TOWARDS A CIRCULAR ECONOMY FOR ELECTRONIC AND ELECTRICAL EQUIPMENT: Building the data and evidence for systemic interventions

July 2026

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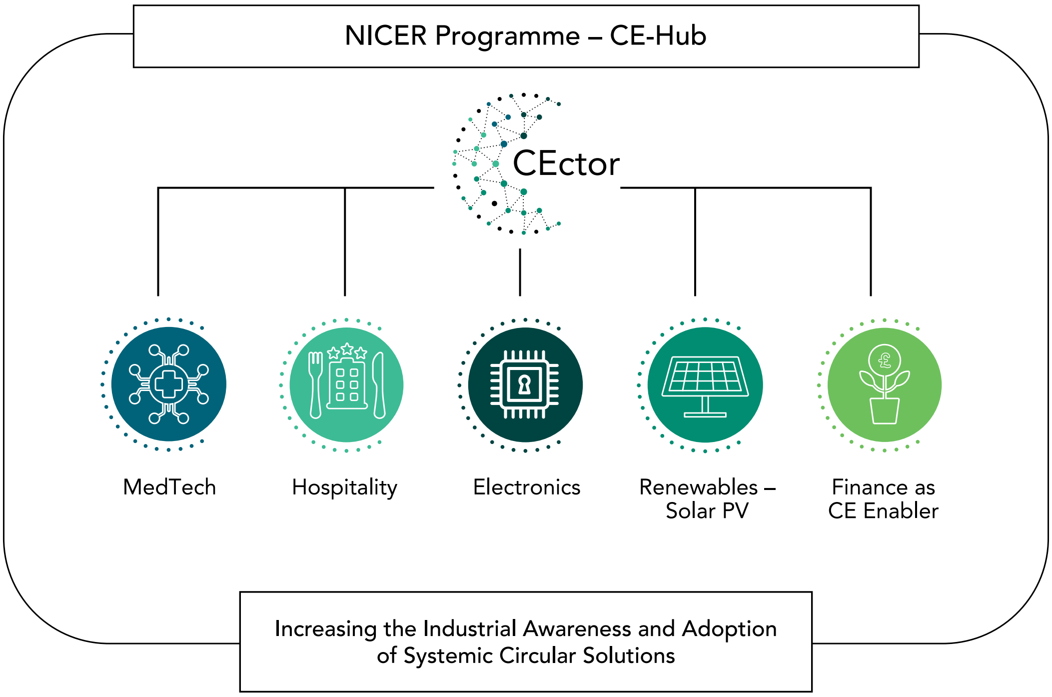
CEctor Accelerating CE Impact
CE-HUB UKRI National Interdisciplinary Circular Economy Research
NICER PROGRAMME
UK Research and Innovation
DICE NETWORK+ Digital Innovation & Circular Economy
Engineering and Physical Sciences Research Council

Contents

Executive summary

This report integrates work from the CE-Hub CEctor project undertaken as part of the UKRI-funded National Interdisciplinary CE Research programme (NICER) and the EPSRC-funded Digital Innovation and Circular Economy (DICE) Network+. The project aims to address the key barriers and potential enabling mechanisms to increase the adoption and implementation of circular economy (CE) across key sectors and applications in the UK.



Citation: *Lysaght, O., Thorman, D., Hopkinson, P., Charnley, F., Zils, M., Bermudez, D., (2026).* TOWARDS A CIRCULAR ECONOMY FOR ELECTRONIC AND ELECTRICAL EQUIPMENT: BUILDING THE DATA AND EVIDENCE FOR SYSTEMIC INTERVENTIONS, Exeter Centre for Circular Economy (ECCE).

Approach

This report utilises a CE framework and data methodology developed through the UKRI NICER CE-Hub Circular Economy Data Observatory to quantify stocks and flows of electrical and electronic equipment (EEE) and waste electrical and electronic equipment (WEEE) from official statistics and peer-reviewed literature as a baseline for future modelling of potential CE interventions, alongside an assessment of structural barriers and enablers to prospective circular economy (CE) adoption.

Barriers are things that restrain change towards a particular outcome. Barriers can represent elements of the status quo which if not managed, can delay or limit change, in some cases indefinitely (OECD, 2009).

The report presents several of the key barriers and enablers affecting the EEE/WEEE value chain based on stakeholder interviews.

The evidence shows that the UK is characterised by high and persistent levels of EEE consumption and WEEE generation, with approximately 1.86 million tonnes of EEE placed on the market annually (26.9 kg per capita) and WEEE generation estimated at 1.65 million tonnes (24.5 kg per capita). However, formal collection systems capture only ~500 kt per year, implying that only around one third of total WEEE is managed through regulated channels. Data from Approved Authorised Treatment Facilities (AATFs) show that reported reuse has declined over time, from 49 kt in 2011 to 10 kt in 2024 or less than 1% of WEEE generation in the period.

Significant material leakage occurs across the system, including:

- diversion to scrap metal recycling streams (approx. 300–400 kt annually),
- entry into residual waste streams (100–370 kt),
- and exports, including unregulated flows (~30 kt estimated illegal exports).

While reuse, repair, and refurbishment activities exist and contribute measurable economic value (e.g. £1.95 billion GVA in repair sectors), they remain marginal relative to overall throughput and are poorly captured in official datasets.

The system therefore retains strong characteristics of a linear economy, with:

- plateauing collection rates,
- low levels of product life extension,
- dominance of low-value material recovery,
- and weak visibility of reverse flows.

The report identifies systemic barriers across business models, consumer behaviour, and policy frameworks, including misaligned incentives, regulatory lag, fragmented data, and limited economic viability of circular activities.

To address these challenges, the report highlights the need for:

- a unified national data infrastructure to track material flows and behaviours especially in the use and life extension phase
- stronger policy alignment across design, use, and end-of-life stages,
- improved consumer information and rights utilisation,
- and targeted interventions to extend product lifetimes and increase value retention.

Overall, the findings provide a baseline as a reference point for coordinated action and orchestration across data, policy, markets, and behaviour.

Introduction

Context

At present the UK lacks a unified data infrastructure that captures traceable and verifiable information across the full material lifecycle for electronics from extraction and production to reuse, recycling, and disposal. The absence of such a system makes it harder to design timely, evidence-based policies, plan strategic investments, and maintain public accountability. The benefits of addressing this gap include faster response to emerging challenges, more efficient resource use, and improved confidence in circular economy (CE) interventions.

The Exeter Centre for Circular Economy (ECCE) is a leader in developing new methods to model material stocks, flows and economic value for CE policy and industry use. Since 2020, this work has focused on establishing a national framework to support CE policy modelling and value estimation. This research underpinned UKRI and Defra funding for the NICER CE-Hub, which led to the development of the Circular Economy Data Observatory (CE-DO). The CE-DO is designed to meet policy and industry needs by providing an integrated, transparent platform that supports coordinated action across sectors.

This spotlight report provides an overview of the stocks and flows of EEE and WEEE within the UK economy, drawing on and diverse data sources. These are framed within a three-stage circular economy framework (inflow, use and outflow stages) applied consistently across previous spotlight reports, which underpins the overall philosophy and theory of change behind the CE-DO (see next section). The report also summarises key barriers and enablers identified from the literature and through stakeholder engagement, highlighting the many challenges that need to be addressed to influence both the growing volume of Electrical and Electronic Equipment (EEE) placed on the market (POM) and management of Waste Electrical and Electronic Equipment (WEEE). The final section outlines key enablers and recommendations for future policy, regulation, and data infrastructure development.

Foundations of a Circular Economy

Guiding principles

While there are many definitions of CE, the majority are underpinned by a set of core principles, originating from the work of the Ellen MacArthur Foundation (EMF). Four of the core guiding principles are:

- **Eliminate** waste and pollution (through design),
- **Circulate** materials and products at their highest value for as long as possible,
- **Regenerate** natural capital,
- **An economy run on renewable energy.**

Beyond these guiding principles the CE concept has been subject to many diverse debates by multiple authors and organisations, often interpreted and presented as being a slightly enhanced form of recycling. As Figure 1 shows however, a CE is more than just improved recycling, which only reduces the rate of resource consumption and should be a last resort after other strategies have been exhausted. Rather, a truly CE conserves, rebuilds and maintains stocks of natural, social and manufactured capital, promoting higher quality and purity of stocks and flows of materials, components and products for repeated life cycles and cascades.

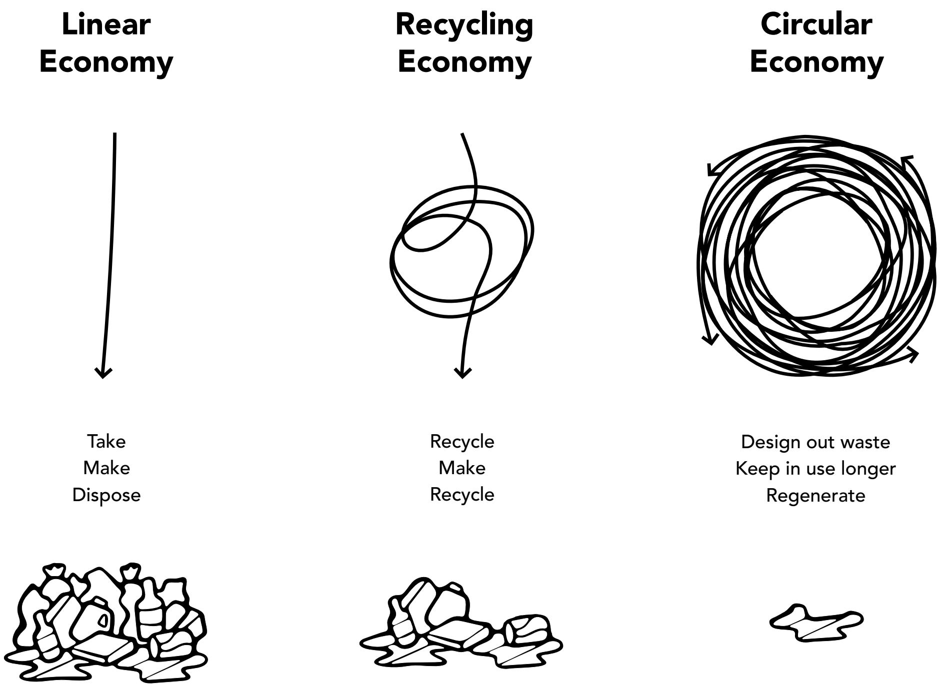


Figure 1: A linear, recycling and circular economy in 3 images (adapted from Circular Flanders[1])

[1] The original infographic is available at https://www.vlaanderen-circulair.be/en/strategic-levers/communicatie (last accessed May 2026)

Circular economy as a systems challenge

Developing a CE therefore presents a system challenge. The CE visual originally developed by the Ellen MacArthur Foundation, known as the 'butterfly diagram' is a useful heuristic that demonstrates CE as a whole system framework (Figure 2). In this conception, the current linear take-make-dispose economic model is depicted as a vertical value chain, where materials and resources flow through the economy to disposal and externalities, often in a single use cycle. In contrast, in a circular economy, the aim is to preserve, circulate and cascade materials and products productively back into the economy at various life cycle stages. The way this might be achieved differs depending on whether materials, components and products are designed for one of two spheres – the biosphere or the technosphere. The technical sphere encompasses materials and products (known as products of service) that are durable, comprising materials such as steel, titanium, critical minerals, copper, synthetic plastics. In the biological sphere, materials biodegrade and/or are consumed (known as products of consumption) and then metabolise, or compost and dissipate or can contribute to stocks (e.g. soils). Many forms of pollution and harm to life occur when technical durable materials, such as plastics, end up in the biosphere (e.g. ocean plastic, air pollution), or biodegradable materials become mixed with technical materials, which are hard to separate and more costly

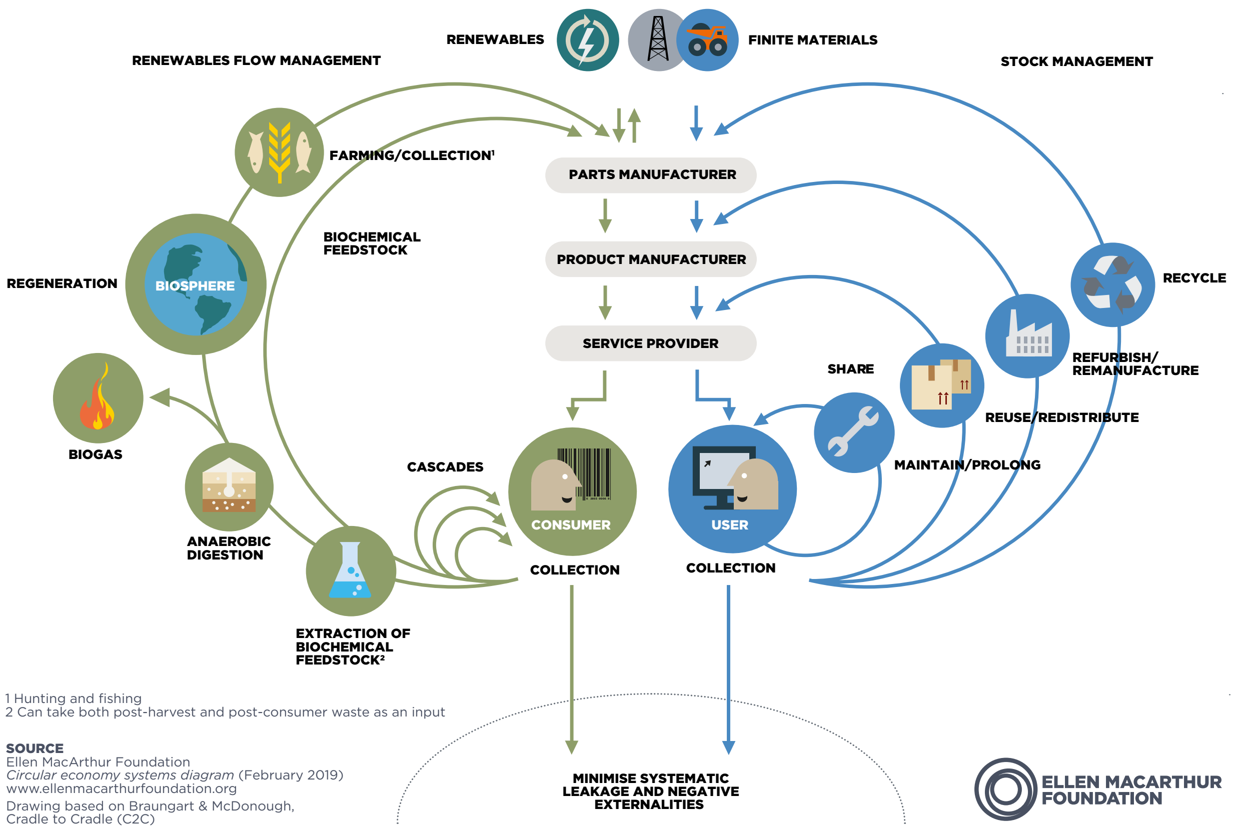


Figure 2: Circular Economy System Diagram (Ellen MacArthur Foundation, 2013)

Creating value in a circular economy

The power of creating value in a circular economy is achieved and compounded by investing in interventions and innovations as a system across the value chain (Zils et al., 2021). For example, prolonging and intensifying product life spans drives up asset utilisation and overall resource productivity and drives down carbon emissions, up to the point of technological shifts. These actions reduce the overall rate and size of the outflows from the system (reducing waste disposal costs), whilst designing and managing the reverse flow of products and assets on circular principles drives value retention and reduces demand for new product or materials at the inflow stage. Designing products and components for circularity at the outset reduces material complexity, toxicity and in some instances necessity, and forms a key value-creation enabler in the use and outflow stages. By connecting each phase as a circular value system, this avoids the prevalent value leakage characteristics of the linear economy, compounds carbon and material productivity, reduces supply chain risks and reduces economic, environmental and social costs, whilst maximising the benefits.

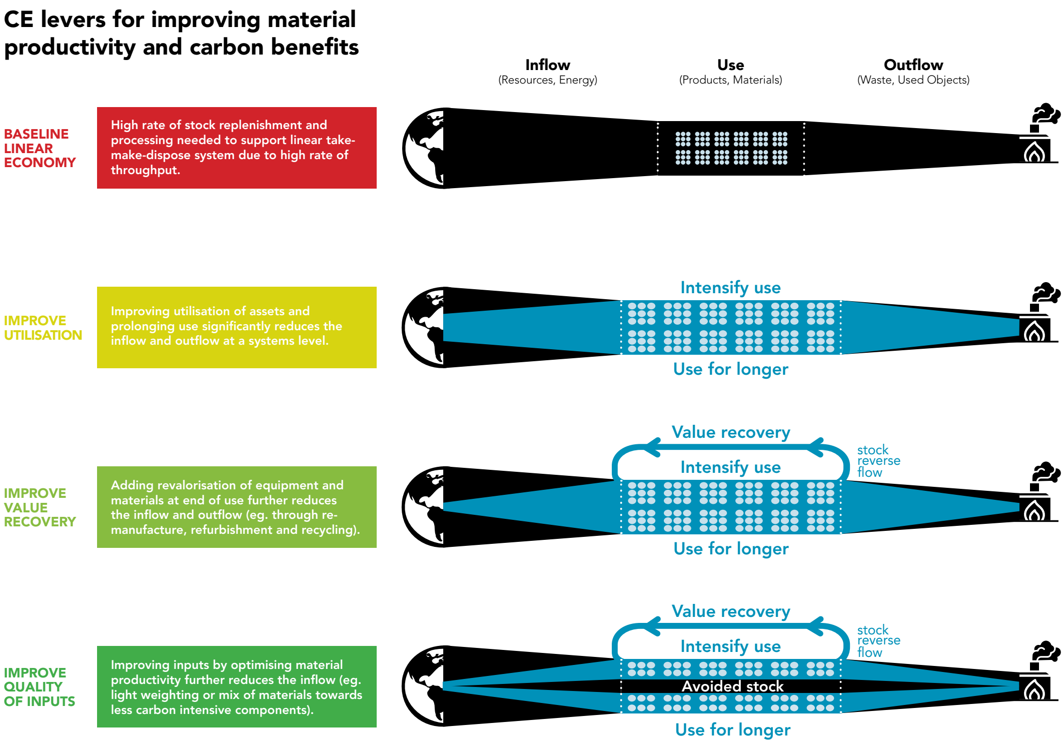


Figure 3: CE levers providing non-linear productivity increases and carbon reductions (adapted from Zils, 2021)

Defining EEE

EEE is defined in the UK Waste Electric and Electronic Equipment (WEEE) Regulations 2013 (as amended) (the "WEEE Regs") as including equipment that is dependent on electric currents or electromagnetic fields to operate properly; equipment for the generation, transfer or measurement of such currents and fields; and equipment designed for use with a voltage rating not exceeding 1,000 volts for alternating current or 1,500 volts for direct current (Environment Agency, 2023).[2] "Placed on the market" (POM) refers to the supply of a product for distribution, consumption, or use in the course of a commercial activity, whether for payment or free of charge.

[2] Since 2019, the Regulations have operated under an "open scope" framework, whereby all products meeting this definition are included unless explicitly exempted. The regulations exempt the following products: "items that protect the country's security such as arms, munitions and items only for military use; a piece of equipment that's designed for and installed in another type of equipment – they can only function within that product, for example a built-in satellite navigation system installed into cars, boats or aeroplanes; and filament bulbs apart from LED filament bulbs" (Environment Agency, 2023). In addition, the regulations exclude: "equipment designed to be sent into space; large scale stationary industrial tools; large scale fixed installations [e.g. elevators]; transport for persons or goods, excluding electric 2-wheeled vehicles which are not type-approved; off-road mobile machinery only for professional use; equipment designed only for research and development use and only available via business to business (B2B); implantable medical devices; and medical devices that are expected to be infective at end-of-life" (Environment Agency, 2023). Consumables such as dishwasher tablets are also excluded from the WEEE Regs, as are parts supplied for repair in the UK. Accessories are only included if required for the operation of products.

How the CE can apply to EEE/WEEE

On a per-capita basis, the UK has one of the highest levels of EEE consumption and WEEE generation globally (Baldé et al., 2024). Given the scale of EEE/WEEE flows in the UK, there is a need to innovate and utilise CE concepts in order to significantly improve product utilisation, material productivity and value retention. In doing so, this has the potential to reduce environmental impacts and burdens[3], reduce costs for consumers, and support challenging targets for net zero. To achieve this requires directing interventions to harness four core CE system building blocks:

Design

Design of products and assets for circularity at the outset

Directing interventions to households, companies, supply chain and public institutions that design and use assets, products and services to reduce intake, reduce reliance on Single Use Devices (SUDs), promote maintenance, product life extension and eliminate toxic materials that prevent re-use or recirculation.

Reverse Logistics

Reverse logistics for effective retention, recovery and reuse of materials, components, products and assets

Directing interventions at the outset to design an adaptive through-life cycle with reverse loops back to the suppliers, third parties or adjacent value chains to ensure valuable products, components and materials can be recirculated profitably.

Business Models

Business models to incentivise circular value creation across multiple life cycles and cascades

Directing interventions to business models that focus on the total cost of ownership and carbon impact, shift to performance-based models that incentivise greater utilisation with guaranteed performance and options to significantly extend product life, through upgrades, repair, refurbishment, remanufacture and cross value chain collaborations (e.g. industrial symbiosis).

System enablers

System enablers to address barriers and challenges and create new opportunities

Directing interventions to promote thinking in systems and identifying enablers that drive system wide and project specific systemic innovation including procurement, new forms of collaboration, core service design, digital and software tools, financial and accounting tools. In the longer-term legislation and policy, such as Extended Producer Responsibility (EPR), carbon border adjustment, eco-design, reporting and disclosure will influence all three building blocks above via design, material selection and future carbon and financial costs and revenue streams.

[3] For example reports of the environmental and health impacts of WEEE see https://www.who.int/news-room/fact-sheets/detail/electronic-waste-(e-waste) and https://www.genevaenvironmentnetwork.org/resources/updates/the-growing-environmental-risks-of-e-waste/. (both last accessed May 2026)

To move from a linear to a circular economy EEE/WEEE system however many barriers and challenges must be overcome. A key first stage is to have a unified data infrastructure that captures traceable, and verifiable information across the full asset-product-material lifecycle - from extraction and production to reuse, reprocessing, recycling, and end of use pathways. As part of value-chain analysis, inventorying value chain activities according to a consistent set of stages can help structure evidence collection, visualisation, comparison and aggregation.

The absence of such a system makes it harder to design timely, evidence-based policies, investments and interventions, maintain public accountability and credibility, and track 'what works'. Specifically, both public and industry engagement are weakened by the lack of accessible, transparent evidence - limiting pressure for change and slowing uptake of CE practices. In parallel, it is essential to map the factors influencing the current system and potentially blocking the effective application of CE interventions (Figure 4).

Description of current state including limitations

- Describe current state including stakeholders and activities.
- Identify problems in areas such as materials, economy, society and external factors.
- Find opportunities to improve overall value process, at system and individual level.
- Define factors influencing value to enable prioritisation.

Application of CE interventions

- Describe CE interventions based on core principles, CE reverse loops and necessary foundations.
- Combine individual CE actions into a larger plan, starting from small-scale testing to implementation at scale.
- Explain how different stakeholder (especially policy and regulators) engage with and contribute to embedding CE interventions.

Description of CE target state and benefits

- Describe CE target state including activities and stakeholders.
- Document impact and benefits in various areas such as materials, economy, society and external factors.
- Summarise key learnings and insights that can be applied to comparable starting situations in scaling.

Figure 4: Transformational steps to a CE target state (Graphic based on Zils 2022)

The following section synthesises official data on EEE and WEEE in the UK, much of which is not routinely collated, to provide an overview of the current system and highlight trends. Taken together, this evidence draws attention to indicative areas of material and value leakage. It also highlights factors reinforcing the prevailing linear system, before outlining priority areas identified through this work.

Current status of EEE and WEEE generation and treatment in the UK

Inflow: EEE placed on the market

EEE POM refers to the supply of EEE in the UK for distribution, consumption, or use in the course of a commercial activity, whether for payment or free of charge.

Over the past century, electrical and digital technologies have become deeply embedded in everyday life in the UK. Today, virtually the entire population have access to electricity, over 96% of households in Great Britain have internet access, nearly all between the ages of 18 and 64 report owning at least one mobile phone, 74% report having a laptop in their household, and 27% a smart home doorbell (ONS, 2020; World Bank, 2023; Ofcom, 2025).

EEE products underpin many parts of the economy, with initial estimates for the size of the UK's digital economy (including the value of digital products and non-digital products 'significantly affected by digitalisation') putting this at around a quarter of national gross value added (GVA) (ONS, 2022).

Reflecting this widespread adoption, the UK has one of the highest levels of electronics consumption globally when taken on a per capita basis (Baldé et al., 2024). Official UK government figures show 1.86 million tonnes[4] or 26.9 kg per capita of electrical and electronic equipment (EEE) within the scope of the WEEE Regs were placed on the UK market in 2024 (Figure 5) (Environment Agency, 2025; ONS, 2025a).

Figure 5: EEE POM by UK-14 Category, EA Administrative Data (tonnes)

[4] Calculated excluding the mass of batteries, which are regulated separately (Environment Agency, 2023).

Environment Agency (EA) (2025) data show that reported EEE POM has increased only modestly since mandatory reporting began in 2008, rising from 1.74 million tonnes to 1.86 million tonnes in 2024. However, estimates of EEE POM from before reporting under the WEEE Regs began suggest a more significant increase across the longer historic record, with POM tonnages up more than double from an estimated 940 kt in 2003[5] (Industry Council for Electronic Equipment Recycling, 2005).

Official POM figures also likely represent an underestimate due to the existence of a de minimis reporting threshold under the WEEE Regs, misreporting by producer compliance schemes (PCS), and potential non-compliance/free-riding leading to unregistered flows[6]. Alternative estimates of EEE POM for the UK based on the apparent consumption method (which uses trade and production data), suggest 2,195 kt of new EEE was purchased in 2021, approximately 15% higher than the official reported data in the same year (Anthesis, 2023).

In terms of composition, EA-published data indicate that 33% of UK EEE POM in 2024 in tonnage terms consisted of 'large household appliances' such as electric cookers and washing machines, followed by 'cooling appliances containing refrigerants' such as air conditioning systems at 14%, 'small household appliances' such as toasters at 12%, and IT and telecommunications equipment at 6% (Figure 6)[7]. 86% of UK EEE POM was registered as being anticipated for use by households.

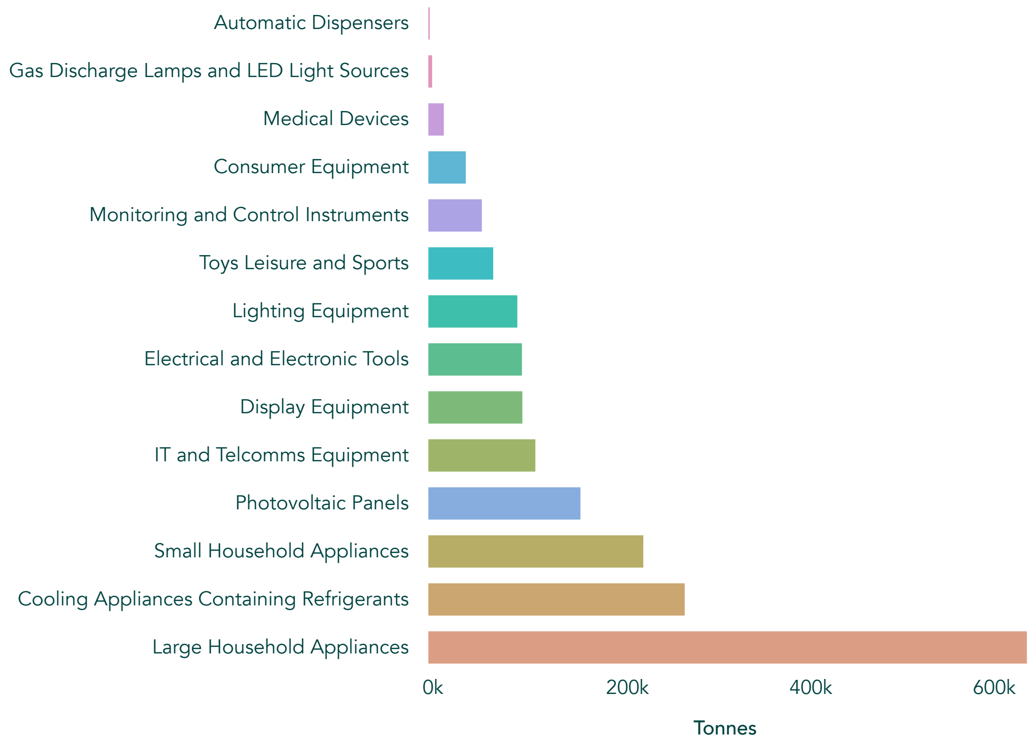


Figure 6: 2024 EEE placed on the UK market (POM) broken down by UK-14 product group (tonnes)

This analysis focuses on direct material flows associated with EEE. However, the upstream material footprint is substantially larger. Global material extraction required to meet final demand in England, across households, government, non-profit institutions serving households (NPISH), and business investment, for product groups aligned with the scope of the WEEE Regulations reached 46.8 million tonnes in 2020. With England accounting for 84% of the UK's total RMC and assuming the same final demand structure, equivalent figures for the whole of the UK might stand at around 55 million tonnes (Defra, 2023; ONS, 2023).

[5] POM was used in the source document as a basis to estimate WEEE generation. Differences in scope need to be kept in mind.

[6] For example, Valpak (2018) in its UK EEE Flows 2018 report estimates the total quantity of EEE placed on the UK market to have been 1.821 million tonnes in 2017. Compared with the official figure published.

[7] Administrative data generated through the reporting and regulation system established under the WEEE Regs, categories EEE/WEEE flows according to 14 product categories (Environment Agency, 2023): large household appliances; small household appliances; IT and telecommunications equipment; consumer equipment; lighting equipment; electrical and electronic tools; toys, leisure and sports equipment; medical devices; monitoring and control equipment; automatic dispensers; display equipment; appliances containing refrigerants; gas discharge lamps and light-emitting diode (LED) light sources; and PV panels. Vapes and electronic cigarettes have been added as a category since the 2025 reporting year.

In-use: EEE stocks, reuse and repair

The stock of EEE represents the quantity of equipment present in households, businesses, and the public sector at a given point in time. Based on estimates of EEE placed on the market (POM) and WEEE generation, the UK's total EEE stock is likely to be on the order of 20 million tonnes.

Survey evidence highlights the widespread penetration of electronic products. Ofcom's 2025 Technology Tracker found that 74% of respondents reported having a laptop in their household, 64% a tablet, 70% a smart TV, and 36% a games console (Ofcom, 2025). These penetration rates are expected to increase further over time, driven in part by demographic change.

Looking beyond household ownership, investment trends also point to a growing stock of equipment. Gross fixed capital formation (GFCF) for ICT equipment and other machinery and equipment increased by 67% in real terms between 1997 and 2022, reaching £69 billion in 2022 (ONS, 2023). Excluding central and local government due to data suppression, the estimated value of the UK capital stock for ICT equipment and related machinery was £351 billion in 2021, of which £62.4 billion was attributable specifically to ICT equipment (ONS, 2023).

Reuse and resale involve the continued use of products by new users while they remain functional and retain their original purpose (Cramer, 2017; Kirchherr, Reike and Hekkert, 2017). Extending product lifetimes, such as via reuse and repair, does not eliminate WEEE generation, but it delays it and helps retain the value of materials and embedded resources. In line with the waste hierarchy, prevention, including reuse, remains the most environmentally preferable option (European Commission, 2015).

Reuse occurs both within the formal WEEE collection and treatment system and outside it. Figure 7 shows the tonnage of WEEE that AATFs have reported as reused on-site or passed on to third parties for reuse. Data from AATFs show that reported reuse has declined over time, from 49 kt in 2011 to 10 kt in 2024 or less than 1% of WEEE generation in the period. This trend is influenced by changes in reporting practices as well as a stronger policy focus on material recycling and recovery targets.

Figure 7: Reuse at AATFs (Environment Agency, 2025)

However, a substantial share of reuse takes place outside formal systems. For example, 10% of respondents to the 2025 Ofcom Technology Tracker reported acquiring their current mobile phone second-hand or refurbished, while 5% received their device through pass-on (Ofcom, 2025). Commercial reuse, including business-to-business activity and remanufacturing by large operators such as RDC-Computacenter, TES, and SIMS, has been estimated at around 90 kt. Together, these figures indicate that official statistics capture only part of total reuse activity.

Repair involves restoring defective products so they can continue to perform their original function. Household expenditure data from the Living Costs and Food Survey (LCFS) show that weekly UK spending on repairs to gas and electrical appliances and spare parts reached £18 million in 2025, while in 2023 (the latest year for which data is available), weekly expenditure on repair of audio-visual, photographic, and information processing equipment was £2 million (ONS, 2026a).

At the industry level, the gross value added (GVA) of firms engaged in the repair of electronic and optical equipment (SIC 33.13) and electrical equipment (SIC 33.14), which primarily relates to industrial and commercial equipment, was £0.91 billion in 2024 (ONS, 2026b). When accounting also for those engaged in the repair of machinery (SIC 33.12), this total rises to £3.3 billion. In addition to this, the GVA of firms engaged in the repair of computers and peripheral equipment (SIC 95.11), communication equipment (SIC 95.12), consumer electronics (SIC 95.21) and household appliances which primarily relates to equipment used by households, was £2.29 billion in 2024 (ONS, 2026b).

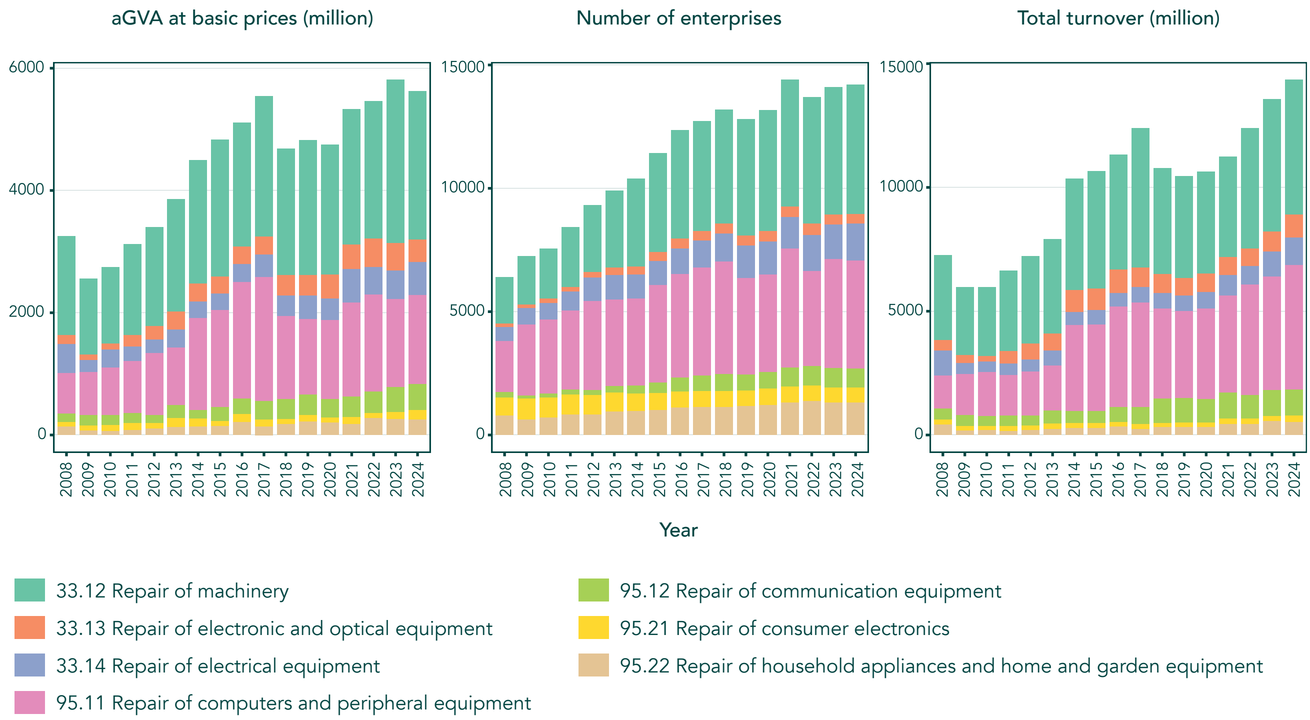


Figure 8: aGVA (million), turnover (million) and enterprise numbers across relevant second-hand, repair and renting activities

In real terms, the value of repair and reuse-related activities has remained relatively stable over the past decade. These sectors account for approximately a fifth of the GVA generated by the UK's manufacturing of computer, electronic, and optical products (SIC 26), and electrical equipment (SIC 27) and manufacture of machinery and equipment, (SIC 28) which together totalled £35.8 billion in 2024 (ONS, 2025b).

This highlights the fairly substantial significant economic contribution of repair activities, though as companies report on economic data under their principal activity for statistical purposes, it is likely an underestimate (Jacobs and O'Neill, 2003). The number of firms operating in relevant SIC categories reached approximately 14,200 in 2024, up from around 6,390 in 2008.

Outflow: WEEE generated

A consequence of the high and growing use of electronics in the UK, has been increasing amounts of WEEE generated[8]. WEEE or e-waste generation refers to 'the amount of discarded electrical or electronic products due to consumption within national territory in a given reporting year, prior to any collection, reuse, treatment, or export' (Forti et al., 2018).

While quantities of WEEE generated are not tracked in official UK statistics, estimates using lifespan-based modelling have been produced from the UK as part of wider research. According to the 2024 UNITAR E-Waste Monitor, an estimated 1.65 million tonnes of WEEE or 24.5 kg per person were generated in 2022 in the UK – approximately four times the global average (Baldé et al., 2024). A 2023 study by Anthesis estimated the figure to be slightly higher, at 1.86 million tonnes in 2021 (Anthesis, 2023). Broadly aligned with these estimates, a Valpak (2018) 'EEE Flows' study referenced estimates of total WEEE generation in the UK of 1.545 million tonnes in 2017 or 23.4 kg per capita[9], while WRAP (2016) includes estimates of total WEEE generated in the UK at 1.528 million tonnes in 2015 or 23.5 kg per capita[10].

Formal collection and treatment of WEEE

The collection of WEEE is a critical first step in enabling its proper treatment, recovery, and recycling. Formally collected e-waste refers to waste that is collected and managed under environmental protection legislation specifically designed for WEEE. This includes e-waste that is exported and subsequently treated in accordance with national standards in another country.

Figure 9 shows the quantity of WEEE from household and non-household sources in the UK reported as having been collected by producer compliance schemes (PCS) and their members. The data are disaggregated by collection route, including Designated Collection Facilities (DCFs), distributor take-back to PCS under Regulation 43, and WEEE collected through systems operated directly by PCS under Regulation 50. Non-household WEEE, for which the collection route is not reported, is included within the total.

[8] Previous estimates have pointed to a similar figure. Valpak (2018) estimated total WEEE generation in the UK to be 1.545 million tonnes in 2017 or 23.4kg per capita. WRAP (2016) estimated total WEEE generated in the UK to be 1.528 million tonnes in 2015.

[9] 651 kt of this (42%) was agency reported, 524 kt to be unreported (34%) and 366 kt (24%) classified as being lost through the residual waste stream.

[10] of which 679 kt (44%) was agency reported, 475 kt was unreported (31%) and 374 kt (24%) was classified as other, including being lost through the residual waste stream.

Figure 9: WEEE collected by Producer Compliance Schemes and their members (Environment Agency, 2025)

The data shows that over the last decade, total WEEE collection figures in the UK have remained relatively stable at approximately 500 kt indicating limited progress in increasing collection levels overall. Current collection volumes remain below the peak of nearly 600 kt recorded in 2016, although modest increases have been observed in recent years. Over this period, the composition of collection routes has shifted, with distributor take-back increasing while tonnages collected via DCFs have declined.

After a period of comfortably meeting a 45% collection target stipulated by the EU based on an average of sales of EEE POM in the three preceding years[11], in 2019, the UK fell short of a newly introduced 65% collection target. The UK no longer applies the EU targets as were included in the recast WEEE Directive (2012/19/EU). Since the UK's departure from the European Union, Defra has instead set household WEEE collection targets on an annual basis. These include an overall collection target, collection targets per product category, and a target on 'small mixed WEEE' summed across categories 2-10 of the UK classification of electronics for official data. The 2024 overall collection target of 482,335 tonnes appears to have been achieved, as were targets for small mixed WEEE and most individual product categories. The exception was photovoltaic (PV) panels (Category 14), where the target was narrowly missed.

[11] E.g., in 2017, the UK met this comfortably, with 1.174 million tonnes estimated to have been collected across reported, unreported, asset management and light-iron stream categories. This figure was reported to the EU, as permitted through their target rules (Valpak, 2018).

WEEE received at Approved Authorised Treatment Facilities

Recycling enables the materials contained in WEEE to be recovered and reintroduced into the economy, while reducing the need for residual treatment and disposal. Figure 10 below presents the quantity of EEE received at AATFs in the UK, disaggregated by household and non-household sources. AATFs are permitted facilities responsible for treating WEEE in accordance with technical standards and issuing evidence notes to PCSs to verify compliance with recovery and recycling obligations.

Between 2011 and 2024, the total quantities of obligated e-waste received at UK AATFs fluctuated between approximately 468 kt (2020) and 592 kt (2016), with most years around 500 kt. Overall, there has been a moderate upward trend over the period, with peaks in 2016 and 2021. Household WEEE makes up the vast majority of waste received, as with quantities put on the market and collected.

Figure 10: WEEE received at AATFs in the UK, free vertical axis (Environment Agency, 2025)

Consistent with patterns observed in POM data, large household appliances are the dominant product group received at AATFs in tonnage terms, typically accounting for approximately 170 kt–215 kt per year. Cooling appliances containing refrigerants represent the second largest category (around 100 kt –145 kt annually), followed by display equipment (approximately 45 kt –137 kt per year), although the latter exhibits a gradual decline over the period. IT and telecommunications equipment (around 37 kt –55 kt annually), small household appliances (31 kt –38 kt), and consumer equipment (31 kt –40 kt) contribute relatively stable volumes year-on-year.

Non-obligated WEEE received at AATFs and approved exporters (AEs) add relatively modest volumes to WEEE collected in the UK (Figure 11).

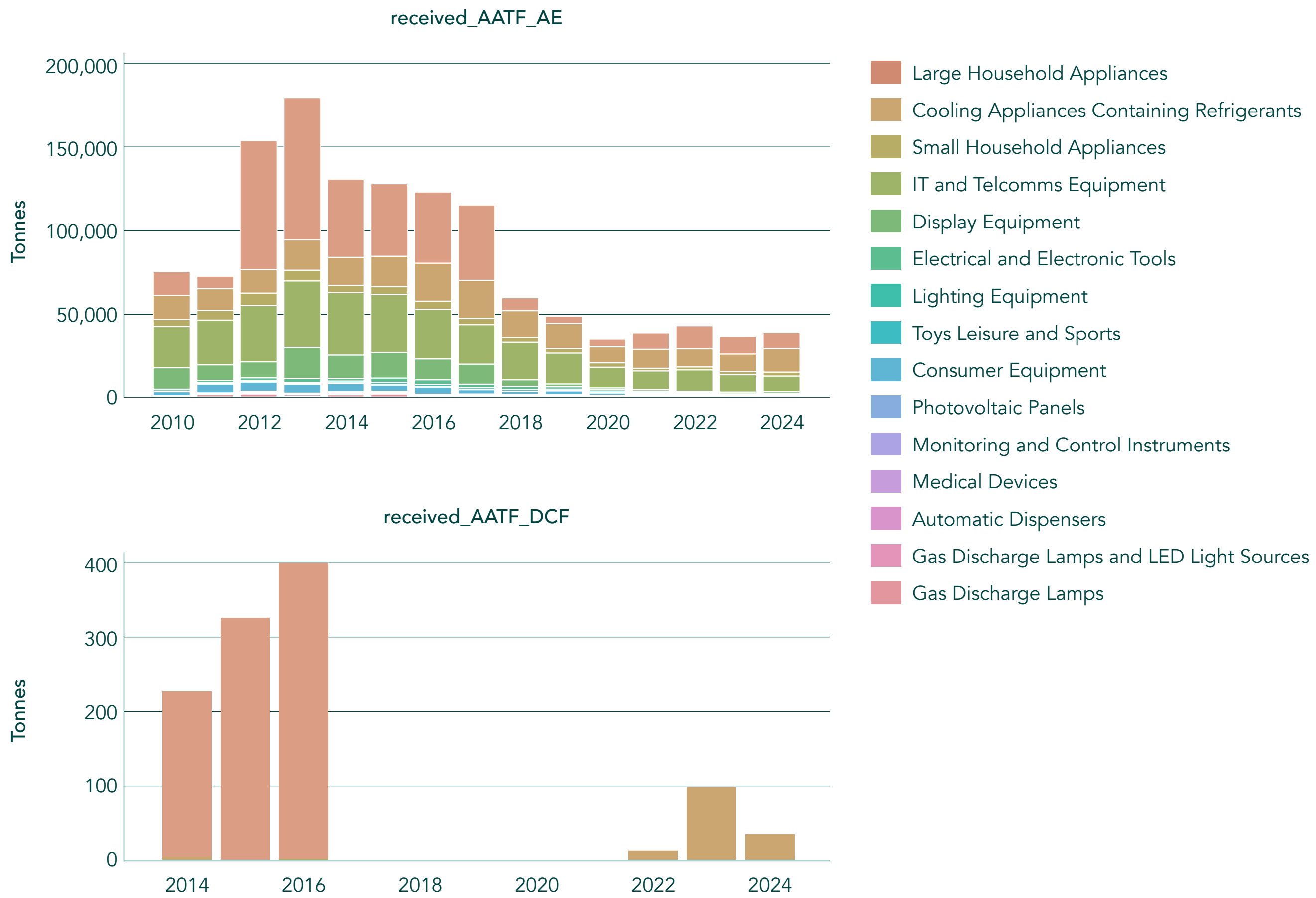


Figure 11: Non-obligated WEEE received by AATFs and AEs, including that received from DCFs (Environment Agency, 2025)

Other recycling

Other recycling refers to the treatment of e-waste outside the formal WEEE system, typically alongside other waste streams such as metal scrap.

Due to the high ferrous metal content of many EEE products (Figure 12)[12], when WEEE does not enter the formal collection system in the UK, it is often recycled through the wider scrap metal recycling sector. Anthesis (2023) estimated that approximately 349 kt of WEEE were recycled via the light iron stream in 2021. This volume was equivalent to roughly 70% of the WEEE tonnage reported as received by AATFs in the same year. While this adds to total levels of recycling, it may lead to suboptimal recovery of certain materials and reduced visibility over material flows compared to treatment within the formal system.

[12] Ferrous metals, particularly iron and steel, are generally the most common material in EEE goods (Widmer et al. 2005 in Ongondo et al., 2011), with composition data collated from Babbitt et al. (2019), a 2021 BEIS commissioned Energy-related Products study (BEIS, 2021) and several Ecodesign studies, showing ferrous metals made up the highest share across EEE product groups, averaging approximately 31% across product groups (Figure 12).

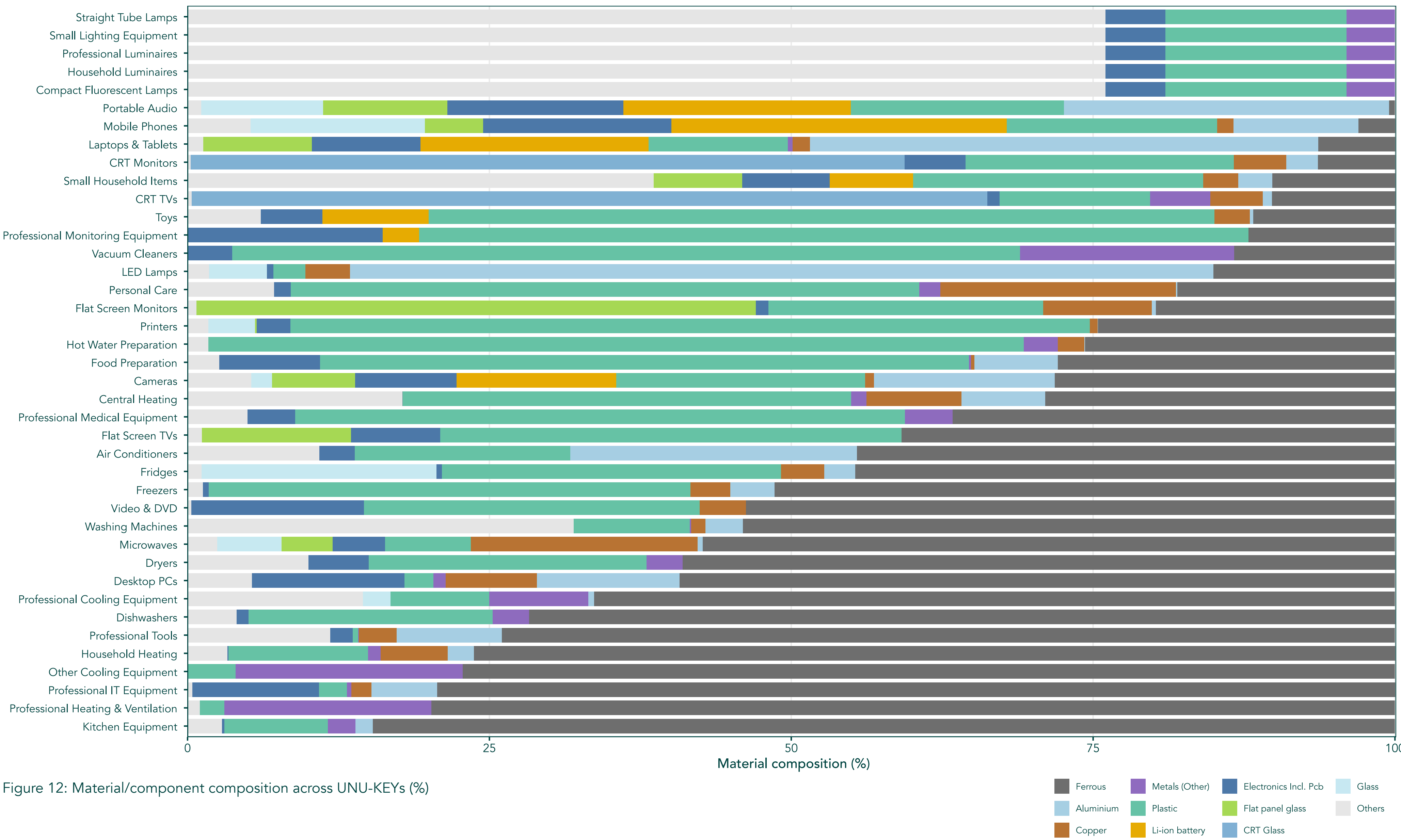


Figure 12: Material/component composition across UNU-KEYs (%)

WEEE entering residual waste

E-waste in the residual waste stream refers to WEEE that is disposed of in non-separately collected waste, including household residual waste and mixed bulk waste. Data from England's Waste Data Interrogator indicate relatively small quantities of waste explicitly classified as electronic equipment under the European Waste Catalogue (EWC) codes were sent to landfill and incineration between 2019 and 2024 (Figure 13). These figures are likely higher when considering waste generation across the UK nations.

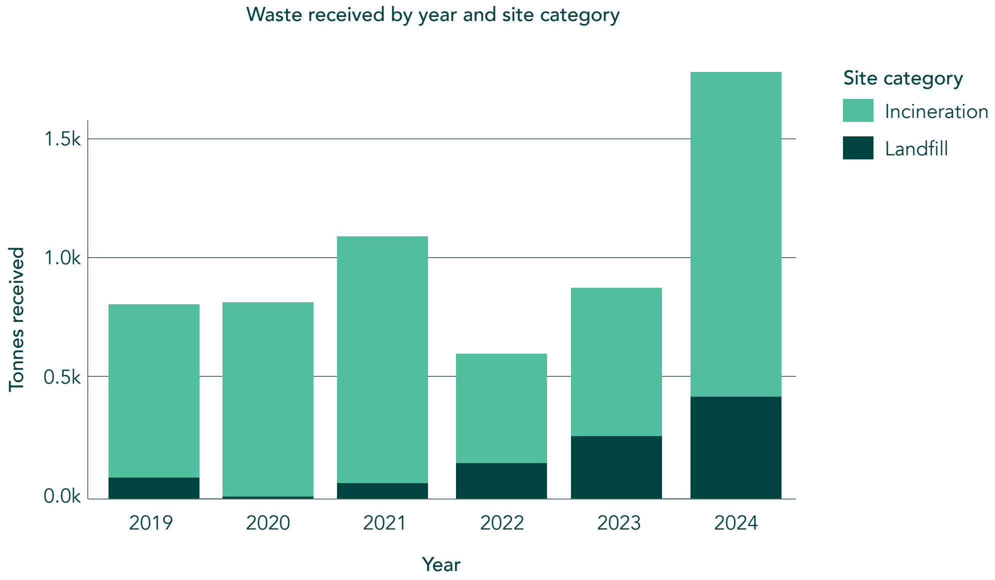


Figure 13: Waste received at residual waste sites in England for select EWC codes (Environment Agency, 2025)

However, these data do not capture the full extent of WEEE entering residual treatment streams. Significant quantities of electronic waste are likely embedded within mixed waste sent to landfill and incineration. A 2019 study by Eunomia estimated that 195 kt of WEEE entered household residual waste in 2017, around 60% of which was small WEEE. More recent analysis by Anthesis (2023) estimated 103 kt in 2021, down from 155 kt in 2017.

Although recent estimates for commercial and industrial (C&I) waste are limited, earlier research suggested that approximately 145 kt of WEEE entered the C&I residual waste stream in 2017 (Material Focus, 2020). Valpak (2018) similarly estimated that around 24% of total WEEE generated in the UK, approximately 370 kt, entered residual waste streams in 2017. These findings indicate that a substantial share of WEEE continues to bypass dedicated collection systems.

WEEE also leaks from the managed waste system through activities such as fly-tipping and the operation of illegal waste sites. Environment Agency data show that incidents of fly-tipping involving white goods and other electrical items in England increased from 30,955 in 2012 to 2013 to 67,387 in 2021 to 2022. Over half of these incidents, 54%, occurred in London, the South East, and the North East (Defra, 2023).

Over the same period, the number of reported illegal waste sites in England handling WEEE has declined. However, this trend should be interpreted with caution, as it is influenced by changes in monitoring and enforcement activity rather than necessarily reflecting a real reduction in underlying activity. A study for Material Focus estimated that WEEE associated with illegal waste sites amounted to approximately 59.2 kt tonnes in the 2019 to 2020 financial year (Purdy and Crocker, 2021).

Transboundary movement of WEEE

Since 2022, the World Customs Organization has introduced a dedicated 4-digit Harmonized System (HS) code, 8549, for electrical and electronic waste (e-waste) and scrap. This heading is further disaggregated into 6-digit codes that classify e-waste primarily by material or component composition:

- 854921 - Electrical and electronic waste and scrap, of a kind used principally for the recovery of precious metal, containing primary cells, primary batteries, electric accumulators, mercury-switches, glass from cathode-ray tubes or other activated glass, or electrical or electronic components containing cadmium, mercury, lead or polychlorinated biphenyls “PCBs”
- 854929 - Waste and scrap, of a kind used primarily for the recovery of precious metals, n.e.c. in item no. 854921
- 854931 - Waste and scrap of electrical and electronic assemblies and printed circuit boards, containing primary cells, primary batteries, electric accumulators, mercury-switches, glass from cathode-ray tubes or other activated glass, or electrical or electronic components containing cadmium, mercury, lead or polychlorinated biphenyls “PCBs” (excl. for the recovery of precious metal)
- 854939 - Waste and scrap; electrical and electronic assemblies and printed circuit boards, other than those used primarily for the recovery of precious metal, n.e.c. in item no. 854931
- 854991 - Waste and scrap, n.e.c. in heading no. 8549
- 854999 - Waste and scrap, n.e.c. in item no. 8549.91

Figure 14 presents UK import and export data for these HS codes, based on UN Comtrade data. In 2024, over 10 kt of e-waste were reported as exported from the UK, substantially exceeding imports in the same year.

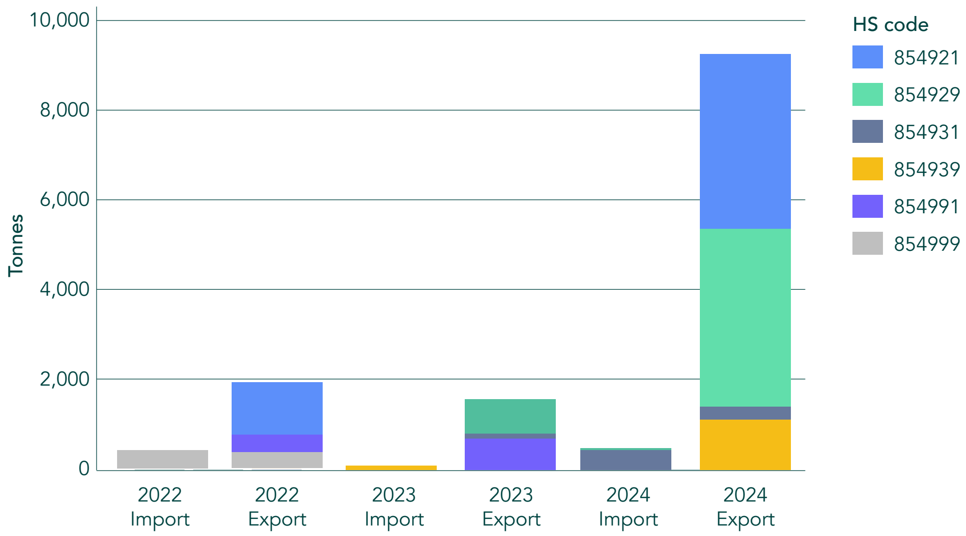


Figure 14: E-waste under HS 8549 exported and imported from the UK (UN Comtrade)

The UK is also a signatory to the Basel Convention, which regulates the transboundary movements of hazardous wastes, including e-waste, to ensure their environmentally sound management. As part of its reporting obligations under the Convention, the UK submits annual data on e-waste exports and imports to the Basel Secretariat. These data, shown in Figures 15 and 16, provide additional information on the international movement of e-waste under the Basel Convention.

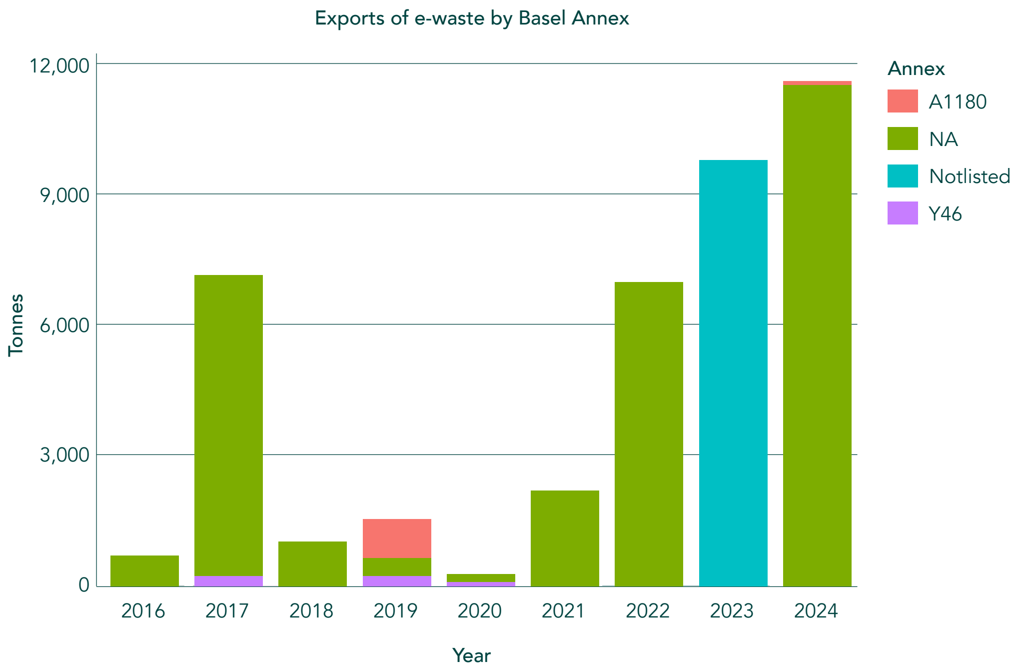


Figure 15: UK exports of e-waste reported to the Basel Convention

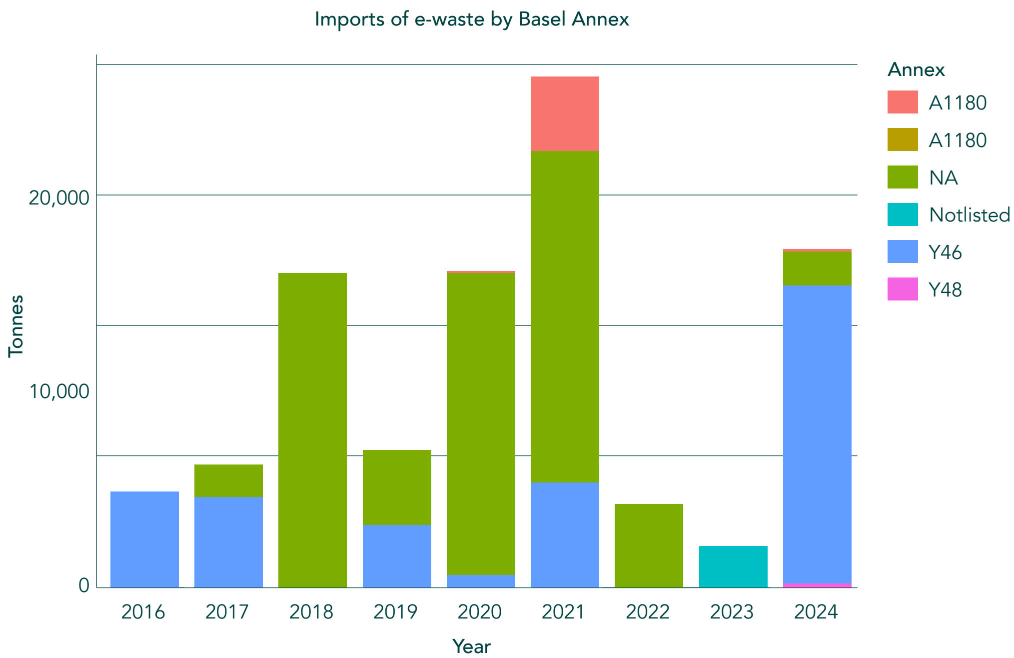


Figure 16: UK imports of e-waste reported to the Basel Convention

Data on undocumented or unregulated flows of WEEE remain limited. However, available evidence suggests that such flows are significant. A study by the Basel Action Network (2019), which used GPS trackers embedded in discarded electronic devices, found that the UK was the largest source of tracked e-waste exports among participating European countries. Of 39 devices deployed in the UK, 5 were exported overseas, representing 13% of tracked units, all to developing countries including Nigeria, Tanzania, and Pakistan. While the legal status of these exports was uncertain, the study concluded that it was unlikely they were conducted in compliance with regulations. Complementary estimates also point to substantial unreported exports. A 2020 study for Material Focus estimated that around 32 kt of WEEE were exported illegally from the UK.

Taken together, these findings indicate that while official trade and Basel reporting provide partial visibility, they do not capture the full scale of transboundary movements. The UK appears to be a significant exporter of used EEE and e-waste, including through channels that are not fully recorded in official statistics, highlighting an important gap in monitoring and enforcement.

Outlook

Overall, the evidence points to a system characterised by high and sustained levels of EEE consumption and waste generation in the UK, with per capita levels among the highest globally. Reuse and repair activities are present and economically significant by supporting a substantial number of firms and contributing notable GVA, but remain modest relative to overall product flows.

While the UK has an established collection and treatment infrastructure, total WEEE collection has remained broadly stable at around 500 kt per year over the past decade. This suggests that only a portion of total WEEE generated, potentially closer to one third based on available estimates, is captured through the formal WEEE management system. Material recycling remains the dominant outcome within the formal system, as compared to e.g. reuse. This activity is largely oriented towards bulk material recovery, with more limited retention of higher-value components and critical materials.

A substantial share of WEEE continues to leak from formal collection pathways. This includes material entering residual waste streams, where it is effectively lost from recovery systems, as well as WEEE handled through informal or parallel routes such as the scrap metal sector and exports. While other recycling results in material recovery, these routes can involve weaker oversight and lower recovery of higher-value or hazardous components. The UK also appears to be a significant exporter of used EEE and e-waste, although the scale and nature of these flows are not fully captured in existing datasets. Exports represent a major loss of control over how WEEE is treated, with evidence suggesting a share may be managed under suboptimal environmental and safety conditions.

Taken together, the UK EEE and WEEE system retains many characteristics of a linear model, with collection rates that have plateaued, significant leakage from formal systems, and a continued reliance on lower-value recovery pathways. At the same time, the presence of active reuse, repair, and secondary material markets provides a foundation for improving circularity. Strengthening collection performance, reducing leakage, improving data coverage, and increasing the retention of product and material value within the UK system represent key areas for improvement.

Barriers and Challenges

Barriers are things that restrain change towards a particular outcome. Barriers can represent elements of the status quo which if not managed, can delay or limit change, in some cases indefinitely. Examples of barriers to a more circular UK economy along the value chain are shown in Figure 17.

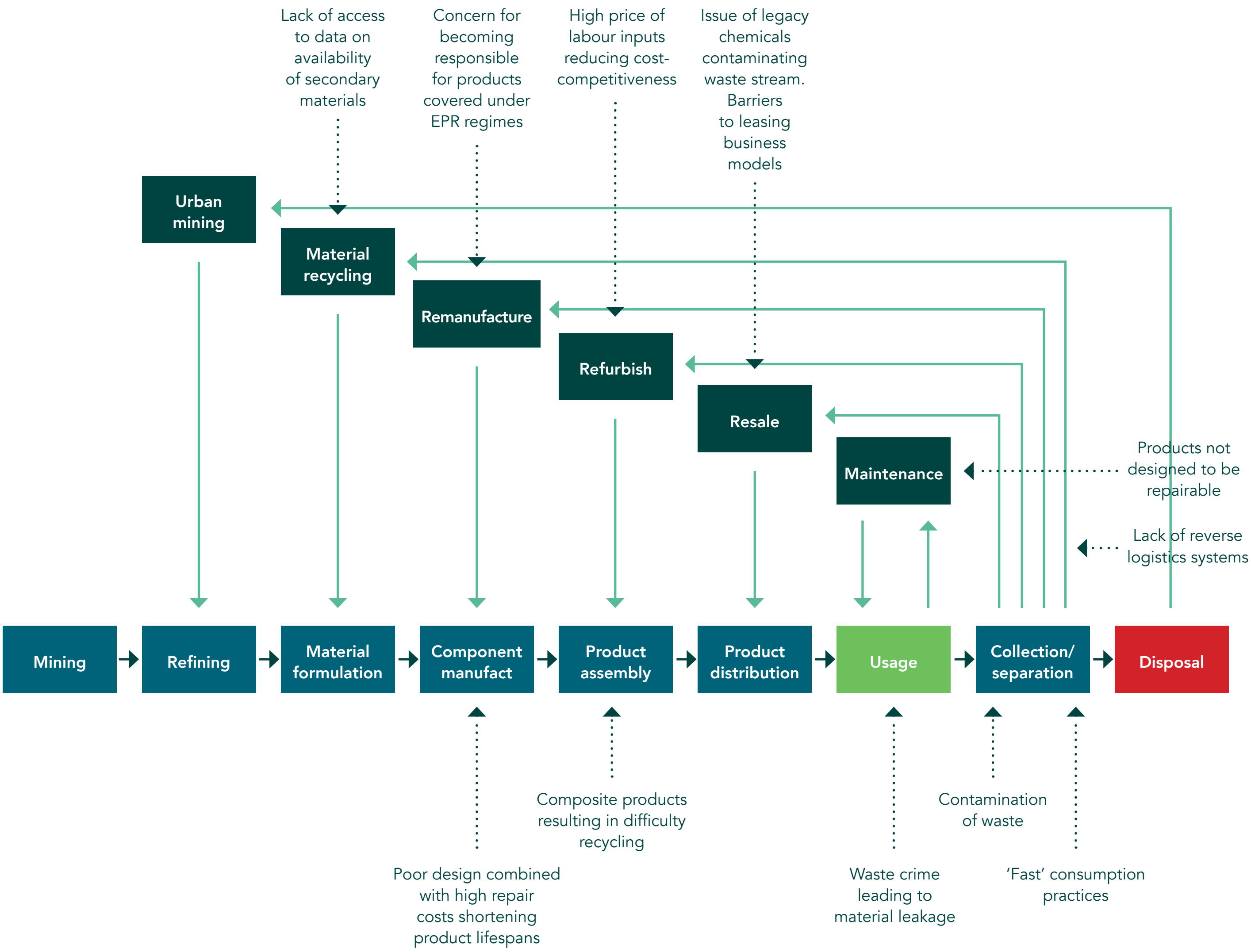


Figure 17: Examples of barriers to a more circular UK economy along the value chain

Previous research has identified and reviewed many barriers and challenges to advancing CE in EEE[13]. To add further insight to this research literature, we conducted a series of interviews (see Annex A), with stakeholders representing different activities in the UK EEE and WEEE value chain, from this article (Thorman et al., forthcoming), we drew out a shortlist of thematic areas most relevant to the current report to inform the final recommendations.

From our data we have already seen the rising growth of EEE consumption and WEEE disposal, the relatively low rates of collection and modest levels of repair and re-use, a characteristic of linear system archetype. Within this system there are competing activities, incentives and motivations between different economic actors and stakeholders creating systemic tensions.

The interviews highlighted some of these tensions and dynamics which we summarise below in relation to three stakeholder groupings: business, consumer, and government.

[13] For example see Abdelmeguid, A., & Corsini, L. (2026). Barriers and Enablers of Circular Economy in Electrical and Electronic Equipment: A Systematic Literature Review. *Business Strategy and the Environment*, 1–34. https://doi.org/10.1002/bse.70559. https://onlinelibrary.wiley.com/doi/10.1002/bse.70559 (accessed May 2026)

Business stakeholders

It is evident that business plays a key role in the volumes of EEE production, consumption and WEEE generation. Historic linear sales models largely operate on a volume-based sales-ownership models, in highly competitive markets with low margins and frequent shifts in product offers driven by fashion and/or innovation. Regulations have evolved to register products placed on the market, ensure consumer safety and rights via guarantees and warranties, incentivise eco-design and manage end of life WEEE collection and treatment. Business is frequently called on to promote greater repairability, adopt different business models and communicate more clearly with the consumer and public regarding durability and maintenance.

The potential high upfront capital costs for introducing new products, processes, businesses or reverse logistics systems can act as an economic barrier, including for new market entrants. These capital costs will also be associated with opportunity costs for alternative investments that may have greater payoff certainty (Flachenecker and Rentschler, 2015). In addition, CE business models can be associated with higher operating expenditures such as for secondary versus virgin material inputs or for production models requiring higher labour inputs as is often the case at present for improved separation of waste or reverse logistics. In the case of repair, our stakeholders raised several comments about the challenges and costs of maintaining spare parts, especially across dispersed supply chains:

"The thing about spare parts is if nobody wants a spare part, you can't give that spare part away, nobody wants it. [Especially if] it's just a part that doesn't go wrong, but you still have to hold it."
(stakeholder comment)

"How companies, you know, would even […] keep spare parts in the UK and the rest of Europe is quite challenging because you know this [requires] warehouses, requires storage facilities, all of this costs money."
(stakeholder comment)

Subject to global competition, it can therefore be difficult for producers to supply to the market relatively costly goods and services, including spares and repairs, especially when business models have become optimised to low cost, high volume.

A sample of issues highlighted in our interviews included:

i) Many EEE products sold in the UK are imported meaning that UK retailers have limited influence over product designs and issues related to repairability.

ii) Professional repair services present inconveniences, including availability and time-consuming procedures, which can discourage users from seeking them out.

iii) Stocking and storing of spare parts for repair and/or replacement is not straightforward, and if not needed can generate their own waste.

iv) The economics of service/repair compared to sales-ownership models is complex and difficult to scale up, whilst still requiring new product to replenish stocks.

v) Service/repair or resale models do not automatically or necessarily lead to reduced consumption, potentially increasing replacement rates.

i) EEE product warranties and guarantees are often quite restrictive and prohibit 3rd party repairs. The ambiguity surrounding warranty rights and guarantees for consumers is often made worse through labels on products and wording in warranty and guarantee agreements.

ii) Manufacturers and sellers frequently refuse consumers' requests for repairs, or offer replace items rather than repair.

iii) Lack of trust and concerns around greenwashing reduce the effectiveness of business-led communication.

vi) Legacy products represent a growing and structurally difficult waste stream, as many were not designed for repair and are less compatible with circular systems.

"So the flow of materials from a legacy item into the electronics resource recovery chain is increasing. It's the fastest growing waste stream in the world at the moment."
(stakeholder comment)

Consumer stakeholders

Discussions with our stakeholders often featured the chicken or the egg paradox. Which came first, and which comes next, the supply or the demand? In the case of the role of consumers in EEE and WEEE one view is the cornerstone of neo classical economic theory - consumers have a choice, act rationally and are responsible for making them. On the other hand, it is widely accepted that businesses are adept at creating needs and wants backed by powerful marketing and advertising campaigns (the hidden persuaders) and incentivised by wider enabling financial and economic incentives alongside weak regulations. Addressing this knotted paradox[14] lies at the heart of many attempts to influence consumer behaviour and questions the notion of consumer sovereignty, as one stakeholder commented.

"So it is about the consumer here, you know, and the circular economy. If you look at moving from a linear economy to a circular economy, the consumer is stuck right in the middle. It's up to them to say yes or no to the changes. So how do you make the changes?"

In relation to consumers, a sample of barriers and challenges highlighted in our interviews included:

i) Low prices of new products make replacement by the consumer a more rational choice.

ii) Circular products have the potential to be more expensive in up-front costs, and some consumers cannot afford to make the choice to behave responsibly or purchase more circular products (e.g. Fairphone).

iii) It is often not clear what the better choices are for circularity.

iv) In some instances, repair and maintenance of EEE might mean less energy efficient products being retained, with overall worse impact for the environment than replacement, and inhibiting recovery of materials from older products for new higher performing products.

v) Many consumers have a wish to repair and maintain products but lack the information, skills or time leading to 'crisis replacement'.

It is proposed that businesses and government have a role to play in communicating these changes to consumers, in a way that is timely and accessible.

"I think it's about clear messaging. Timely and clear messaging without having to bother people down with, you know, with figures or you know, complex. Diagrams and things. It's all about, you know, distilling such information with the right sized [information] and very clear. Ways to make sure that your message is not lost." (stakeholder comment)

Further extracted bullet points from the analysis represent what type of information might be best communicated, and in some cases, how:

vi) Lack of consumer knowledge about their rights.

vii) Data on whether consumers attempt to repair broken products or dispose/replace is also limited, qualitative, from non-representative samples and fragmented.

viii) Lack of transparent and predictable pricing for repair services creates uncertainty, discouraging repair uptake and reinforcing replacement behaviour.

ix) Convenience, affordability and immediacy of new products outweigh repair decisions, particularly under time and financial pressure.

Government stakeholders

Whilst EEE and WEEE are embedded in global and international production systems, UK National and Local Government play an important role across the EEE and WEEE value chain through various macroeconomic policies, environmental regulations, industrial strategy and infrastructure investments, often shaped in consultation and engagement with industry, consumer and citizen actors. However, management and regulatory control of EEE placed on the market and subsequent WEEE involves diverse economic actors that can be difficult to include, monitor or enforce, as one stakeholder commented:

"Living in a world where actually a lot of stuff, a lot of electronics aren't coming from recognised brands, they're coming from websites that are operating on a direct to consumer basis where there is no control: There's no accountability. They're not taking any responsibility for their products at end of life."

[14] For an explanation of knotted paradoxes and circular economy see Jain et al. (2025). Paradoxical Tensions in Net-Zero Innovation Implementation: A Network Orchestrator Perspective, *Academy of Management*. Available online at https://doi.org/10.5465/AMPROC.2025.16594abstract (last accessed May 2026)

A sample of barriers and challenges highlighted in our interviews included:

i) Examples of how current regulations are readily circumvented.

ii) Evaluation of the effects of warranty/consumer rights policies on product life spans is few and far between.

iii) The time lag in policy or regulation in response to emerging markets (e.g. vapes) or product innovations.

iv) The lack of influence on product design outside the UK/EU.

v) Ways in which regulations are impacted by lobbyists creating loopholes and exemptions which work against circularity.

vi) Underfunding of Local Authority collection and potential local repair/reprocessing systems.

"And when it looks at waste, it looks at local government and the private sector that manage waste. They offer you the service where they'll come and collect the washing machine, but it's a specialist bulky service. Or you've got to get it down to your local tip and those are getting more difficult to get into. So local authorities are penny pinching and I think some of the waste collection services are suffering because of that."
(stakeholder comment)

vii) Fragmentation and out of date data especially on reverse loops.

viii) Policy frameworks are often disproportionately focused on downstream waste management rather than upstream design, use and consumption, limiting system-wide impact.

ix) Limited visibility and data on repair, reuse and informal activities constrain the ability of government to design, target and evaluate effective interventions.

x) Incentive structures are insufficient to make circular options economically competitive with linear alternatives, limiting the effectiveness of policy measures.

Summary

In short, the current EEE/WEEE is a system that has grown rapidly over the past 20 years, and presents many problems in terms of material leakage, environmental impact and future resource security. There are many stakeholder interests contributing to the current system and with the potential to embed future CE intervention. Whilst there are many EEE/WEEE initiatives such as repair cafes, enhanced collection and re-use systems and calls for regulatory reform, the current CE target state is unclear. Moreover, the diversity of small scale, ad-hoc initiatives, makes it very difficult to see the wood from the trees and monitor and evaluate the effectiveness and impact of these on the overall EEE/WEEE system. In the final section, we draw together some insights and priorities to address these challenges.

Conclusion and recommendations

At present the UK lacks a unified data infrastructure that captures traceable, and verifiable information across the full material lifecycle - from extraction and production to reuse, reprocessing, recycling, and disposal. The absence of such a system makes it harder to design timely, evidence-based policies, plan strategic investments, and maintain public accountability. The benefits of addressing this gap include faster response to emerging challenges, more efficient resource use, and improved confidence in circular economy interventions.

In Figure 4 we highlighted the importance of defining and describing the baseline status (stocks and flows) of material and product flows, use and outflows through the economy, in order to assess circular economy interventions at scale and the barriers and challenges to be overcome.

As this report has shown, defining and describing the baseline EEE and WEEE status for the UK is challenging but essential for the monitoring and evaluation of future circular economy ambitions – otherwise it is very difficult to see the effects of individual actions and initiatives into aggregate impacts and outcomes. Such issues are not unique to EEE and WEEE but reflect common data-policy-industry challenges, notably:

- Policy development is often outpaced by fast-evolving environmental and economic challenges due to outdated, fragmented, or siloed data sources, making it difficult for government departments to align interventions or evaluate outcomes in a timely manner.
- Public and industry engagement are weakened by the lack of accessible, transparent evidence - limiting pressure for change and slowing uptake of CE practices.
- Investors, funders, and innovators currently lack access to real-time market intelligence that reflects the dynamics of material flows, environmental impact, and economic opportunity.
- Awareness of circular economy data and strategies remains uneven across sectors, with no common evidence base to align efforts across government, industry, society, and academia.

This report has synthesised available published statistics and peer-reviewed literature to provide a spotlight on the status of EEE/WEEE stocks and flows. There are many gaps that need to be filled and further checks required where we have relied on or utilised single studies.

From the available data we have shown that:

- The UK has one of the highest EEE volumes placed on the UK market (1.86M tonnes in 2024, 26.9 kg per capita) and WEEE disposal (1.65M tonnes, 24.5 kg per capita) in the world and shows little sign of slowing down. The exact reasons why the UK holds this position is not entirely clear and requires further comparative analysis.
- Around a third of the EEE placed on the market is large household appliances such as electric cookers and washing machines, which in turn account for the dominant product group received at AATFs in tonnage terms (approximately 170 kt –215 kt per year). This highlights products where circular economy could make the greatest difference to total inflow and outflow in weight terms.
- Ferrous metals make up the highest share of materials across EEE product groups, averaging approximately 31% across product groups, although EEE also contains many other valuable metals, plastics, and critical minerals. An estimated 300-400 kt of ferrous metals enter the scrap metal recycling sector outside formal collection systems. Large volumes of EEE also enter the household residual waste collection system with estimates ranging between 150 – 370 kt highlighting that a substantial portion of electronic waste bypasses designated collection channels. Retaining products in use and secondary material recovery at the end of life is a source of potential economic value for the UK economy and would reduce overall life cycle environmental burdens and impacts. Achieving this requires the co-ordination of dedicated actions (collection, segregation, infrastructure, incentives, markets). Our data highlights the scale of the challenge and opportunity:

- Whilst, until 2019, the UK met its 45% WEEE collection targets in the WEEE Directive (2012/19/EU) it fell short of a newly introduced 65% collection target. The UK no longer applies the EU targets.
- Domestic reuse, including business-to-consumer, business-to-government, and consumer-to-consumer channels, was estimated at 82 kt in 2021. However, reported reuse of WEEE in official statistics has dropped over the time of reporting, from 49 kt in 2011 to 10 kt in 2024. More widely, repair however forms a significant economic activity. The gross value added (GVA) of firms providing repairs to computers and peripheral equipment (SIC 95.11) and communication equipment (SIC 95.12) in the UK stood at £1.95 billion in 2023 (ONS, 2025).
- The UK also has the highest export of e-waste, much of it to the Global South and levels of illegal or unregulated exports estimated at around 30,000 tonnes.

Future CE- EEE and CE-WEEE?

The report has summarised many barriers and challenges to shifting the current predominately linear approach to circular EEE and WEEE.

It is evident that interventions are needed across the four CE building blocks – design, business models, reverse logistics and system enablers (finance, education, regulation, infrastructure). The ability to influence these will vary from product to product and across different lifespans. The impact on EEE product design, product life spans and performance, end of life disposal, disclosure and traceability will also depend on how the UK transitions and translates recent and forthcoming EU regulations, including the EU Ecodesign for Sustainable Products Regulation, Digital Product Passports, and the Product Regulation Metrology Act 2025 and the EU's Right to Repair Directive (2026).

In the short term, there is a clear opportunity and need to drive up product lifespans and utilisation, and reduce the need to replace products due to failure rates, obsolescence and difficulty in repair.

Perhaps ironically, the UK as well as having the largest volume of EEE/WEEE per capita globally, also has one of the most favourable Consumer Rights legislation under the Consumer Rights Act (CRA) 2015. The CRA offers mandatory consumer rights that potentially hold the key to improving product longevity.

We believe that greater effort at relatively low cost is needed to increase the understanding and take up of consumer rights, guarantees and warranties through clear, consistent and simple communication at the point of sale and through leading consumer facing stakeholder organisations. This should be linked with improved consumer information labelling to show expected product life span and labelling on repairability and repair options

Extending the period for mandatory guarantees and reducing the burden of proof for failure versus misuse would benefit consumers and provide an incentive for repair options over replacement. Future Extended Producer Responsibility (EPR) regulations need to create modulated fees and prioritise repair over replacement to shift the market towards more durable products.

In summary

There is a significant lack of hard data on key system-wide factors affecting levels of consumption, utilisation and waste flows including collection rates, product repair and reprocessing of revalorisation of disposed products through remanufacturing, refurbishing or recycling.

There is a significant knowledge and data gap in the role of policy and regulation effectiveness in relation to purchasing, repair and disposal decisions. This makes it very difficult to assess the historic impact of consumer rights legislation, or the role of instruments such as labelling, warranties and guarantees or WEEE regulations.

Improving customer take-up rates of consumer rights, warranties, guarantees or wider repair opportunity especially for low-priced items, requires a comprehensive and systematic review of consumer behaviour and the activity costs.

To move the UK towards a future circular EEE/WEEE system at scale however will require much more effort and measures, with some essential next steps.

An impartial, accessible and reusable UK CE data intelligence system is urgently needed to provide a clear measurement and decision making framework in line with international CE measurement and analysis standards. Such a system is required to address multiple and fast changing policy, industry and public queries about EEE and WEEE, and provide the tools to monitor progress and evidence outcomes from diverse policy interventions and industry programmes towards a future circular economy state. Such a system would enable diverse stakeholders to contribute to, orchestrate and co-ordinate actions within a systematic, comprehensive and consistent CE framework as set out earlier in this report. Whilst data and evidence alone cannot deliver a circular economy, the complexity of EEE/WEEE can easily overwhelm and lead to fragmentation and losing sight of the overall goal; namely to reduce WEEE waste, increase overall material productivity, provide higher utility for consumers, and extend responsibility for more durable and repairable product design to suppliers.

References

Abdelmeguid, A., & Corsini, L. (2026). Barriers and Enablers of Circular Economy in Electrical and Electronic Equipment: A Systematic Literature Review. *Business Strategy and the Environment*, 1–34. https://doi.org/10.1002/bse.70559

Anthesis (2023). *Electrical and electronic equipment flows in the UK*. London: Anthesis Group.

Babbitt, C. W., Madaka, H., Althaf, S., Kasulaitis, B., & Ryen, E. G. (2020). Disassembly-based bill of materials data for consumer electronic products. *Scientific Data, 7*(1), 251. https://doi.org/10.1038/s41597-020-0573-9

Baldé, C.P., Forti, V., Gray, V., Kuehr, R. & Stegmann, P. (2024). *The Global E-waste Monitor 2024*. Bonn/Geneva/Rotterdam: United Nations Institute for Training and Research (UNITAR), International Telecommunication Union (ITU) and International Solid Waste Association (ISWA).

Basel Action Network (2019). *Holes in the Circular Economy: WEEE Leakage from Europe*. Seattle: Basel Action Network.

BEIS (2021). *UK Energy-related Products Policy Study.* London: Department for Business, Energy and Industrial Strategy.

Circular Flanders (no date). *Linear, recycling and circular economy infographic*. Available at: Circular Flanders infographic (Accessed: 7 May 2026).

Consumer Rights Act 2015 (c. 15) London: The Stationery Office.

Cramer, J.M. (2017). *Circular economy: lessons from practice*. The Hague: Eleven International Publishing.

Defra (2023). *UK statistics on waste and material resources*. London: Department for Environment, Food and Rural Affairs.

Ellen MacArthur Foundation (2013). *Towards the Circular Economy: Economic and business rationale for an accelerated transition*. Cowes: Ellen MacArthur Foundation.

Environment Agency (2023). *Waste Electrical and Electronic Equipment (WEEE): producer responsibility guidance*. Bristol: Environment Agency.

Environment Agency (2025). *UK Waste Electrical and Electronic Equipment (WEEE) data 2024*. Bristol: Environment Agency.

European Commission (2015). *Closing the loop: An EU action plan for the Circular Economy*. Brussels: European Commission.

Flachenecker, F. & Rentschler, J. (2016). *Investments in Resource Efficiency*. University College London.

Forti, V., Baldé, K., Kuehr, R. (2018). *E-waste Statistics: Guidelines on Classifications, Reporting and Indicators, second edition*. United Nations University, Bonn, Germany.

Geneva Environment Network (2026). *The growing environmental risk of e-waste*. Available at https://www.genevaenvironmentnetwork.org/resources/updates/the-growing-environmental-risks-of-e-waste/ (last accessed May 2026)

Industry Council for Electronic Equipment Recycling (2005). *Status Report on Waste Electrical and Electronic Equipment*. London: ICER.

Jacobs, G. & O'Neill, C. (2003). On the reliability (or otherwise) of SIC codes. *European Business Review*, 15(3), 164-169. https://doi.org/10.1108/09555340310474668

Jain, M, Hopkinson, P., Zils, M & Sabri, Y. (2025). Paradoxical Tensions in Net-Zero Innovation Implementation: A Network Orchestrator Perspective. *Academy of Management* available online at https://doi.org/10.5465/AMPROC.2025.16594abstract (last accessed May 2026)

Kirchherr, J., Reike, D. and Hekkert, M. (2017). Conceptualizing the circular economy: An analysis of 114 definitions. *Resources, Conservation and Recycling, 127*, 221–232.

Material Focus (2020). *Electrical waste challenges in the UK*. London: Material Focus.

OECD (2009). *Overcoming Barriers to Administrative Simplification Strategies: Guidance for Policy Makers*, OECD Publishing, Paris, https://doi.org/10.1787/9789264059726-en

Ongondo, F.O., Williams, I.D. & Cherrett, T.J. (2011). How are WEEE doing? A global review of the management of electrical and electronic wastes. *Waste Management, 31*(4), 714–730.

Office for National Statistics (2020). *Internet access – households and individuals, Great Britain: 2020*. Newport: Office for National Statistics.

Office for National Statistics (2022). *The digital economy in the UK*. Newport: Office for National Statistics.

Office for National Statistics (2023). *Capital stocks and fixed capital consumption, UK: 2023*. Newport: Office for National Statistics.

Office for National Statistics (2025a). *United Kingdom population mid-year estimate (Series ID: UKPOP)*.Population estimates time series dataset. Retrieved May 7, 2026, from https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/timeseries/ukpop/pop

Office for National Statistics (2025b). *Non-financial business economy, UK: Sections A to S*. Annual Business Survey dataset. Retrieved May 7, 2026, from https://www.ons.gov.uk/businessindustryandtrade/business/businessservices/datasets/

Office for National Statistics (2026a). Family spending workbook 1: detailed expenditure and trends. Available at: https://www.ons.gov.uk/peoplepopulationandcommunity/personalandhouseholdfinances/expenditure/datasets/familyspendingworkbook1detailedexpenditureandtrends (Accessed: 25 July 2026)

Office for National Statistics (2026b). UK non-financial business economy, Annual Business Survey: Sections A to S. Available at: https://www.ons.gov.uk/businessindustryandtrade/business/businessservices/datasets/uknonfinancialbusinesseconomyannualbusinesssurveysectionsas (Accessed: 25 July 2026).

Purdy, S. & Crocker, M. (2021). *An Independent Study into Fly-tipping and Unregistered Waste Carriers in England*. London: Material Focus. https://www.materialfocus.org.uk/report-and-research/an-independent-study-fly-tipping-unregistered-waste-carriers-england/

UN Comtrade (2025). *UN Comtrade Database*. Available at: UN Comtrade Database (Accessed: 7 May 2026).

UNEP (2010). *Assessing the environmental impacts of consumption and production: Priority products and materials*. Nairobi: United Nations Environment Programme.

Valpak (2018). *UK EEE flows study 2018*. Stratford-upon-Avon: Valpak Consulting.

Vlaanderen Circular (n.d.). *Sometimes a picture says more than a thousand words. Communication*. Available at https://www.vlaanderen-circulair.be/en/strategic-levers/communicatie (last accessed May 2026)

Widmer, R., Oswald-Krapf, H., Sinha-Khetriwal, D., Schnellmann, M. & Böni, H. (2005). Global perspectives on e-waste. *Environmental Impact Assessment Review, 25*(5), 436–458.

World Bank. (2023). *Access to electricity (% of population) (EG.ELC.ACCS.ZS)*. World Development Indicators. Retrieved May 7, 2026, from https://data.worldbank.org/indicator/EG.ELC.ACCS.ZS?locations=GB

World Health Organisation (WHO) (2024). *Electronic E-waste*. Available at https://www.who.int/news-room/fact-sheets/detail/electronic-waste-(e-waste) (last accessed May 2026)

WRAP (2016). *UK EEE flows report 2016*. Waste and Resources Action Programme (WRAP).

Zils, M. (2021). *Circular economy systems and productivity transitions*. Exeter: University of Exeter.

Zils, M. (2022). *Circular economy transformation frameworks and systems modelling*. Exeter: University of Exeter.

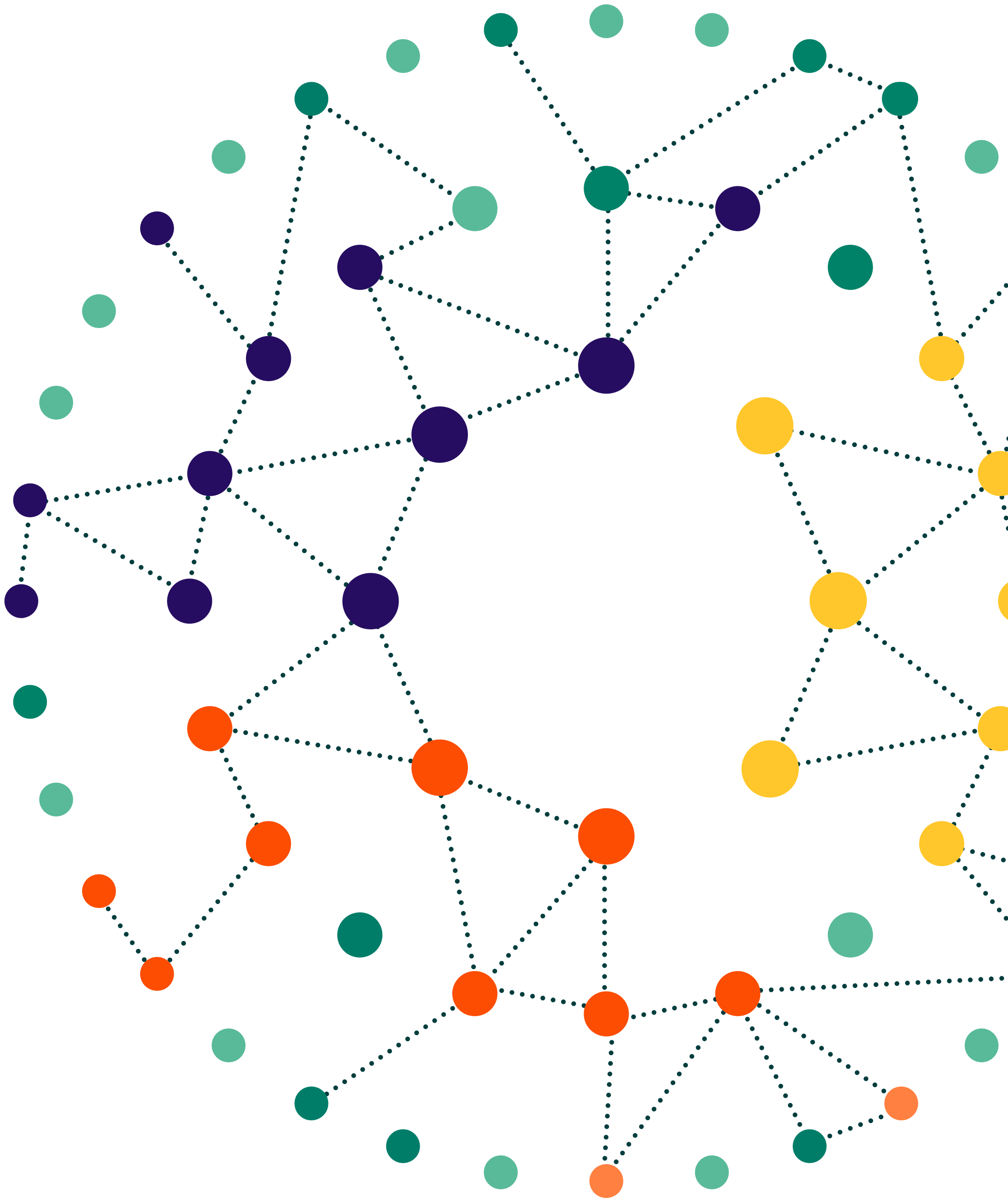
Zils, M., Hopkinson, P., Charnley, F., Pencheon, D., Dawson, T., Eatherley, D., Burton, K. & Gopfert, A. (2021). *Accelerating the transition towards a net zero NHS*. Exeter: University of Exeter Centre for Circular Economy in association with Philips UKI. Available at: Accelerating the transition towards a net zero NHS (Accessed: 7 May 2026).

Annex 1: Stakeholder Interviews

Eight one-hour interviews were conducted with participants recruited from producer representative associations, NGOs, charities, a range of businesses, and academics – all working in the sector of electronic appliances with direct interest, engagement and experience of circular economy approaches.

Discussions were steered towards solutions-based outcomes and insights, whilst giving well-placed people a chance to reflect on the feasibility and scope for accelerating social transformations in the way that businesses, governance and consumers can play a role.

Quotes that are displayed in this report are not comprehensive, but rather illustrative of themes. The initial findings of this analysis were presented at a workshop, where 28 participants discussed a selection of the themes. This iterative process allowed a larger group of participants to respond and bring more context and insights to support the results. A full copy of the report is available through request to D.thorman@sheffied.ac.uk



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