



Initial climate action plan

January 2020



MERSEYSIDE RECYCLING & WASTE AUTHORITY

Contents

1. Background	1
2. The climate challenge: Why it matters	2
3. Scope of the climate emergency.....	3
4. Link to circular economy.....	4
5. Land management and natural capital	6
6. Behavioural change.....	7
7. Our response so far.....	8
8. Commitments and core actions	13
9. Summary	16
Appendix 1 References	17

1. Background

Human-induced climate change is a global issue that has been one of the most contested truths for the past two decades¹. It is now an immediate problem with an overwhelming case for setting and investing in a net zero carbon target² framed by a circular economy revolution and a local climate emergency movement. The climate crisis moment is here³; climate thinking must now become a default part of our everyday decision-making⁴.

Merseyside Recycling and Waste Authority (MRWA) Members declared a climate emergency on Friday 18th October 2019 whilst simultaneously agreeing to develop a new Zero Waste 2040 Strategy and an Action Plan for Resource and Waste Management at the earliest opportunity. Cities are at the core of strategic low carbon development and climate change mitigation⁵. Our actions are consistent with the Liverpool City Region (LCR) need to reach zero or near zero carbon no later than 2043 in order to stay within the recommended maximum carbon budget of 46.1 million tonnes CO₂⁶.

Operating at the interface between local action, national policies and international agreements, MRWA recognises the seriousness of climate change. Our mission statement and corporate aims address the need to mitigate climate effects:

Mission statement

To ensure that we reduce the impact of our actions on climate change and improve the sustainable management of waste and resources.

Aims

1. Improve the sustainable management of waste and resources
2. We will deliver effective waste services
3. Co-operate to improve working arrangements
4. MRWA is committed to measure and report on climate change impacts and sustainability improvements and will report on UN Sustainable Development Goals (SDGs).

Underpinned by recent climate science evidence, this document sets out how MRWA has acted to confront the climate challenge and resource efficiency agenda in recent years. In declaring a climate emergency, urgent action and transformational change is required. This

¹ Jennings, P. D. and Hoffman, A. J. (In press). Three paradoxes of climate truth for the anthropocene social scientist. *Organization & Environment*.

² Betts, P. (2019). Chair's summary report of the International Advisory Group to the Committee on Climate Change in relation to its work on the UK's long-term emissions goal. <https://www.theccc.org.uk/wp-content/uploads/2019/05/International-Net-Zero-Advisory-Group-Chair-Report.pdf>

³ Shukman, David (2020). Sir David Attenborough warns of climate 'crisis moment'. 16 January 2020. <https://www.bbc.co.uk/news/amp/science-environment-51123638>

⁴ Howard Boyd, E. (2019). The new normal: Leadership in the climate crisis. Speech by Chair of the Environment Agency and UK Commissioner to the Global Commission on Adaptation. RSA President's Lecture 2019, 31 October 2019. <https://www.gov.uk/government/speeches/the-new-normal-leadership-in-the-climate-crisis>

⁵ Mi, Z., Guan, D., Liu, Z., et al. (2019). Cities: The core of climate change mitigation. *Journal of Cleaner Production*, 207, 582-589.

⁶ Kuriakose, J., Jones, C., Anderson, K., et al. (2019). Setting climate commitments for Liverpool City Region: Quantifying the implications of the United Nations Paris Agreement for Liverpool City Region. The University of Manchester, Tyndall Centre, October 2019. <https://carbonbudget.manchester.ac.uk/reports/combined/>

document therefore also sets out how MRWA intends to take further just and realistic climate and circular economy measures in the short- and long-term supported by detailed actionable targets.

MRWA expects to publish an updated climate action plan biennially to report our progress, maintain momentum and provide long-term direction.

2. The climate challenge: Why it matters

There are a range of climate impacts, which have major effects on us all at global and local scale, including poverty risk, disease and increasingly prevalent hostile and destructive weather patterns. The severity and potential impacts of climate change are underlined by the latest World Economic Forum ranking of extreme weather events as the top global risk by likelihood, with failure of climate change mitigation and adaptation placed second⁷. The necessary international and national policy traction is gaining ground but is yet to reconcile with significant public consciousness.

Climate science tells us that the eventual extent of climate heating is proportional to the total amount of carbon dioxide (CO₂) that human activities add to the atmosphere⁸. In 2018 the planet's CO₂ levels reached the highest reported levels in history at 407.38 ± 0.1 parts per million (ppm), rising from approximately 277 ppm in 1750 at the start of industrialisation⁹.

Consequently, during the last century the planet has warmed by an average of nearly 1°C. In order to prevent the worst effects of climate change, there is global consensus through the 2015 United Nations Climate Change Conference (COP21) and the international Paris Agreement¹⁰ to limit the temperature increase to well below 2°C from the pre-industrial era by the end of this century. Following the Paris Agreement, the Intergovernmental Panel on Climate Change (IPCC) published a special report in October 2018 which asserted that limiting global warming to 1.5°C would require unprecedented 'rapid and far reaching' changes in all aspects of society including achieving net zero by 2050¹¹. The UN suggest a greater urgency with only a decade remaining to tackle the climate crisis¹².

The UK parliament declared an environment and climate emergency in May 2019¹³, the first national government to do so. In June 2019, a decade after the Climate Change Act became law and in updating the Act from an 80% target, the UK became the first G20 country to set a net zero carbon target by 2050 to end the UK contribution to rising global temperatures¹⁴. Decarbonisation is inevitable; mankind will either manage the transition to net zero carbon

⁷ World Economic Forum (2019). The global risks report 2019. 14th edition, 15 January 2019.

http://www3.weforum.org/docs/WEF_Global_Risks_Report_2019.pdf

⁸ Energy & Climate Intelligence Unit (2018) Net zero: Why is it necessary? <https://ca1-eci.edcdn.com/briefings-documents/net-zero-why-PDF-compressed.pdf?mtime=20190529123722>

⁹ Friedlingstein, P., Jones, M. W., O'Sullivan, M., et al. (2019). Global carbon budget 2019. Earth System Science Data, 11, (4), 1783-1838.

¹⁰ United Nations (2015). The Paris Agreement. https://unfccc.int/sites/default/files/english_paris_agreement.pdf

¹¹ Intergovernmental Panel on Climate Change (2018). Global Warming of 1.5 °C: An IPCC special report on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty. <http://www.ipcc.ch/report/sr15/>

¹² World Economic Forum (2020). Cutting out carbon: 5 environmental laws coming into effect in 2020. 3 January 2020.

<https://www.weforum.org/agenda/2020/01/green-laws-environment-2020>

¹³ <https://www.parliament.uk/business/news/2019/may/mps-debate-the-environment-and-climate-change/>

¹⁴ Statutory Instrument 2019 No. 1056 (2019). The Climate Change Act 2008 (2050 Target Amendment) Order 2019. London, The Stationery Office. http://www.legislation.gov.uk/uksi/2019/1056/pdfs/uksi_20191056_en.pdf, Vidal, J. (2019). The climate crisis in 2050: What happens if cities act but nations don't? The Guardian, 10 October 2019. <https://www.theguardian.com/cities/2019/oct/10/the-climate-crisis-in-2050-what-happens-if-cities-act-but-nations-dont>, Wiseman, J. (2018). The great energy transition of the 21st century: The 2050 zero-carbon world oration. Energy Research & Social Science, 35, 227-232.

emissions proactively by transitioning the economy, or nature will do it for us, by depopulating and deindustrialising the planet¹⁵.

This acceptance of climate truth requires a wholesale transition to a decarbonised economy whilst securing further growth, a need recognised as one of the most pressing international policy challenges¹⁶ that is supported nationally by HM government and the Committee on Climate Change. Considerable national progress has been made; the UK has reduced emissions by 40% since 1990, largely through decarbonisation of electricity supply and not through changes involving consumer behaviour¹⁷. Achieving economic growth and reducing carbon emissions go hand in hand; the UK has demonstrated absolute decoupling between 1985 and 2016, with GDP per head growing by 70.7% whilst CO₂ emissions fell by 34.2% at the same time¹⁸.

3. Scope of the climate emergency

We publicly recognise the climate crisis and we are committed to placing the mitigation of our carbon emissions as the cornerstone of our work. We have a shared moral responsibility and common endeavour to manage intergenerational equity; we cannot act alone. MRWA will take collaborative action with partners to contribute towards delivering a zero carbon Liverpool City Region. We will prioritise helping LCR adopt circular economy principles as a means of reducing carbon emissions, maximising resources and promoting social value, through initiatives including the LCR Circular Economy Club.

In the context of this report it is important to differentiate between zero carbon and net zero carbon; they are both blunt measures that signal climate commitment, but they are not interchangeable terms. To provide clarity, a rationale of achieving zero carbon dictates that no carbon emissions are acceptable. Zero carbon is quite different to the reality and achievability of net zero carbon. Setting a target of net zero carbon means that MRWA needs to balance CO₂e sequestration with CO₂e emissions, an approach that allows for offsetting of some activities.

In January 2020, to progress this agenda, MRWA established an internal Carbon Working Group, with the following objectives:

1. To lead by example on climate change action.
2. To agree a framework for carbon reporting with integration into the existing Environmental Management System.
3. To establish a quantified baseline carbon budget.
4. To report past performance, highlighting progress and achievements using agreed metrics (landfill reliance, contract implementation, demonstrable % reductions).

¹⁵ Zarnett, B. (2019). Climate change: Incrementalism is no longer a viable option. 8 July 2019. Retrieved 7/10/2019, <https://medium.com/swlh/climate-change-incrementalism-is-no-longer-a-viable-option-34bb9b0a2d82>.

¹⁶ Zenghelis, D. (2019). Securing decarbonisation and growth. National Institute Economic Review, 250, (1), R54-R60.

¹⁷ Carmichael, R. (2019). Behaviour change, public engagement and net zero. A report for the Committee on Climate Change by Imperial College London, October 2019. <https://www.theccc.org.uk/publication/behaviour-change-public-engagement-and-net-zero-imperial-college-london/>

¹⁸ Office for National Statistics (2019). The decoupling of economic growth from carbon emissions: UK evidence. 21 October 2019. London. <https://www.ons.gov.uk/economy/nationalaccounts/uksectoraccounts/compendium/economicreview/october2019/thedecouplingofeconomicgrowthfromcarbonemissionsukevidence>

5. To forecast future performance using agreed carbon budget metrics.
6. To prioritise carbon actions based on scale of impacts including CO₂e offsetting and mitigation.
7. To adopt a whole system approach with resilience to emerging legislative and policy intervention.
8. To advance wider LCR carbon initiatives by influencing and collaborating with others.

In reporting our carbon performance, we will ensure transparency and traceability of decision-making and data in the context of stated assumptions and uncertainties. This will enable others to understand the important factors.

Solely addressing greenhouse gas emissions does not fully address the parallel ecological urgency or recognise the contribution that natural capital (ecosystems) has in achieving net zero carbon. There are wider benefits that ecological restoration, natural systems and their role in carbon sequestration can bring at the local level.

The 2030 agenda for sustainable development¹⁹, adopted by all 193 UN Members States in 2015, produced a shared blueprint with a set of 17 Sustainable Development Goals (SDGs, otherwise known as Global Goals). Our core actions are framed against the SDGs and implementation will contribute towards meeting the following ones:

- **SDG 6 Clean Water and Sanitation** - Ensure availability and sustainable management of water and sanitation for all.
- **SDG 7 Affordable and Clean Energy** - Ensure access to affordable, reliable, sustainable and modern energy for all.
- **SDG 11 Sustainable Cities and Communities** - Make cities and human settlements inclusive, safe, resilient and sustainable.
- **SDG 12 Responsible Consumption and Production** - Ensure sustainable consumption and production patterns.
- **SDG13 Climate Action** - Take urgent action to combat climate change and its impacts.
- **SDG 15 Life on Land** - Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

4. Link to circular economy

MRWA is responsible for managing around 700,000 tonnes of waste per year from more than 600,000 households. How we manage household waste including food and packaging

¹⁹ United Nations General Assembly (2015). Transforming our world: The 2030 Agenda for Sustainable Development. A/RES/70/1, 21 October 2015. https://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E

has an important bearing on emissions²⁰. The 2018/19 recycling rate for LCR was 37.8%. At MRWA we understand the importance of upstream prevention of waste, the re-use and recycling of materials and products in achieving net zero carbon and zero waste by 2040 as well as the benefit of contributing to overall action on climate heating.

In 1999 the EU adopted the landfill directive to reduce the environmental impact of landfilling waste (Council of the European Union 1999), including measures for the first time to capture landfill gas to reduce emissions and their global warming potential. Targets were set to limit the amount of biodegradable municipal waste sent to landfill as a significant source of methane emissions to atmosphere. Part of the UK response included 'Waste Strategy 2000' which introduced statutory household waste recycling targets on Local Authorities (LAs) and other initiatives to divert waste from landfill. Future policy measures are likely to include a ban on biodegradable waste going to landfill by 2025²¹.

Many climate change responses primarily focus on emissions from energy and transport. Whilst this is a vital part of tackling climate heating we also need to consider the impact of our everyday products. Climate governance is inherently linked to wider sustainability principles, industrial strategy²² and as a catalyst for clean growth²³. The fifth carbon budget (2028-32) set by parliament recognises the 40% contribution that households make to UK emissions; by reducing and sorting waste better, household emissions could reduce by 0.25 tonnes CO₂ per year²⁴. There is an unequivocal link between climate change and circular economy; transition to renewable energy and energy efficiency improvements can address 55% of CO₂e emissions with the remaining 45% coming from producing cars, clothes, food, and other products²⁵. Transformational change in product design, manufacture and use to extend longevity and reduce emissions through the supply chain is vital.

Even with best available energy efficiency and zero carbon energy, by 2100 collectively we will still be exceeding our carbon budget for energy and industrial emissions²⁶. Natural resource extraction and processing make up approximately 50% of total greenhouse gas (GHG) emissions²⁷ and so improved resource efficiency is vital.

The potential carbon savings of different waste streams varies; Table 1 identifies obvious priority materials to target based on collected residual waste arisings in 2018/19. This is

²⁰ Milne, S., Chambers, K., Elks, S., et al. (2019). Living carbon free - Exploring what a net-zero target means for households. A report for the Committee on Climate Change by Energy Systems Catapult, May 2019. <https://www.theccc.org.uk/publication/living-carbon-free-energy-systems-catapult/>

²¹ Committee on Climate Change (2019). Reducing UK emissions: 2019 Progress Report to Parliament. 10 July 2019. London. <https://www.theccc.org.uk/publication/reducing-uk-emissions-2019-progress-report-to-parliament/>

²² Department for Business, Energy & Industrial Strategy (BEIS) (2017). Industrial strategy: Building a Britain fit for the future. White paper, Cm 9528, November 2017. <https://www.gov.uk/government/publications/industrial-strategy-building-a-britain-fit-for-the-future>

²³ Department for Business, Energy & Industrial Strategy (BEIS) (2017). The Clean Growth Strategy: Leading the way to a low carbon future. October 2017. London.

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/651916/BEIS_The_Clean_Growth_online_12.10.17.pdf

²⁴ Committee on Climate Change. (2016). Fifth carbon budget - Infographic. 20 July 2016. <https://www.theccc.org.uk/2016/07/20/fifth-carbon-budget-infographic/>.

²⁵ Ellen MacArthur Foundation (2019). Completing the picture: How the circular economy tackles climate change. 23 September 2019. https://www.ellenmacarthurfoundation.org/assets/downloads/publications/COMPLETING_THE_PICTURE_HOW_THE_CIRCULAR_ECONOMY_TACKLES_CLIMATE_CHANGE_V2_23_September.pdf, United Nations (2015). The Paris Agreement. https://unfccc.int/sites/default/files/english_paris_agreement.pdf

²⁶ Ellen MacArthur Foundation (2019). Completing the picture: How the circular economy tackles climate change. 23 September 2019. https://www.ellenmacarthurfoundation.org/assets/downloads/publications/COMPLETING_THE_PICTURE_HOW_THE_CIRCULAR_ECONOMY_TACKLES_CLIMATE_CHANGE_V2_23_September.pdf

²⁷ United Nations Environment Programme - International Resource Panel (IRP) (2019). Global resources outlook 2019: Natural resources for the future we want. Nairobi.

https://www.resourcepanel.org/sites/default/files/documents/document/media/unep_252_global_resource_outlook_2019_web.pdf

consistent with the setting of MRWA target materials based on the 2015 compositional analysis study.

Table 1 Selected priority waste streams from collected residual waste (2018/19) based on carbon intensity

Material	Estimated tonnage	Estimated proportion of total collected residual waste (%)
Food	135,288	39.0
Plastic	48,232	13.9
Textiles	16,270	4.7

Plastics are particularly challenging; usage in Europe has reached 100 kg per capita per annum²⁸ and two-thirds of UK plastic waste separated for recycling was traded abroad for processing in 2018²⁹ due to insufficient UK reprocessing capacity for some plastic types. There are export restrictions in place, for example through the UN Basel Convention, and industry has called for a complete ban on export of plastic waste³⁰. However, the food packaging and distribution system is premised on single use plastics³¹ for which there is currently no real market or reuse system. This means that some difficult to recycle plastics, such as polystyrene yoghurt pots, will continue to be part of the residual waste fraction for the foreseeable future. Government has resisted a complete export ban on plastic waste, although the 2019 Queen's Speech did announce a government intent to ban the export of plastic waste to non-OECD countries altogether³².

Improved understanding of waste arisings and carbon insight will be delivered by a 2020/21 waste compositional analysis project, Carbon Working Group and the zero waste strategy.

5. Land management and natural capital

Land is a critical natural asset and improved land use can help meet climate objectives³³. MRWA is responsible for a portfolio of seven closed landfill sites that predominantly received municipal solid waste, commercial and industrial waste. Landfill gas production has peaked at these sites and the utilisation period (using engines for renewable energy) has passed. The sites are now either reliant on passive landfill gas management systems to control residual gas production (methane oxidation) or in the process of transition towards being

²⁸ Material economics analysis for the Energy Transitions Commission (2018).

²⁹ McGlone, Conor (2019). Why calls for a plastic waste export ban have divided industry. ENDS Report, 7 Nov 2019 <https://www.endsreport.com/article/1665093/why-calls-plastic-waste-export-ban-divided-industry>

³⁰ Biffa (2019). Plastic surgery: Managing waste plastics. September 2019. https://www.biffa.co.uk/-/media/files/sustainability/biffa-plastic-surgery-managing-waste-plastic_reality-check-series_issue-4.ashx

³¹ Possible (2019). Ten bold ideas. Accelerating climate action in the 2020s. October 2019. London. <https://www.wearepossible.org/latest-news/ten-bold-ideas>

³² The Queen (2019). The Queen's Speech 2019 [with an introduction from the Prime Minister]. Prime Minister's Office, 10 Downing Street, London, 19 December 2019.

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/853886/Queen_s_Speech_December_2019_-_background_briefing_notes.pdf

³³ Committee on Climate Change (2018). Land use: Reducing emissions and preparing for climate change. November 2018. <https://www.theccc.org.uk/publication/land-use-reducing-emissions-and-preparing-for-climate-change/>

operated on a passive basis. The relative contribution of landfills to our climate emissions will be determined by the Carbon Working Group.

There are many options for carbon abatement within the technology landscape. Some technologies such as carbon capture and storage (CCS) are relatively unproven and are at the extreme scale of affordability³⁴. At the lower end of technology and investment, options including organic soil restoration, habitat restoration, afforestation, grassland management and improvement of degraded land are more readily utilised. It has been suggested that up to 1.5 million hectares of new woodland should be planted in the UK to sequester carbon by 2050 using available poor quality or non-agricultural land³⁵.

Soil is an important natural capital resource that holds three times as much carbon as the atmosphere, has absorptive capacity to reduce flood risk and is a habitat in its own right³⁶. In considering soil health and pressures on it, protection of soil biodiversity and ecological function is important and harm through poor soil management must be avoided.

Soil carbon sequestration is the process by which CO₂ is removed from the atmosphere. By changing land management practice, the carbon content of soil can be increased over timescales likely to be decadal³⁷. Considerations include vegetation, nutrient and animal management. The land application to soils of carbon-rich biochar derived from lignocellulosic biomass shows great promise in controlling odour, removing contaminants and mitigating fugitive emissions³⁸. MRWA will advocate and develop land carbon initiatives for managing 'negative' emissions as a natural climate solution (those emissions that cannot be eliminated entirely). In addition to the opportunity of utilising closed landfill site space, there is also the possibility of utilising marginal land adjacent to main infrastructure for carbon sequestration.

6. Behavioural change

The UK 40% reduction in emissions since 1990 has largely been achieved through decarbonisation of electricity supply from coal to renewables and not through changes involving consumer behaviour³⁹. Consumption is embedded in wider social, cultural, economic, and material systems that require shifts in behaviour, mainly in transport, heating and diet as being the largest contributors to household carbon footprints⁴⁰. Through consumption behaviour, it is estimated that households are responsible for 72% of global

³⁴ McKinsey & Company (2009). Pathways to a low-carbon economy: Version 2 of the Global greenhouse gas abatement cost curve. https://www.mckinsey.com/~media/mckinsey/dotcom/client_service/sustainability/cost%20curve%20pdfs/pathways_lowcarbon_economy_version2.ashx

³⁵ Committee on Climate Change (2018). Land Use: Reducing emissions and preparing for climate change. 15 November 2018. <https://www.theccc.org.uk/publication/land-use-reducing-emissions-and-preparing-for-climate-change/>

³⁶ Environment Agency (2019). The state of the environment: soil. June 2019. Bristol. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/805926/State_of_the_environment_soil_report.pdf

³⁷ Royal Society and Royal Academy of Engineering (2018). Greenhouse gas removal. September 2018. https://royalsociety.org/topics-policy/projects/greenhouse-gas-removal/?utm_source=royalsociety.org&utm_medium=redirect&utm_campaign=greenhouse-gas-removal

³⁸ Ding, Y., Xiong, J., Zhou, B., et al. (2019). Odor removal by and microbial community in the enhanced landfill cover materials containing biochar-added sludge compost under different operating parameters. *Waste Management*, 87, 679-690; Wong, J. T. F., Chen, X., Deng, W., et al. (2019). Effects of biochar on bacterial communities in a newly established landfill cover topsoil. *Journal of Environmental Management*, 236, 667-673; Zhang, C., Zeng, G., Huang, D., et al. (2019). Biochar for environmental management: Mitigating greenhouse gas emissions, contaminant treatment, and potential negative impacts. *Chemical Engineering Journal*, 373, 902-922.

³⁹ Carmichael, R. (2019). Behaviour change, public engagement and net zero. A report for the Committee on Climate Change by Imperial College London, October 2019. <https://www.theccc.org.uk/publication/behaviour-change-public-engagement-and-net-zero-imperial-college-london/>

⁴⁰ Druckman, A. and Jackson, T. (2016). Understanding households as drivers of carbon emissions. Chapter 9 in: *Taking Stock of Industrial Ecology*. R. Clift and A. Druckman. Cham, Springer International Publishing: 181-203.

GHG emissions⁴¹. Net zero targets are therefore an immense challenge for the whole of society⁴².

Through its Behaviour Change Programme, MRWA can play a significant role in changing consumer habits and other marginal incremental lifestyle choices by encouraging citizens to adopt the waste hierarchy and support Liverpool City Region transition to a Circular Economy.

7. Our response so far

In the early 2000s MRWA and its partner Liverpool City Region (LCR) Districts took action to improve and invest in new recycling and waste treatment collections and infrastructure to divert more waste from landfill and reduce associated GHG emissions. MRWA's Bidston facility was re-developed in 2004 and completed in 2005/06, including opening of a Materials Recovery Facility (MRF) to facilitate the introduction of Wirral's kerbside co-mingled recycling service and improve the borough's recycling performance.

Further investment to divert waste from landfill and reduce GHG emissions was delivered through a long-term procurement that launched in 2006. This led to a new Waste Management and Recycling Contract (WMRC) signed in May 2009 with Veolia and the opening of MRWA's second Materials Recovery Facility (MRF) in June 2012 at Gilmoor. Across Merseyside, the overall recycling rate achieved a peak of 41.9% in 2014/15 before consistently declining to 37.8% in 2018/19. The majority of English regions experienced a decline in household recycling rates over a same period with around half local authorities showing a downwards trend in recycling % from 2011/12 to 2016/17⁴³.

The main waste treatment technologies utilised during the last five years are shown in Figure 1 along with overall recycling rate in the context of an EU recycling target of 50% by 2020.

⁴¹ Dubois, G., Sovacool, B., Aall, C., et al. (2019). It starts at home? Climate policies targeting household consumption and behavioral decisions are key to low-carbon futures. *Energy Research & Social Science*, 52, 144-158.

⁴² Department for Environment, Food & Rural Affairs (Defra), and Department for Business, Energy & Industrial Strategy (BEIS) (2019). *Leading on clean growth: Government response to the Committee on Climate Change 2019 progress report to Parliament - Reducing UK emissions*. 15 October 2019. London. <https://www.gov.uk/government/publications/committee-on-climate-changes-2019-progress-reports-government-responses>

⁴³ Department for Environment, Food & Rural Affairs (Defra) (2019). *ENV18 - Local authority collected waste: annual results tables*. Last updated 28 November 2019. <https://www.gov.uk/government/statistical-data-sets/env18-local-authority-collected-waste-annual-results-tables>

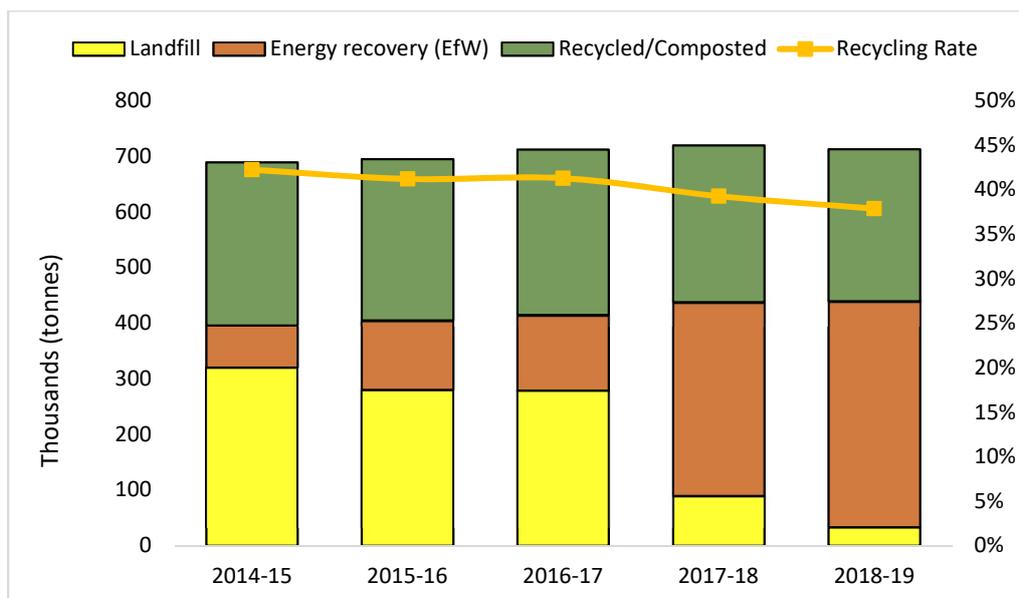


Figure 1 Waste treatment methods and recycling rate from 2014/15

The procurement of new contracts delivered an Energy from Waste (EfW) facility to divert the majority of household residual waste from landfill to energy recovery. The Resource Recovery Contract (RRC) with MERL (Suez as the operator) was signed in December 2013 with the Wilton EfW facility and Kirkby Rail Transfer Loading Station (RTLS) becoming fully operational in September 2017. The Wilton facility has already resulted in a significant emissions reduction; the WRATE tool estimated an annual carbon saving of 273,073 tonnes CO₂e between 2013/14 and 2018/19 as well as producing enough energy to power 54,971 homes. The EfW is a volume reduction process; it converts approximately 20-25% of waste input mass to incinerator bottom ash, all of which is recycled from Wilton, including metals that fall through the grate. Around another 2-5% of input mass is converted to air pollution control residue (APCr) through flue gas treatment. APCr is a hazardous waste that goes to landfill; this is a necessary component for any EfW system to comply with the EU Waste Incineration Directive emissions standard.

Waste sources are presented in Figure 2. This illustrates the important relationship between the EfW in managing residual waste and dry recycling and composting technology for resource recovery. Figure 2 also demonstrates the tremendous opportunity for increasing reuse as we develop our understanding of waste streams through the waste compositional analysis study.

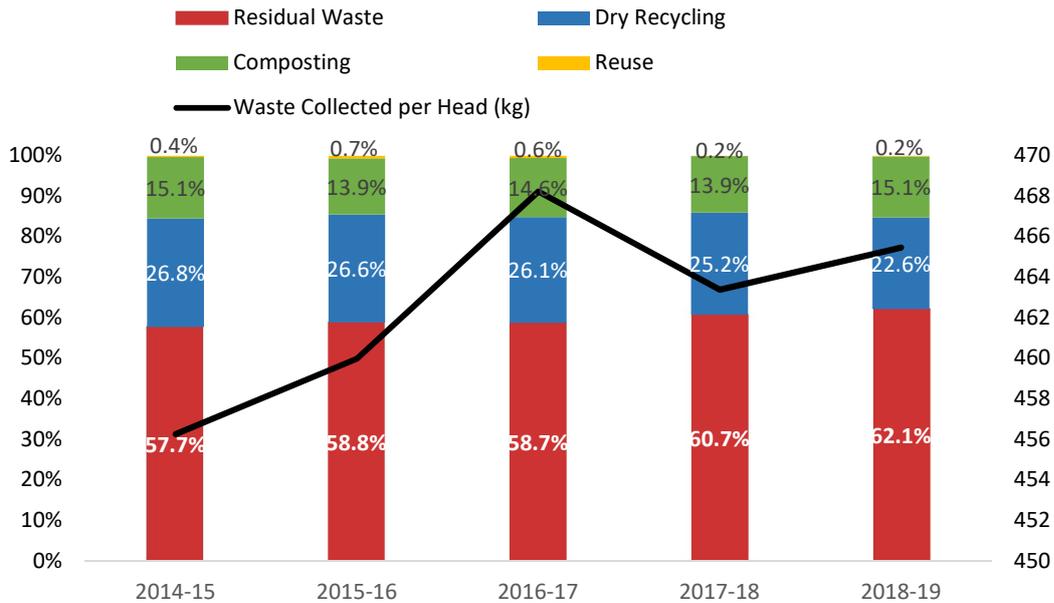


Figure 2 Waste sources and waste collected per head from 2014/15

Another aspect of improving MRWA’s recycling infrastructure has included the building of new Household Waste Recycling Centres (HWRCs), including Old Swan in December 2015, and re-development of existing HWRCs including Kirkby (May 2012), Huyton (July 2012) and Ravenhead (March 2014). These investments have supported increased reuse and recycling capacity and further reductions in GHG emissions. The HWRC programme has won awards and recognition from CEEQUAL for the sustainable construction techniques and features, including rainwater harvesting, on-site renewable energy and reuse of materials in construction. MRWA limits emissions further through its management of seven closed landfills and ISO 14001 accredited Environmental Management System.

The main materials derived from HWRCs are shown in Figure 3. This information is being used to identify opportunities for further recovery and reuse in negotiation with our contractor.

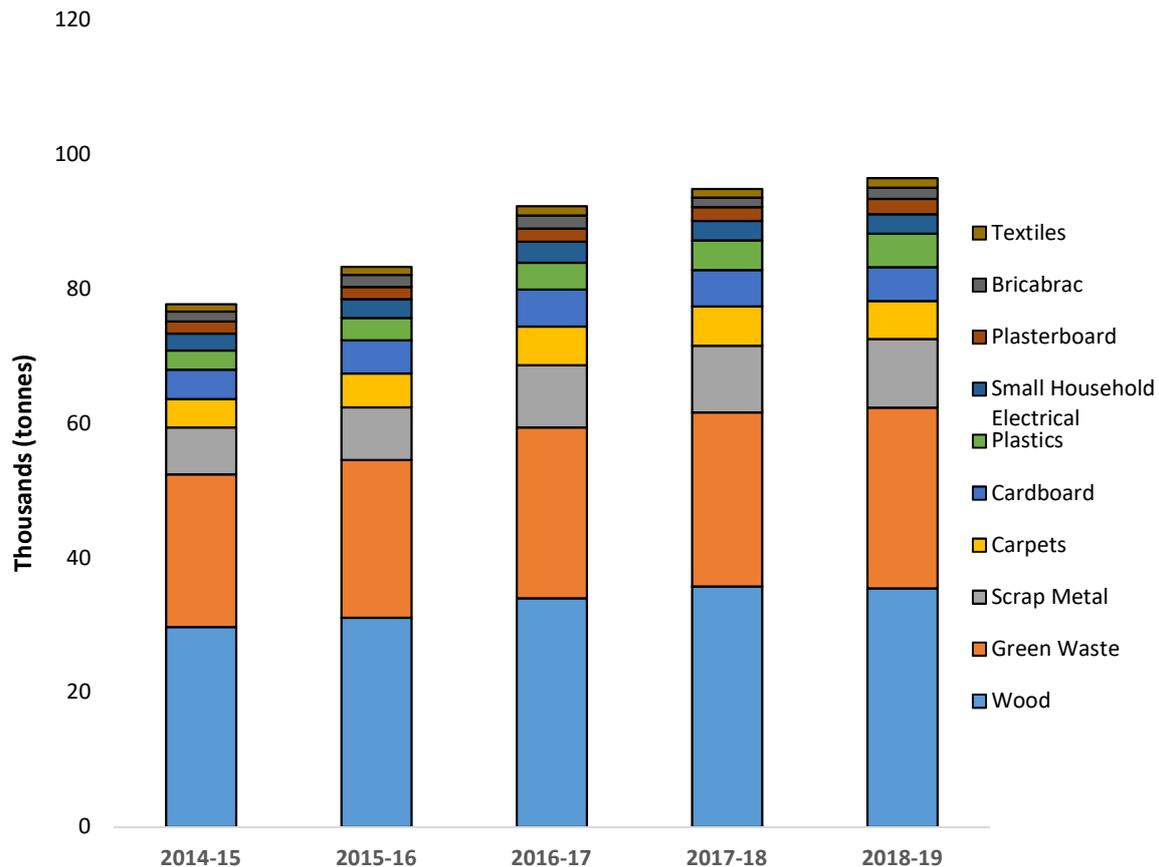


Figure 3 HWRC materials 2014/15 - 2018/19

Alongside physical infrastructure, MRWA has led the City Region's strategic and behavioural change response to reducing waste and its associated climate heating. Working with its partners MRWA led on the region's first waste strategy (2005) to coordinate action to move waste up the waste hierarchy towards prevention, reuse, recycling and reduced GHG emissions. The most recent strategy, 'Resources Merseyside' was published in 2012.

In order to contribute to improving the static national recycling rate, the introduction of separate weekly food waste collection by LAs is likely to be mandatory by 2023⁴⁴. During 2019/20, MRWA is working with the districts to scope a district-wide food waste collection scheme including an estimate of carbon savings. Approximately 14% of all food purchased in the UK is thrown away⁴⁵ and an estimated 135,000 tonnes of food waste was collected from residual bins in Merseyside and Halton during 2018/19 (39% of total tonnage) so this collection scheme could bring significant benefits from any subsequent treatment system.

An ambitious new waste strategy will focus on achieving zero waste by 2040 and mirroring the city region's 2040 net zero carbon emissions objective. MRWA is a signatory of national commitments targeting reduced emissions, including the three Courtauld Commitments to

⁴⁴ HM Government (2018). Our waste, our resources: A strategy for England. Defra, Resources & Waste Strategy Team, PB 14552, 18 December 2018. London. <https://www.gov.uk/government/publications/resources-and-waste-strategy-for-england>

⁴⁵ Carmichael, R. (2019). Behaviour change, public engagement and net zero. A report for the Committee on Climate Change by Imperial College London, October 2019. <https://www.theccc.org.uk/publication/behaviour-change-public-engagement-and-net-zero-imperial-college-london/>

improve resource efficiency and reduce waste in the grocery sector (since 2005) and the Nottingham Declaration on Climate Change (signed in 2008).

Annual carbon performance of the WMRC contract over the last decade is shown in Figure 4, based on annual WRATE⁴⁶ data and accounting for transport, facilities, recycling, treatment/recovery and landfill (i.e. excluding rail transfer and RRC contract elements). For the four years 2009/10 to 2012/13 inclusive, CO₂e emissions were 267,556 tonnes before carbon neutrality was reached during 2013/14. The contract then started delivering a considerable carbon saving compared to landfill.

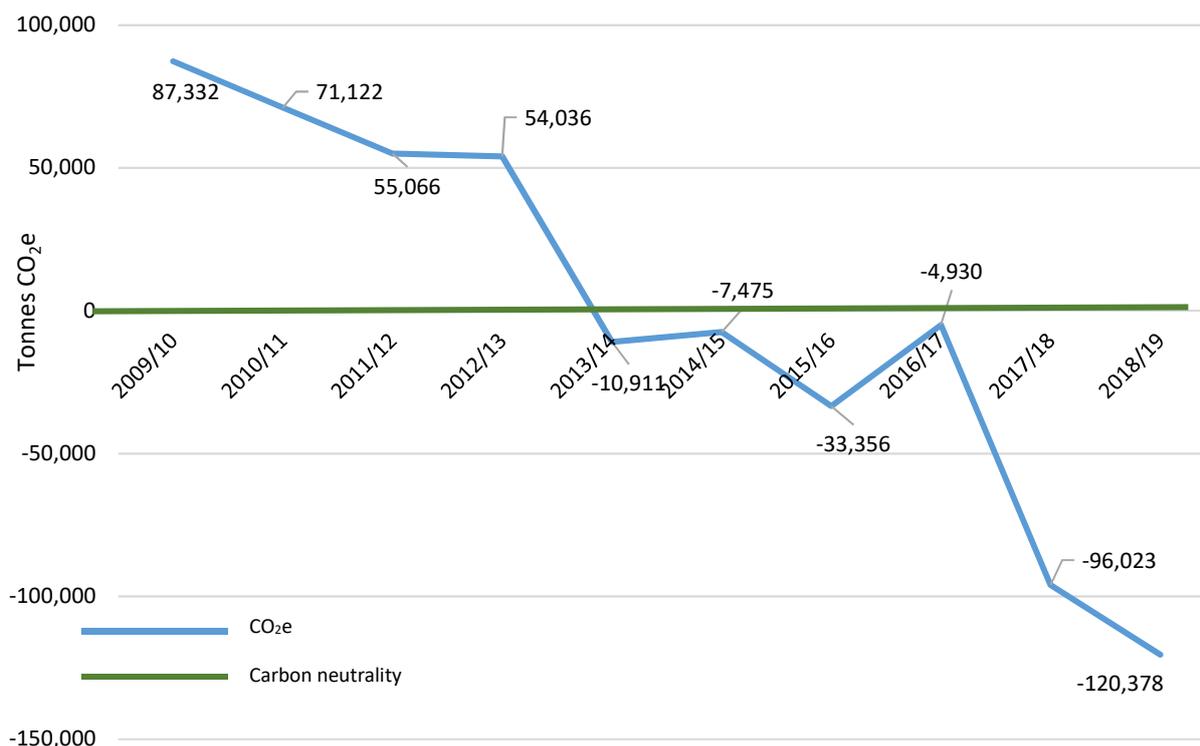


Figure 4 Annual WMRC carbon performance 2009/10 - 2018/19

Despite making good progress in carbon savings achieved through contractual changes, recycling and EfW are not the only ways to reduce CO₂e and conserve resources. In accordance with the principles of the waste hierarchy (Council of the European Communities 1975), MRWA places the greatest priority on waste prevention and reuse and these areas are where MRWA can make further gains. MRWA has delivered a wide range of activities under its waste strategies with a strong focus on waste prevention, reuse and achieving more and higher quality recycling. Campaigns, including 'Love Food Hate Waste' and 'Pass It On', have supported residents to prevent avoidable food waste and reuse unwanted clothing. In 2018, MRWA launched the 'Recycle Right' behavioural change campaign to reduce contamination of recycling collections from difficult to recycle materials. By improving recycling efforts, the city region can reduce the quantity of waste requiring residual treatment or disposal and reduce associated GHG emissions.

⁴⁶ <http://www.wrate.co.uk/>

MRWA and Veolia's Community Fund has continued to expand in value and impact over the last decade. The emphasis is on waste prevention, reuse and recycling. During the five years 2014/15 to 2018/19, sixty projects delivered 4,079 tonnes of disposal diversion with an estimated saving of 5,252 tonnes CO₂e.

During 2018/19, fourteen Community Fund projects shared grants worth £115,000 achieving a disposal diversion of 673 tonnes materials with an estimated saving of 1,419 tonnes CO₂e. The projects focused on food waste prevention, furniture and textiles reuse and repair. Beyond these metrics, the fund has facilitated local, grassroots community action to improve the environment, change lives and empower and inspire families, friends, schoolchildren and neighbours to take positive action to reduce waste and carbon emissions across the city region for the benefit of us all. In 2018/19, social value was reported for the first time with an estimated total value of £609,589 for all projects.

8. Commitments and core actions

In order to deliver our corporate plan we have developed a range of initial themed core actions within key areas. These core actions are shown in Table 2 with identified theme, link to SDGs and MRWA teams, partners and stakeholders.

Each of the themed core actions will collectively deliver the greatest initial benefits in tackling climate change, meeting our corporate aims and contributing towards specific SDGs. Actions will be refined as our understanding of carbon performance develops and is progressed through the Carbon Working Group. In planning all our core actions, delivery is expected to be in the short-to medium-term, indicatively defined as 12 months to 3 years.

Some of the actions that we seek are more challenging to deliver. In particular, landfill avoidance as EfW contingency requires careful consideration due to associated train impacts. This is constrained by few current local alternatives to landfill with capacity available for the volumes of waste generated in Merseyside during a contingency period. Investment to increase EfW capacity using alternative EfW plants relatively local to Wilton is being considered by Suez nationally but is likely to take considerably longer than 3 years. Where possible, outputs and timescales for identified core actions are included in Table 2.

In addition to our core actions, MRWA has immediate commitments for 2020/21:

- Review relevant internal policies and strategies to ensure that circular economy and net zero carbon principles are embedded and consistent;
- Complete a mid-term (10 year) WMRC contract review for future-proofing as we transition to a circular economy;
- Adopt full green procurement to minimise environmental impacts considering the whole supply chain and including end of life;
- Ensure circular economy and net zero carbon are embedded in our education and campaigns programmes;
- Continue to promote community reuse activities through the Community Fund;
- Work with partners to influence wider LCR climate and circular economy initiatives including leading the LCR Circular Economy Club and participating in the Good Business Festival; and
- Identify external funding opportunities for waste and carbon reduction.

The health and wellbeing benefits of our actions will be promoted through social media channels, annual reporting and media releases to help us deliver wider social and economic value.

Table 2 Initial core aims contributing towards achieving net zero carbon by 2040

Theme Action	SDG	Partners /stakeholders/ MRWA team
<p>Carbon performance</p> <ul style="list-style-type: none"> • Develop climate metrics • Establish CO₂e baseline for the whole waste system, consistent with EMS integration. • Derive ambitious carbon targets for reaching net zero by 2040. <p>Output: Report by 31 December 2020.</p>	 	<p>MRWA Strategy MRWA Data MRWA Estates MRWA Contracts MRWA Business Services Veolia Suez Districts</p>
<p>Energy conservation, consumption and production</p> <ul style="list-style-type: none"> • Identify opportunities for extending solar panel use across our portfolio of sites Output: Scoping report by 31 March 2020. • Determine whether or not actual contractual supply as renewables only is in place. Discussions are ongoing. Actual MRWA consumption is not currently possible as consumption is not separately metered. • Active leachate management is required at our closed landfill sites; volumes of leachate requiring pumped extraction are dependent on rainfall and can be influenced by groundwater ingress. Electricity consumption is constantly monitored (with improvements made during the last 6 years) and renewable source provision reviewed periodically. Output: Report electricity reductions relative to leachate volumes (m³) to demonstrate reduced consumption. 	  	<p>MRWA Estates MRWA Strategy MRWA Contracts Veolia Mann Island Facilities Management</p>
<p>Landfill avoidance</p> <ul style="list-style-type: none"> • Negotiate the removal of landfill as the EfW contingency default for planned and emergency downtime. 	 	<p>MRWA Contracts Suez</p>

Theme Action	SDG	Partners /stakeholders/ MRWA team
<p>Food waste collection</p> <ul style="list-style-type: none"> Scope a district-wide system including estimated carbon benefits. <p>Output: Report to Members 7 February 2020.</p>	  	<p>MRWA Finance Director MRWA Strategy MRWA Contracts MRWA Data MRWA Estates Districts (Senior Officers Working Group)</p>
<p>Closed landfill management - Carbon sequestration</p> <ul style="list-style-type: none"> Deliver a pilot carbon sequestration project as a woodland and sink meadow at Foul Lane former landfill, Southport. Pre-planning application made, planting to be complete within an estimated 5 years. The carbon benefit is likely to be decadal; biodiversity gains are more immediate. 	  	<p>MRWA Estates Mersey Forest MRWA Strategy</p>
<p>Closed landfill management - Gas control</p> <ul style="list-style-type: none"> Adopt passive methane oxidation with monitoring at closed landfill sites to control residual gas production and minimise methane emissions to atmosphere. In the first instance a rationale is being developed for Bidston Moss former landfill to move to passive oxidation from intermittent flaring; this includes a review of landfill gas data and soil properties to determine suitability for methane oxidation. <p>Output: Rationale report by 29 February 2020.</p>	 	<p>MRWA Estates MRWA Strategy</p>
<p>Reuse and waste prevention</p> <ul style="list-style-type: none"> Work with our contractor to explore further reuse opportunities at HWRCs. Reduce amount of residual waste and increase recycling rates, largely through the Behavioural Change Campaign and targeted education programmes. Develop a business case for a reuse co-operative and scope opportunities to promote community sharing and reuse initiatives such as swap shops, repair cafes, refill networks and community fridges. 	  	<p>MRWA Contracts MRWA Strategy MRWA Business Services Districts Veolia</p>

Theme Action	SDG	Partners /stakeholders/ MRWA team
<p>Waste stream and waste treatment impacts</p> <p>The compositional analysis study will be used to:</p> <ul style="list-style-type: none"> Identify the carbon impact of different waste stream and treatment methods (including waste collection) Identify future priority materials. <p>Output: Report by 31 March 2021. Timescales are dependent on 2 or 4 season compositional analysis.</p>	 	<p>MRWA Strategy MRWA Data MRWA Estates MRWA Contracts Veolia Suez Districts</p>
<p>Transport emissions</p> <ul style="list-style-type: none"> Feasibility of implementing e-mobility by replacing MRWA vans has been scoped with timing for implementation delayed for the foreseeable future based on cost benefit. <p>Output: Scope installation of charging points as a first step.</p>	 	<p>MRWA Estates</p>

9. Summary

Responding to climate change by pledging and meeting net zero commitments and zero waste aspirations will be a defining challenge of the present generation. By implementing our proposed core actions, MRWA can play a crucial role in delivering this as we seek to further understand our carbon performance as an immediate priority.

Demonstrable progress has been made in reducing our carbon emissions. Between 2009/10 and 2012/13 CO₂e emissions were 267,556 tonnes before contract changes started delivering a considerable carbon saving of 273,073 tonnes from 2013-14 to 2018/19.

We now seek to develop our understanding and gain a comprehensive picture of carbon across the entire waste system including collections. Once we have measured our CO₂e baseline, consistent with EMS integration, we will identify further priorities and actions.

Appendix 1 References

- Betts, P. (2019). Chair's summary report of the International Advisory Group to the Committee on Climate Change in relation to its work on the UK's long-term emissions goal. <https://www.theccc.org.uk/wp-content/uploads/2019/05/International-Net-Zero-Advisory-Group-Chair-Report.pdf>
- Biffa (2019). Plastic surgery: Managing waste plastics. September 2019. Plastic surgery: Managing waste plastics. October 2019
- Carmichael, R. (2019). Behaviour change, public engagement and net zero. A report for the Committee on Climate Change by Imperial College London, October 2019. <https://www.theccc.org.uk/publication/behaviour-change-public-engagement-and-net-zero-imperial-college-london/>
- Committee on Climate Change (2016). Fifth carbon budget - Infographic. 20 July 2016. <https://www.theccc.org.uk/2016/07/20/fifth-carbon-budget-infographic/>.
- Committee on Climate Change (2018). Land Use: Reducing emissions and preparing for climate change. 15 November 2018. <https://www.theccc.org.uk/publication/land-use-reducing-emissions-and-preparing-for-climate-change/>
- Committee on Climate Change (2019). Reducing UK emissions: 2019 Progress Report to Parliament. 10 July 2019. London. <https://www.theccc.org.uk/publication/reducing-uk-emissions-2019-progress-report-to-parliament/>
- Council of the European Communities (1975). Council Directive 75/442/EEC of 15 July 1975 on waste (Framework Directive on Waste, 1975). Official Journal L 194, pp0039-0041.
- Council of the European Union (1999). Directive 1999/31/EC on the Landfill of Waste. Official Journal of the European Communities, L 182, 1-19.
- Department for Business, Energy & Industrial Strategy (BEIS) (2017). The Clean Growth strategy: Leading the way to a low carbon future. October 2017. London. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/651916/BEIS_The_Clean_Growth_online_12.10.17.pdf
- Department for Business, Energy & Industrial Strategy (BEIS) (2017). Industrial strategy: Building a Britain fit for the future. White paper, Cm 9528, November 2017. <https://www.gov.uk/government/publications/industrial-strategy-building-a-britain-fit-for-the-future>
- Department for Environment, Food & Rural Affairs (Defra) (2019). ENV18 - Local authority collected waste: annual results tables. Last updated 28 November 2019. <https://www.gov.uk/government/statistical-data-sets/env18-local-authority-collected-waste-annual-results-tables>
- Department for Environment, Food & Rural Affairs (Defra), and Department for Business, Energy & Industrial Strategy (BEIS) (2019). Leading on clean growth: Government response to the Committee on Climate Change 2019 progress report to Parliament - Reducing UK emissions. 15 October 2019. London. <https://www.gov.uk/government/publications/committee-on-climate-changes-2019-progress-reports-government-responses>
- Ding, Y., Xiong, J., Zhou, B., et al. (2019). Odor removal by and microbial community in the enhanced landfill cover materials containing biochar-added sludge compost under different operating parameters. Waste Management, 87, 679-690.

- Druckman, A. and Jackson, T. (2016). Understanding households as drivers of carbon emissions. Chapter 9 in: Taking Stock of Industrial Ecology. R. Clift and A. Druckman. Cham, Springer International Publishing: 181-203.
- Dubois, G., Sovacool, B., Aall, C., et al. (2019). It starts at home? Climate policies targeting household consumption and behavioral decisions are key to low-carbon futures. *Energy Research & Social Science*, 52, 144-158.
- Ellen MacArthur Foundation (2019). Completing the picture: How the circular economy tackles climate change. 23 September 2019. https://www.ellenmacarthurfoundation.org/assets/downloads/publications/COMPLETING_THE_PICTURE_HOW_THE_CIRCULAR_ECONOMY-TACKLES_CLIMATE_CHANGE_V2_23_September.pdf
- Environment Agency (2019). The state of the environment: soil. June 2019. Bristol. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/805926/State_of_the_environment_soil_report.pdf
- Friedlingstein, P., Jones, M. W., O'Sullivan, M., et al. (2019). Global carbon budget 2019. *Earth System Science Data*, 11, (4), 1783-1838.
- HM Government (2018). Our waste, our resources: A strategy for England. Defra, Resources & Waste Strategy Team, PB 14552, 18 December 2018. London. <https://www.gov.uk/government/publications/resources-and-waste-strategy-for-england>
- Howard Boyd, E. (2019). The new normal: Leadership in the climate crisis. Speech by Chair of the Environment Agency and UK Commissioner to the Global Commission on Adaptation. RSA President's Lecture 2019, 31 October 2019. <https://www.gov.uk/government/speeches/the-new-normal-leadership-in-the-climate-crisis>
- Intergovernmental Panel on Climate Change (2018). Global Warming of 1.5 °C: An IPCC special report on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty. <http://www.ipcc.ch/report/sr15/>
- Jennings, P. D. and Hoffman, A. J. (In press). Three paradoxes of climate truth for the anthropocene social scientist. *Organization & Environment*.
- Kuriakose, J., Jones, C., Anderson, K., et al. (2019). Setting climate commitments for Liverpool City Region: Quantifying the implications of the United Nations Paris Agreement for Liverpool City Region. The University of Manchester, Tyndall Centre, October 2019. <https://carbonbudget.manchester.ac.uk/reports/combined/>
- McKinsey & Company (2009). Pathways to a low-carbon economy: Version 2 of the Global greenhouse gas abatement cost curve. https://www.mckinsey.com/~media/mckinsey/dotcom/client_service/sustainability/cost%20curve%20pdfs/pathways_lowcarbon_economy_version2.ashx
- Mi, Z., Guan, D., Liu, Z., et al. (2019). Cities: The core of climate change mitigation. *Journal of Cleaner Production*, 207, 582-589.
- Milne, S., Chambers, K., Elks, S., et al. (2019). Living carbon free - Exploring what a net-zero target means for households. A report for the Committee on Climate Change by Energy Systems Catapult, May 2019. <https://www.theccc.org.uk/publication/living-carbon-free-energy-systems-catapult/>
- Office for National Statistics (2019). The decoupling of economic growth from carbon emissions: UK evidence. 21 October 2019. London.

<https://www.ons.gov.uk/economy/nationalaccounts/uksectoraccounts/compendium/economicreview/october2019/thedecouplingofeconomicgrowthfromcarbonemissionsukevidence>

Possible (2019). Ten bold ideas. Accelerating climate action in the 2020s. October 2019. London. <https://www.wearepossible.org/latest-news/ten-bold-ideas>

Royal Society and Royal Academy of Engineering (2018). Greenhouse gas removal. September 2018. https://royalsociety.org/topics-policy/projects/greenhouse-gas-removal/?utm_source=royalsociety.org&utm_medium=redirect&utm_campaign=greenhouse-gas-removal

Shukman, David (2020). Sir David Attenborough warns of climate 'crisis moment'. 16 January 2020. <https://www.bbc.co.uk/news/amp/science-environment-51123638>

Statutory Instrument 2019 No. 1056 (2019). The Climate Change Act 2008 (2050 Target Amendment) Order 2019. London, The Stationery Office. http://www.legislation.gov.uk/ukxi/2019/1056/pdfs/ukxi_20191056_en.pdf

The Queen (2019). The Queen's Speech 2019 [with an introduction from the Prime Minister]. Prime Minister's Office, 10 Downing Street, London, 19 December 2019. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/853886/Queen_s_Speech_December_2019_-_background_briefing_notes.pdf

United Nations (2015). The Paris Agreement. https://unfccc.int/sites/default/files/english_paris_agreement.pdf

United Nations Environment Programme - International Resource Panel (IRP) (2019). Global resources outlook 2019: Natural resources for the future we want. Nairobi. https://www.resourcepanel.org/sites/default/files/documents/document/media/unep_252_global_resource_outlook_2019_web.pdf

United Nations General Assembly (2015). Transforming our world: The 2030 Agenda for Sustainable Development. A/RES/70/1, 21 October 2015. https://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E

Vidal, J. (2019). The climate crisis in 2050: What happens if cities act but nations don't? The Guardian, 10 October 2019. <https://www.theguardian.com/cities/2019/oct/10/the-climate-crisis-in-2050-what-happens-if-cities-act-but-nations-dont>

Wiseman, J. (2018). The great energy transition of the 21st century: The 2050 zero-carbon world oration. Energy Research & Social Science, 35, 227-232.

Wong, J. T. F., Chen, X., Deng, W., et al. (2019). Effects of biochar on bacterial communities in a newly established landfill cover topsoil. Journal of Environmental Management, 236, 667-673.

World Economic Forum (2019). The global risks report 2019. 14th edition, 15 January 2019. http://www3.weforum.org/docs/WEF_Global_Risks_Report_2019.pdf

World Economic Forum (2020). Cutting out carbon: 5 environmental laws coming into effect in 2020. 3 January 2020. <https://www.weforum.org/agenda/2020/01/green-laws-environment-2020>

Zarnett, B. (2019). Climate change: Incrementalism is no longer a viable option. 8 July 2019. Retrieved 7/10/2019, <https://medium.com/swlh/climate-change-incrementalism-is-no-longer-a-viable-option-34bb9b0a2d82>.

Zenghelis, D. (2019). Securing decarbonisation and growth. National Institute Economic Review, 250, (1), R54-R60.

Zhang, C., Zeng, G., Huang, D., et al. (2019). Biochar for environmental management: Mitigating greenhouse gas emissions, contaminant treatment, and potential negative impacts. *Chemical Engineering Journal*, 373, 902-922.