and other agents to support their net zero, climate change adaptation and circular economy strategies

a) and b) The ESA members closely engage with their customers, partners and with the communities they operate within, often going the extra mile to provide clear data, guidance and information on service options, standards and benefits. This includes close collaboration on compliance, cost and resource efficiency and the carbon footprint of recycling and waste services and how this can be further improved.

In a competitive market, further embedding and normalising these added-value aspects of service and customer care is expected. The ESA will review, correlate and promote examples of best practice in this area.

c) In order to unlock investment in the services and infrastructure needed to drive the circular economy and to contribute to further GHG reduction, long-term policy and regulatory clarity is required. It is therefore vital that the industry, with its track record for delivering investment in UK recycling and recovery, continues to work with the UK governments and regulators on the further development, delivery and effective regulation of existing legislation and proposals under the resources and waste strategies of England, Scotland, Wales and Northern Ireland.

The ESA will maintain and further develop strong working relations with the key government departments in Defra; DCLG; BEIS and Treasury to support effective policy and legislation at a formative stage and to press for positive change. We will continue to track and support the development and delivery of core policy and regulations in this area.

Action 1.2
Invest in new local and regional facilities to move materials up the waste hierarchy

a) The ESA members have promised to invest more than £10bn over the next ten years in the UK and remain keen to provide a vital contribution to a post-Covid green recovery. This is contingent on the right policy framework being in place and it is essential that the UK government and those in the devolved administrations provide our sector with confidence that the policies and proposed regulation set out in the UK's resources and waste strategies will continue to be implemented without unnecessary delay.

b) Working with government and regulators, the ESA will continue to regularly monitor waste volumes and projected trends, as well as new policies and regulations that could impact these, in order to inform investment decisions and minimise the risk of overcapacity or under-capacity of any resources and waste management infrastructures.

We will also seek and promote innovation, and regularly monitor the viability of new waste management technologies to ensure the ones that are developed and deployed at scale meet the minimum requirement of being less carbon-intensive than older infrastructures.

Action 1.3
Raise awareness on the sector's essential role and services

a) The full spectrum of activities operated by our sector, from combined heat and power energy from waste facilities to state-of-the-art materials recycling and reprocessing facilities, provide a vital public sanitation function which safeguards public health in the UK. The ESA and its members will continue to raise awareness about the sanitary and carbon benefits associated with all recycling and waste management activities, through continued engagement with communities and through improved emissions accounting and reporting.

Priority two: Reduce emissions from our operations

Action 2.1.
Promote waste prevention and reuse

a) Waste prevention is the highest ranked priority in the waste hierarchy and focuses on upstream strategies to reduce the amount of waste generated. These measures are taken before a material or a product becomes waste, and include activities such as raising awareness on how people and businesses can reduce their waste, encourage and enable products to be used for longer, repaired and reused by others, etc.

Preventing waste reduces the pressure on the world's limited resources and could help avoid as much as 58 million tonnes of material and 100 million tonnes of CO_2e emissions[8]. Not only does it avoid the GHG emissions that are emitted when waste is treated and disposed of by our sector, but also the emissions that are associated with the production of goods.

The ESA and its members are committed to play an active role in this aspect, by supporting the government waste prevention strategies, and by engaging with members of the public, our customers and other sectors to raise awareness on what happens to their waste and how they can best reduce or re-use.

b) The vast amount of data collected by our sector on the services we provide can help stakeholders to understand material flows and end destinations, and the benefits and impacts of our services. This can support the design of effective waste prevention strategies and can help inform eco-design decisions.

The ESA stands ready to provide information and share data on the materials members collect and process to support these strategies, by helping UK governments, and the manufacturing, retail, packaging, and other relevant sectors to better understand materials flows and the environmental impacts associated with the treatment of different types of waste. We will also continue to collaborate with our local authority and commercial customers to help them prevent and minimise waste, for example by joint working on communications and behavioural change campaigns and activities, and by sharing with them detailed data on the composition of their waste to help them adjust their supply chain.

8 ERM (2013) Waste Prevention Actions for Priority Wastes: Economic Assessment through Marginal Abatement Cost Curves, a report for Defra (completed December 2012)

Action 2.2
Maximise the carbon benefits of recycling

a) Recycling delivers clear and quantifiable resource efficiency and GHG emissions reduction benefits. Recovering, recycling and putting materials to further use saves emissions caused by extracting and processing new raw materials. The challenge for the ESA's members is that most of these benefits are accounted for elsewhere in the supply chain, and as sorting and reprocessing facilities generally deploy energy intensive processes, increased recycling actually adds to our members' scope 1 and 2 emissions. In fact, our analysis show that recycling is the biggest driver of direct and indirect emissions in our sector.

Our work with Ricardo looked at how these GHG emissions benefits can be consistently quantified and reported to comprehensively evaluate the overall contribution of our sector to the national GHG emissions. This work finds that while sorting and recycling operations emitted a total of 14.7MtCO_2e of scope 1 and 2 emissions in 2018, these operations avoided three times more emissions (44.8MtCO_2e). This confirms the huge potential that the recycling services provided by our sector can play in helping the UK achieve net zero GHG emissions.

In addition to investing and operating core and enhanced recycling facilities across the UK, we will also commit to deploying and reporting on the best practice in relation to energy and process management to ensure that recycling facilities are operated at optimum efficiency. We will also work to ensure that recycling of any material is carbon efficient and demonstrates a net carbon benefit over the whole lifecycle of the material. This may not automatically follow where carbon/energy intensive processes are required in order to produce a marketable product from certain recycled materials.

For those wastes still going to landfill, we build state of the art containment sites with control systems to capture and treat or use the liquids and gases that arise. As a sector we have worked over the last 15 years to continually capture more of the landfill gases arising and to utilise as much as possible of those gases for energy production.

b) In addition to consistent quantification and reporting at sector level, the ESA and its members will continue to work with policymakers and customers to further increase UK recycling levels in order to maximise the clear emissions benefits, and to drive down contamination of materials collected for recycling through improved messaging and engagement of the public and businesses. The ESA has proactively supported recent and forthcoming regulations in the UK nations that enable and incentivise higher and sustained levels of recycling. These include proposed regulations such as extended producer responsibility, consistent collections, Plastics Tax, deposit return scheme, etc.

We also welcome on-going focus on effective regulatory enforcement and waste crime reduction measures to minimise the environmental and societal impacts of poor and illegal waste management practices.

Our members also work to continuously improve recycling and associated services to customers from all sectors, helping them to achieve their own sustainability and GHG-reduction ambitions in a cost-effective manner.

We will continue to evaluate and deploy technological and service innovation to

further enhance the effectiveness and efficiency of UK recycling at all stages of the process chain where financially and economically viable. This support will be throughout the lifecycle from better design of products and packaging, through exploring new processes such as deployment of artificial intelligence and robotics in mechanical recycling plants, and chemical recycling of plastics, to front-end sorting systems at recovery and disposal sites where environmentally and economically sustainable. Our sector has a proud record of trialling, scaling up and successfully deploying new and innovative technology for the treatment and recycling of the full range of post-consumer and post-production waste materials, and stands ready to invest further.

Case study:
Dagenham Plastic Recycling Facility – Veolia

Veolia invested an additional £1 million in its Dagenham Plastic Recycling Facility, which turns milk bottles into rHDPE pellets, as a result of increased demand for recycled polymers. This additional investment, which included installation of a new granulator, new processing kit and an upgraded washing process, increased the total food-grade rHDPE production capacity of the facility by 20% to 12,000 tonnes per year.

Case study:
End-of life supply chain for electric car batteries – EMR Metals Recycling

The RECOVAS partnership, led by EMR and part-funded by the government's Advanced Propulsion Centre, aims to create a new circular end-of-life supply chain for the electric vehicle industry. The project will provide a standardised and reliable route for recycling and repurposing lithium ion car batteries at a scale that can cope with the expected sales of electric vehicles in the UK. The supply chain will help all partners to triage batteries when they arrive at approved end-of-life vehicle treatment facilities across the UK for either manufacturing, reuse or – where it is not possible – recycling.

c) Further engage with the manufacturing, retail, and packaging sectors to improve the recyclability of packaging and materials, and to promote clearer labelling.

To increase recycling rates, the enhanced recovery of recyclable materials for reprocessing by our sector must be paired with improved design for recycling. Producers have the greatest influence over the design of products and packaging, and the ESA will work with the manufacturing, packaging and retail sectors to support the use of more easily recyclable materials in products and packaging. There are examples of best-practice and initiatives such as the UK Plastics Pact that provide excellent pointers in this area, for example reducing unrecyclable composite packaging, phasing out non-recyclable materials, etc.

We will also work with these sectors to support clear on-packaging recycling labelling on products and packaging. Clear and effective communications with consumers is important to change behaviour and improve recycling performance and should be promoted both at local and national level. Clearer product labelling (i.e. binary marking whether a material is recyclable or not, aligned with consistent collection systems) is essential so that consumers immediately know whether a product is recyclable or not, and are able to put the 'right stuff in the right bin'.

Action 2.3
Reduce emissions from Energy from Waste

a) Our work with Ricardo evaluates that in 2018, EfW plants in the UK helped avoid a total of around 2Mt CO_2e of emissions. Energy from waste facilities generate baseload and largely renewable power (with c.50% of current power generated from organic/biogenic and therefore wholly renewable carbon sources within the waste-derived fuel inputs). In fact, the incineration of biogenic waste releases CO_2 that is part of the natural carbon cycle. In other words, CO_2 that was only recently absorbed by growing matter is simply returned to the atmosphere. This does not increase the total amount of CO_2 in the atmosphere in contrast with the incineration of fossil-origin wastes which releases CO_2 that had been locked up in the ground for millions of years. The opportunity for emissions reduction is therefore to further reduce the fossil-based carbon inputs in the residual waste stream.

Our members will work together with UK governments, local authorities and key partners, to help assess and develop effective methods of diverting and utilising for recycling increasing volumes of fossil-based materials from EfW input waste streams.

Currently, the most effective methods include increasing participation and segregation via kerbside or commercial recycling collection systems, enhanced design for recyclability in post-customer packaging and products (i.e. less composite and unrecyclable plastic packaging), and the potential replacements of difficult to recycle fossil-based products, such as plastic films and flexibles and synthetic fibres in fast fashion, with biogenic materials of similar properties for their primary purpose.

The ESA will work with governments, regulators and other sectors to ensure that these upstream methods are effectively implemented wherever possible.

In addition, our members will further assess the viability of active on-site

pre-treatment and material recovery or diversion to further reduce fossil carbon content of input waste streams – though it should be noted that this presents an 'end-of-pipe' solution which is rarely optimal for cost or environmental outcomes. For example, most at-scale end-of-pipe mechanical/biological treatment (MBT) type operations in the UK over the past decade have proved neither environmentally nor economically sustainable, due to the poor quality of materials separated for potential recycling. Recycling operations must produce materials of sufficient quality to meet market specifications and to hold any economic value and the ESA's position is clearly that the focus for increased recycling should therefore occur before waste becomes 'residual'.

b) Operational combined heat and power (CHP) energy from waste plants are from 13% to 25% more efficient than those that generate electrical power only[9]. This additional efficiency also directly translates into measurable carbon benefit due to offsetting higher carbon heat generation.

The ESA and its members will continue to work with government and other key stakeholders to effectively ensure and incentivise the commercial viability of local heat networks to enable a greater proportion of UK EfW plants to utilise heat outputs alongside zero emissions electrical power. There are already a good number of best practice CHP EfW plants and partnerships operating across the UK, including SELCHP in Lewisham, Devonport in Plymouth, Runcorn and Eastcroft in Nottingham, Wilton in Middlesbrough, and modern UK EfW facilities are designed to be CHP-ready.

The ESA and its members will therefore seek to replicate conditions of current successful CHP schemes and actively work with governments, local authorities, energy partners and customers, via the Heat Networks Industry Council, on strategic planning issues, to overcome current barriers to heat offtake and enable the delivery of key economic and carbon benefits.

Case study:
Delivering heat from EfW – Viridor/Vattenfall partnership

Viridor has partnered with Vattenfall, the Swedish energy company, to capture and deliver the heat from its portfolio of EfW plants in the UK to local homes and businesses. By providing affordable and local heat from non-recyclable materials that would otherwise be wasted, this partnership will help reduce the UK's reliance on fossil fuels, address fuel poverty, and improve energy security.

9 DEFRA (February 2014) Energy from Waste: A guide to the debate

Case study: Delivering heat in Midlothian – FCC

Midlothian Council and Vattenfall have planned to deliver low carbon energy projects across the Midlothian Council area. The first project will be a low carbon district heating network supplying the new Shawfair town in the north of the council area and is expected to save over 2,000 tonnes of CO2 per year. FCC Environment, which operates Edinburgh and Midlothian councils' recycling and energy recovery centre near Millerhill, will supply heat to the district heat network.

The ESA and its members will also seek to better quantify the carbon benefits of optimised efficiency in energy R1 rating factors (where R1 plus CHP is the top tier of optimised efficiency, followed by R1 compliant, R1-ready and from waste facilities, for example by developing a clear tiered rating system for UK EfW facilities based on the EU equivalent with non-R1 the least efficient. Fuel input factors can also be incorporated).

c) In addition to vital baseload electricity and heat, the EfW process produces a range of recyclable by-products. In 2020, this process generated just under 2.7Mt of IBA and around 450kt of APCr[10].

We estimate that the recovery of incineration by-products helped avoid 28ktCO_2e of emissions in 2018 in the UK. Maximising the utilisation of these by-products has demonstrable emissions reduction benefits, either through:

- the displacement of primary product extraction and production (i.e. for post-combustion metals recycling)
- the production and deployment of high-quality Incinerator Bottom Ash Aggregates, or
- through the combination of replacing virgin aggregates and the active carbonation process involved in APCr treatment and recycling, using waste carbon dioxide gas as a resource to treat APCr and to produce carbon negative aggregates and building materials – a commercial process pioneered in the UK.

d) Carbon capture, utilisation and storage (CCUS), (also referred to as carbon capture, utilisation and sequestration), is a process that captures carbon dioxide emissions from sources such as power plants and either reuses or stores it so it will not enter the atmosphere.

The ESA and its members believe CCUS will play a key role in our sector's pathway to net zero, and in particular in decarbonising EfW plants. There are two ways to reduce CO_2 emissions from the EfW process: either by decarbonising the

10 Tolvik (May 2021) UK Energy from Waste Statistics - 2020

waste inputted (i.e. by preventing fossil-origin waste to enter the residual waste stream via increased waste prevention and increased separation at source for recycling), or by capturing the CO_2 released from the process. Unless the biogenic waste makes up the totality of the residual waste stream, CCUS is likely to be the only technological way for EfW plants to get to net zero.

Capturing and storing CO_2 emissions from EfW will help plants reach carbon neutrality. Furthermore, the introduction of measures to drive down the level of fossil carbon in the waste, for example by ensuring that non-recyclable plastic materials are removed from the residual waste stream, will increase the biogenic component of the residual waste stream which will eventually make up the majority of the residual waste stream. By also capturing this biogenic CO_2, EfW can become carbon positive. The CO_2 captured from these facilities could potentially be used to produce renewable hydrogen fuel which would help decarbonise the waste fleet.

The ESA and its members will actively work with government to ensure that current technical, environmental and economic challenges around CCUS are quickly addressed to allow our sector to invest in these technologies. With the right regulatory and policy framework in place, we believe that our sector can start fitting CCUS to their EfW facilities as early as 2025. We will monitor, support and trial CCUS technologies over the strategy period, with regular viability reviews.

In addition, we will work with our members to better understand and share guidance on the criteria that EfW plants need to meet to be CCUS-ready.

Action 2.4
Reduce emissions from landfill

a) The decomposition of organic waste in landfill generates a potent GHG. Landfill gas emissions are considered a significant anthropogenic source of methane (CH4). In the UK, it is estimated that around 7.2 million tonnes of biodegradable

SUEZ's Haverton Hill energy-from-waste site

Case study:
Carbon Capture & Storage – SUEZ Teesside Energy

SUEZ is working with BP to explore the feasibility of capturing and storing CO_2 emissions from the Haverton Hill and Wilton EfW sites – combined, these facilities emit around 900,000 tonnes per year of CO_2. Operations are expected to begin in 2025/26 for the UK's first carbon capture and storage project from energy-from-waste. This will help SUEZ meet its greenhouse gas reduction targets and assist in the battle to prevent further climate change.

municipal waste were sent to landfill in 2018[11]. Biodegradable waste can be used for composting or as resource for the generation of heat, electricity and fuel by means of incineration and anaerobic digestion.

Pre-segregated organic (food and garden) waste can also be utilised in composting systems, providing high-quality rich, recycled and peat-free compost for use in agriculture and horticulture and with clear carbon benefit.

While incineration can recover the most energy, anaerobic digestion plants also make compost, retaining nutrients for soil improvement and still recover some of the contained energy in the form of biogas.

The waste hierarchy indicates that in most cases, composting is the preferred treatment for organic waste (e.g. garden waste or mixed food and garden waste), followed by anaerobic digestion, and by incineration with energy recovery. There is however an exception for food waste, where AD is considered as environmentally better than composting[12].

b) EfW is currently the lowest carbon solution for waste that is not technically and economically recyclable. As well as putting waste to further use, it provides sufficient reliable, decentralised electricity to power 1.8m UK homes and could support more zero carbon local heat networks.

1 tonne of residual waste into landfill today will emit for the next 60 years, taking us beyond the 2050 target for net zero. In addition, landfill science does not yet provide a dataset to support the concept that materials are sequestered in them within a long-term timeframe. As such the ESA does not believe that carbon or materials can be proven to be sequestered in landfill, and it is clear that landfilled plastics are likely to leach chemicals for many decades, and that these will require collection and treatment.

c) and d) Landfill gas is the end-product of the decomposition of biodegradable waste. Methane, a core component of landfill gas, is a highly potent GHG up to 84 times greater global warming potential effect than that of carbon dioxide. Landfill gases mainly consist of carbon dioxide (CO_2), methane (CH_4) and other trace components. Landfill gas utilisation is a process of gathering, processing, and treating (predominantly via gas engines) the methane and other gases emitted from decomposing garbage to produce electricity, heat, fuels, and various chemical compounds. Gas modelling and the design and deployment of infrastructure to capture and harness the gas is a well-established, but continuously evolving technology. Current capture rates at fully capped modern, well-managed landfills average around 85-90%. Increased efficiency in capturing landfill gas therefore helps further prevent methane from entering the atmosphere.

No one-size-fits-all gas capture solutions exist, and the ESA members continue to pioneer better gas management techniques across their portfolio of operational and closed sites. This is especially important given that landfill sites can release gas years after they have been closed. These emissions are also called “legacy emissions”.

11 DEFRA (March 2020) UK statistics on waste – March 2020 update

12 DEFRA (December 2018) Food and drink waste hierarchy: deal with surplus and waste

Action 2.5
Reduce remaining emissions through carbon offsets and sequestration

a) Quality habitat creation on restored landfill sites is a key part of responsible and sustainable land stewardship. It also offers clear opportunities for the provision of measurable carbon sequestration and associated benefits, via tree planting, soil management, biodiversity and other natural capital services. The ESA and its members will work with the government and other relevant organisations to define a robust and consistent methodology to quantify the carbon savings of sequestration.

Opportunities should be evaluated for wider offsetting services for members and their customers, especially maximising the potential of major landholdings such as closed and restored landfill sites, sustainable land management and restoration (e.g. restore lands on closed landfill sites).

b) It is clear that, in order for the UK to reach net zero, credible offset markets and mechanisms will have a role to play and this will include properly priced natural capital elements. Protocols for carbon credits and offsetting compliance markets, including emissions trading schemes, are still being determined following the Paris Agreement (which supersedes the Kyoto Protocol's Clean Development Mechanism).

At a later stage (from 2025) in the strategy period, and once all the above-mentioned aspects have been implemented, the ESA and its members will consider offsetting for the quantified remainder of its carbon impacts, if necessary, via leading offsetting protocols or standards. For example, the ESA and its leading members may partner with The Carbon Trust, which only recognises Gold Standard, VCS and UK Woodland Carbon Code credits for offsetting.

This should include the evaluation of carbon off-setting schemes for customers of EfW facilities, should other measures leave a substantial proportion of fossil-based inputs in residual waste streams, and potentially for landfill 'legacy' emissions.

Priority three: Reduce emissions from our buildings, transport solutions and infrastructure

Action 3.1
Reduce emissions from waste transport

a) Transport costs, and the control thereof, are of key significance in the sector's service portfolio. The carbon emissions from collections and transport are our third biggest impact.

Our sector often demonstrates best practice to ensure ever more efficient and cost-effective recycling and waste collections for the benefit of customers – delivering a vital, reliable and affordable service. The same is true of waste handling and logistics transportation of waste between transfer stations and end point reprocessing, treatment and disposal facilities. Health and safety and relevant regulatory requirements and compliance (for example related to air quality, Duty of Care, etc.) are also key in this area, including standards relating to low-emissions technology, engines and urban zoning.

Continuous improvement methods available to operators that will reduce GHG emissions, alongside other benefits, include the deployment of digital

platforms and IT solutions for customer service, vehicle maintenance and route mapping fleet management, and driver and mechanics' training and accreditation.

Key drivers will include further tightening of air quality regulation, further incentivisation of separate recycling collections, and the phasing out of fossil-fuel combustion engine vehicles. Government has also sporadically considered reviewing the regulatory landscape for the provision of commercial waste collections across the UK, and the ESA and its members will closely monitor this to ensure the benefits of market competition are maintained and balanced alongside effective regulation.

Transitional opportunities that will require detailed review (with cost, availability and reliability being key concerns) will include replacing fossil fuels with renewable electricity, biofuels and green hydrogen. Natural synergies with regards to electric vehicle charging points being installed at energy recovery facilities may emerge.

b) The ESA and its members always support the use and development of local and regional markets for recycling and waste management, reflecting the proximity principle as enshrined in the UK waste and planning law. For the purposes of cost and resource efficiency (including GHG management), the ESA and its members will always prioritise the provision and use of local and sub-regional markets by preference. The ESA members will continue to invest in the UK recycling and waste management infrastructure to further enhance the resource efficiency of the UK.

Where export remains the most viable option for secondary materials, i.e., paper, plastics, etc., driven by global market realities, the ESA has driven the development and adoption of quality standards, transparency and responsible business practice. Options to further minimise the proportion of materials exported to the non-UK markets could include the wider utilisation of internal or 'shadow' carbon pricing as an evaluation tool.

Case study:
Transporting construction sector wastes by rail – Biffa

In partnership with GB Railfreight, Biffa has opened rail hubs in Leeds and Manchester and is developing another facility in London to transport inert-type soils and wastes from the construction sector by rail, instead of road. Since January 2019, using this rail network saved 11 million km in tipper truck journeys and 6,600 tonnes of CO_2 emissions. Biffa currently transports 27% of waste destined for landfill by rail and is targeting 50% by 2025.

The ESA will continue to work closely with government to seek further improvements in optimum systems to track waste movements, building on current Duty of Care and related regulation. Current trials for the electronic tracking of all controlled waste material throughout the supply chain are being supported by the ESA members. Potential benefits include further reduction in waste crime and its detrimental impacts, as well as waste planning and resources and carbon efficiencies utilising improved data.

Action 3.2
Reduce emissions from buildings and infrastructure

Whilst only a small component in the context of achieving net zero emissions, it is important that all sources of emissions are addressed through our strategy. Therefore, we will work towards net zero to reduce the use of energy within the buildings our sector operates:

a) Increasing self-sufficiency of power and heat supply can have numerous benefits including security of and control over supply, cost savings and emissions savings where the power/heat comes from a low carbon source.

Across the sector estate there are numerous opportunities to benefit from:

- Renewable and non-renewable (but low carbon)
- Onsite and offsite – self supply vs PPAs/ private wires
- Heat recovery from processes/utilising waste heat
- Working collaboratively with others to enhance overall efficiency

This should be considered in tandem with reducing power and heat demand in order to increase the proportion of demand that can be met by organisations' resources.

The ESA and its members will look towards the development of renewable energy on their sites through solar and wind solutions. We will also look to use heat and power from our own processing facilities (e.g. EfW/AD) where viable.

b) There is strong potential to meet the sector's power needs through renewable energy generation. This can be done by two primary methods:

- Direct supply: Onsite and offsite – self supply via private wires or sleeving or via PPAs
- Procurement of low carbon energy (green power and gas) through the energy supplier market

c) Replacing natural gas heating with non-fossil fuel heating sources can offer considerable potential for decarbonisation, as the gas grid is not expected to decarbonise as fast as the electricity grid. There are several non-fossil fuel heating options:

- Electrification of heat (either to electric heating or heat pumps). This offers the greatest decarbonisation potential when coupled with green electricity supply.
- Biomass / biogas heating
- Utilising waste heat
- Hydrogen

d) The first step of the emissions reduction hierarchy is to improve efficiency. These measures often have lower costs and shorter paybacks and reduce demand

to decrease the size of (and so capital expenditure on) any power or heat generation technologies. There are a range of mainstream technologies and management procedures to achieve this.

- Technology solutions such as control systems, thermal insulation, heating/cooling system improvements, LED lighting

- Implementing energy management systems to ensure energy use is monitored and managed

e) As a sector our assets and infrastructure typically have a long operational life. Therefore, it is important that we consider the long-term GHG emissions impacts of the projects we commission now, as we will be living with the GHG impacts of design decisions made today beyond our net zero timeline. We must ensure that the operational carbon impact of all new projects is calculated and included within the development decision making cycle. This has been successfully achieved in other sectors by projecting the cost of energy and emissions arising as part of the Opex and Totex calculations.

To avoid creating unnecessary emissions through the construction process, the ESA and its members will also seek to quantify the embodied or capital carbon associated with delivery of projects. We will adopt the approaches outlined in the HMT Infrastructure carbon review, including monetising carbon and incorporating it into the Capex cost – benefit assessments, and wherever possible use PAS 2080 as the framework for doing so.

By adopting both these approaches we will mitigate the long term, life-cycle GHG impacts of our projects.

f) The GHG impact of our employees commuting to work does not fall within the boundary of our net zero commitment, however, as a large employer we will take a leadership position on this to support the wider economic decarbonisation. This will include developing sustainable transport plans and investing in the infrastructure that can support the transition to low cost, zero emissions transport over time.

This could include bus networks and particularly those operating from electrical or zero carbon/renewable energy sources and as a sector apply circular economy principles through recovery of the waste oil and seek to re-use within public transport. Other options could include supporting cycle to work schemes, and providing the facilities for employees associated with this.

Additionally, as the transport system moves towards electrification, installing vehicle recharge points at our locations, supporting staff to switch to electrical, but also enabling our own vehicles (company cars, vans etc.) to make the same transition.

Data collection and reporting: Improve transparency of the sector's impacts on GHG emissions

Action 4.1
Improve data collection

a) and b) The ESA commissioned external expertise via Ricardo consultants to conduct a review of the available methodologies for the quantification of GHG emissions for the UK recycling and waste management sector, including direct (scope 1), indirect (scope 2), and avoided emissions from all primary sector activities.

Their analysis considered nine different methodologies and identified the Entreprises pour l'Environnement (EpE) "Protocol for the quantification of GHG emissions from waste management activities" (2013) as the most appropriate methodology to promote consistency in GHG emissions reporting across our sector, and recommended a number of modifications to bring the protocol up to date, make it UK centric and more user-friendly. The updated protocol will be made available to the sector for future GHG emissions reporting and will be used to annually report our members' greenhouse gas emissions in the ESA Annual Report.

Action 4.2
Improve emissions reporting

a) Monitoring and performance are central to understanding the progress we will make in achieving net zero - having the right systems and processes is a key component of achieving that objective. We have recognised from the work we have done the need for new waste metrics and begun to outline the form we believe they should take. From the basis of our standard reporting tools and/or industry wide data sets we will focus on strengthening those processes to align with net zero etc., and reporting at the sector level.

In parallel to this, we look to put in place an agreed framework with our members and individual companies to allow them to report key points for amalgamation at the waste sector level to collect data on sector-wide GHG emissions annually from its members. To support the move to net zero and enable reporting at the sector level the systems and processes around this will be enhanced to provide greater clarity and consistency. This will include establishing a core, sector-wide emissions boundary and reporting tool built on the GHG Protocol, which will enable emissions to be amalgamated on a like-for-like basis. This will also enable the data to be anonymised and reduce the exposure of individual members to challenge from stakeholders.

From the baseline emissions calculation, we have created a business-as-usual projection of GHG emissions which will form our 'minimum' level of decarbonisation. This is accompanied by a series of decarbonisation scenarios, which will be used as the benchmark of performance and allow us to report our progress annually.

As with all net zero commitments it is important that our strategy is around sustained emissions reduction and does not simply rely on offsetting principles. As such we will align our decarbonisation plans and scenarios to the Science Based Targets approach, this focuses the attention on the accumulated emissions over time rather than at any single point and drives earlier action as a result.

b) It is becoming increasingly important to verify or accredit emissions reductions as proof of performance. We will review the most appropriate mechanism for achieving this, either as a whole sector, or as individual companies. This will include considering establishing a bespoke, sector specific accreditation and looking at the existing approaches in the market, for example Science Based Targets initiative and Carbon Trust Standard/CEMARS.

Action 4.3

Improve accuracy and quantification accuracy of the carbon benefits achieved outside of the waste sector (recognising the importance of interdependencies and cross-sectoral synergies in the UK's net zero journey)

Some of the stronger levers our sector can pull to reduce emissions rely on the quantification of the benefits achieved in other sectors. For example, recycling helps reduce emissions from the mining, transportation, and manufacturing sectors. However, these factors are often static and dated, and as the economy decarbonises, the benefits achieved through these sectors will change. The ESA and its members believe that further work is needed to better understand this dynamic, recognising important interdependencies, and to improve accuracy when measuring and maximising the environmental benefits of our services.

Appendix 3: Working with other stakeholders

In this section, we have expanded upon some of the commitments outlined in our strategy.

We will work with government to:

- **Ensure that the recycling and waste management sector is considered for GHG management purposes as one system, rather than in silos.**

Too often, the recycling and waste management sector is treated in silos rather than as a system. Our main purpose is to manage the UK's waste resources by collecting, sorting and treating these in accordance with the waste hierarchy. Where recyclable materials are collected separately, we treat this material at our material recovery facilities (MRFs) to put them to further use. Where high quality recycling is not possible for various reasons including the over-contamination of waste, the impossibility to recycle materials infinitely or the need to dispose of remaining residues after recycling, our members put these resources to further use by recovering energy from material that would otherwise be wasted, and safely dispose of residue.

- **Put in place the necessary policy framework and infrastructure to support our sector's transition to net zero.**

Essential zero carbon infrastructures will need to be deployed across the UK to support the transition to net zero. We will work with the government and other sectors to identify common issues and understand the pathways needed for the deployment of these infrastructures. Common issues include the development of CCUS, and the decarbonisation of transport which will require rolling out zero carbon energy infrastructure such as Electric Vehicle charging stations.

- **Ensure a positive and supportive regulatory framework that incentivises and encourages the sector's efforts and investments in supporting the transition towards a zero carbon and more circular economy.**

- **Clarify the timetable for delivery and accelerate implementation of the Resources and Waste Strategy for England published in 2018 and the strategies in Scotland, Wales and Northern Ireland, enabled by key elements of the Environment Bill.**

The Resources and Waste Strategy introduces major new reforms that will have a profound impact on producers and the way things are made; how we collect materials when they are discarded; how we treat those materials and how waste services are funded. These measures are essential to move the UK towards a circular economy and towards net zero and will require major changes and investment from the environmental services sector. The Environment Bill, which provides the much-needed new legislative framework to implement these new reforms, is essential to underpin this next phase of investment, and should

be adopted in Parliament as soon as possible. The ESA and its members will work with UK government to ensure that the Resources and Waste Strategy for England (and those in other UK nations) is aligned with net zero, and that any conflicts between the two are resolved with urgency to guide investment in the sector.

We will work in close partnership with local authorities to:

* **Improve the sector's efficiency by encouraging waste avoidance and, where waste remains, maximising the separation of recyclables and waste collected for beneficial material reprocessing and recovery.**
* **Enable convenient and cost-effective products and services designed for higher levels of recyclability and the expansion of recycling-led services.**
* **Encourage the adoption of decarbonised waste collection, transport and logistics vehicle fleets and fuel, through the progressive electrification and deployment of renewable and alternative fuels.**
* **Identify key interdependencies and cross-sector synergies which have potential to accelerate carbon reduction in waste and resources management.**
* **Provide guidance on key measures that can be adopted in jointly delivered services and best practice contract procurement, and the role they can play to help the sector deliver a net zero future (i.e., adjust current evaluation criteria and the way bids are scored to ensure that the lower-carbon options are prioritised, in line with the net zero target).**

Waste collection is perhaps the most visible service any local authority offers to its residents, and one of the few that is used by every household. It is of critical importance to every local authority that this flagship service is convenient, and above all reliable – while also being responsive to the direction set by national policy.

The government's Resources and Waste Strategy heralds the introduction of the most radical changes to recycling and waste policy for over a decade, partly driven by the recognition that waste producers, not local authorities, should bear the greatest proportion of the costs of responsible and resource (and carbon) efficient post-consumer product and packaging stewardship. All parts of the value chain will need to be aligned if we are to get close to achieving the step-change in recycling performance now envisaged.

Meeting future municipal recycling targets will require an almost 30% increase on current recycling volumes, across both the household and commercial sectors. The introduction of radical reform of our producer responsibility systems, along with more consistent collections, will necessitate service changes for huge numbers of local authorities around the country. It will be vital that both the public and private sectors work together to turn all of this ambition into reality.

As the UK's aspirations to achieve higher recycling rates and carbon reduction strengthen, it is important that models for services delivery are carefully considered. This includes contracts and service procurement, best practice and consistent collections, and the provision of more vital infrastructure.

The ESA and its members will continue to work in close partnership on these matters with local authorities, and the bodies representing them and their core environmental services, including the LGA, ADEPT, COSLA, NAWDO, joint waste authorities, waste partnerships, etc, to drive our joint net zero ambitions.

Glossary

- **Anaerobic digestion:** Anaerobic digestion is a process by which organic matter such as animal or food waste is broken down by micro-organisms in the absence of oxygen. This process produces two main outputs: biogas, a methane-rich gas that can be used as a fuel or to provide renewable energy; and a digestate, a source of nutrients that can be used as a fertiliser.
- **Air Pollution Control residues (APCr):** Air Pollution Control residues are produced from cleaning gaseous emissions generated during the combustion of wastes at EfW plants. To recover energy, waste is combusted into hot gas. The exhaust combustion gases are then treated to remove contaminants as a solid ash known as APCr.
- **Avoided GHG emissions:** Avoided GHG emissions arise when an activity leads to avoiding emissions that would otherwise have occurred elsewhere. In ESA's case, materials that are diverted to reuse or recycling can offset the need to make new products from virgin materials, and so can be assigned a credit for the emissions avoided by not making those new products. Analogously, energy created from waste (notably via anaerobic digestion and incineration) can offset the need for that electricity and or heat to be generated from other sources, whose associated emissions are therefore avoided.
- **Carbon Capture, Utilisation and Storage (CCUS):** Carbon capture, utilisation and storage, (also referred to as carbon capture, utilisation and sequestration), is a process that captures carbon dioxide emissions from sources such as power plants and either reuses or stores it so it will not enter the atmosphere.
- **Direct GHG emissions:** Direct GHG emissions occur from process or equipment owned or controlled by the entity. For example, emissions from combustion installations, landfills (fugitive emissions), company- owned vehicles, etc. In accordance with the GHG Protocol, direct emissions are also known as 'scope 1' emissions.
- **Energy from Waste (EfW):** Energy from Waste facilities recover energy via the combustion of residual waste. This energy can be in the form of electricity, heating and/or cooling, or as a fuel (e.g. transport fuels).
- **Incinerator Bottom Ash (IBA):** IBA is the ash that is left over after waste is processed at Energy from Waste facilities. IBA can contain a number of materials including ash from the combustion process and unburnt materials such as glass, metals, concrete. Almost all IBA is removed, re-used or recycled. For example, IBA can be recycled into aggregates for construction, and metals can be recovered and sent for recycling.

- **Indirect GHG emissions:** Indirect GHG emissions are emissions that are consequences of the activities of the entity but that physically occur at sites or during operations owned or controlled by an organisation other than the reporting entity. In accordance with the GHG Protocol, indirect emissions can be distinguished into two categories known as scope 2 and scope 3 emissions. Indirect emissions resulting from imports of electricity, heat or steam not self-produced have to be accounted for as scope 2 emissions. For example, the electricity purchased from the grid. All other indirect emissions correspond to scope 3 emissions. For example, the emissions from vehicles not owned (or not controlled) by the entity.

- **Material Recovery Facilities (MRFs):** Material Recovery Facilities receive, separate, and prepare recyclable materials to be sold to end-user manufacturers.

- **Mechanical biological treatment (MBT):** Mechanical biological treatment is a residual waste treatment process which uses a combination of mechanical and biological treatment to sort the waste. The mechanical process includes an automatic segregation system to separate recyclable materials from the mixed waste, and the biological element removes moisture from the waste and helps produce a homogenous consistent fuel for thermal treatment processes. They are designed to complement but not replace other waste management technologies such as recycling and composting.

- **Net-zero:** According to the Science Based Target initiative, "reaching a state of net-zero emissions consistent with limit warming to 1.5°C involves two conditions: 1. To achieve a scale of value-chain emission reductions consistent with the depth of abatement achieved in pathways that limit warming to 1.5°C with no or limited overshoot; and 2. To neutralize the impact of any source of residual emissions that remains unfeasible to be eliminated by permanently removing an equivalent amount of atmospheric carbon dioxide."

- **Residual waste:** Also known as 'non-recyclable waste', residual waste is the waste that is left over when all the recycling possible has been done.

Acknowledgments

The ESA would like to thank all of the members who contributed to the creation of this strategy and, in particular, members of ESA's Climate Change Working Group and Tim Rotheray. We would also like to give special thanks to Dan Cooke for his support throughout the project, along with Rachel Espinosa, Alexandra Este, Simon Gandy and Ioanna Kyriazi (Ricardo), and Ben Johnson.

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The Environmental Services Association (ESA) is the trade body representing the UK's recycling and waste management industry. Our members are helping the UK move towards a more circular economy by collecting, sorting, and treating waste to recover materials and energy, while protecting the environment and human health. Combined, our members collect or process tens of millions of tonnes of waste material every year and have helped to increase England's recycling rate five-fold over the past twenty years.

If you would like to find out more about the Environmental Services Association, please visit **www.esauk.org**

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