CIWM

BATTERIES – THE NEED FOR A NEW APPROACH

towards Extended Producer Responsibility

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1 Executive Summary

This CIWM commissioned research project, 'Batteries – the need for a new approach towards Extended Producer Responsibility', set out to review public attitudes towards current producer responsibility arrangements for batteries and engage stakeholders to inform and influence future management and recovery of used batteries. The work builds on previous sector and issue engagement by CIWM including a 2020 webinar, and recent work carried out by the Environmental Services Association (ESA).

Fires caused by batteries are a crisis for the resources and waste sector, for taxpayers, for homeowners, and for Government. Addressing the problem is an emergency, and an emergency response is required. Batteries are a perfect candidate for extended producer responsibility and a deposit return scheme.

There were more than 1,200 fires caused by or suspected to have been caused by batteries at UK waste and recycling sites and vehicles in 2023 (Material Focus, 2024), an increase of 71% from 2022. These are batteries – in particular, high-powered, rechargeable batteries – that should not have been put in a bin, which should instead have been taken to a collection point.

The cost of the damage and lost time from these unacceptable and entirely avoidable fires caused by batteries is estimated at £158 million in annual damages (Eunomia, 2021). Fortunately, so far no-one has been killed in any of these incidents however clearly there is significant concern that this fortune may run out.

There are three reasons why these high-powered rechargeable batteries are ending up in bins – the wrong waste in the wrong place:

1. Clear and impactful information on how to correctly dispose of used batteries is not reaching consumers at point-of-sale or disposal and consumer awareness of the hazards is low due to a lack of funding for campaigns;

2. Batteries are finding their way into more and more everyday items, from single-use vapes to toys and gadgets and even into clothes and shoes, and consumers may be unaware an item even contains a battery;

3. Producer responsibility rules have not kept up with changing chemistry and pervasiveness of technology, with little or no incentive for manufacturers or retailers to change, placing the burden of cost onto local authorities.

Championing extended producer responsibility, and supporting the sector's transition to a circular and net zero economy are key commitments for CIWM – along with promoting safety for colleagues and consumer value for money.

1.1 What most consumers think about batteries

Our consumer research shows that the public are concerned over the impact and danger of batteries, are keen to do the right thing and strongly support action for change.

There is a lack of knowledge, information and confidence amongst consumers on how to dispose of batteries and gadgets that may contain batteries. This is particularly problematic in relation to cheaper/lower value and smaller items, such as vapes and rechargeable toothbrushes, whereas higher-value items are more likely to be traded in or sold on, with fewer ending up in a bin.

Where batteries can be removed and replaced, i.e. traditional 'AA' batteries, they are much more likely to be taken back to a retailer or other collection point – by almost 70% of people.

By contrast, higher value or larger items are more likely to be traded or otherwise taken to a Household Waste & Recycling Centre (HWRC). Breaking this down for typical example items, the charts below show that the degree of confidence an individual may have does not necessarily follow through into markedly improved outcomes, showing a lack of information reaching consumers due to low point-of-sale and disposal cut-through.

The public are 'petrified' when they discover the true impact of putting the wrong waste in the wrong place, in this case a battery or an item containing a battery in the bin.

1.2 There is strong support for a deposit-return scheme

Continuing with 'business as usual' is unacceptable and change must happen in order that this urgent crisis for our industry, for taxpayers and for Government can be addressed.

Our research indicates that the public strongly support the use of deposits for items like batteries. The level of deposit doesn't need to be very high or set at a percentage of the value of a product, because the big-ticket items when it comes to 'wrong waste – wrong place' are cheaper, smaller products such as vapes and toothbrushes.

1.3 There is a clear need for targeted action

The report shows that action on batteries should be targeted:

- clear and unambiguous definitions for battery types and categories to prevent the current lead-acid imbalance
- problem products tend to be lower-value, smaller items e.g. rechargeable toothbrushes, vapes etc, not higher value, expensive or large items, e.g. smartphone, laptop, cordless garden tools
- place a flat-rate deposit on batteries or products containing batteries, e.g. £2
- potential for an eco-design 'levy' on products where currently batteries cannot be removed or replaced, as an incentive to producers to improve design and/or to consumers to buy a different product in lieu of inaction by manufacturers
- unclaimed deposits/levy income should be used to promote research and development – these should be cost-neutral as the objective must be to set up systems for success… EPR should be there to cover collection/recycling costs.

By encouraging removable batteries and supporting the right to repair, products will be better made e.g. motors will have to last several battery-life cycles and/or be repairable too, ensuring products last longer and offer consumers better value-for-money.

CIWM supports the expansion of take-back schemes which are the right approach to support the mission of 'simpler recycling':

- making the problem and solution visible to consumers;
- ensuring the producer pays; and

- enabling the management of deposit scheme administration and levy collection (collected for and on behalf of the exchequer at point of sale, akin to VAT).

Whilst this will interrupt 'Business as Usual' and be mildly inconvenient for retailers and manufacturers, it's much less inconvenient than setting fire to vehicles and facilities used to manage society's waste and recycling.

1.4 We need a new deal for consumers

1. Battery manufacturers and retailers need to act immediately and work with the CIWM to **promote safer, simpler recycling**, ensure 'the right waste in the right place' and celebrate success, such as measures being put in place by the Bicycle Association to collect e-bike batteries, which make the problem and solutions more visible.

   It is great to see voluntary schemes being implemented which take the issue of batteries, battery disposal and battery safety seriously and it is exactly these sorts of schemes that should become mandatory under EPR.

2. **Chemistry-specific targets** must be brought in and introduced as part of the process of updating existing battery producer responsibility legislation to an EPR for batteries, as a matter of urgency to ensure consumers can access collection points and industry-funded take-back schemes for high-powered rechargeable batteries and items containing these batteries – lead acid batteries account for 70% of recycling evidence but are just 3% of the UK market.

   Currently compliance is a box-ticking exercise – targets are being easily met at the expense of disincentivising investment in capacity to handle and recycle non-lead acid batteries. This is a quirk of the current out-of-date regulations and needs reviewing urgently, however this amendment to the current regulations is only a quick fix to address the current emergency situation being caused by batteries; it is not a long-term solution.

3. Work should start immediately on a **deposit-return scheme for batteries** which our research shows the public strongly supports this measure and the problem items are generally smaller/cheaper where a modest deposit will have the highest impact.

We think a modest, flat rate deposit on all batteries or items containing batteries would be simple and effective, targeting the most problematic products and spurring action to address the issues flagged above. Retailers and manufacturers would need to ensure battery collections or collection points were available.

Deposits would have the additional effect of challenging manufacturers to come up with better product designs, drive more products to have removeable and replaceable batteries and bring about the beginning of the end of designed-in obsolescence dictated by battery life. This would vastly improve safety of products at the end-of-life, reducing the risk to CIWM members and the public, and improve value for money through repairability.

4. Support needs to galvanise around the development of **domestic rare-earth material circularity** and tech circularity businesses – this is not about amending end-of-life regulations, but a fundamental shift in attitudes from 'cost' to 'value' through right-to-repair and eco-design principles.

   With global demand for rare earths materials expected to reach 466,000te by 2035, up from 170,000te in 2022, clearly there is demand for these materials. Urgent Government action is needed to support R&D investment in rare-earth material recycling.

   Combined with the above points, the UK should lead by example and move from being one of the most wasteful societies in the world when it comes to electrical and electronic equipment, to become one of the most progressive and resourceful, respecting the safety of others and grasping the opportunity presented by mining the urban environment for valuable materials, supporting manufacturing and export, creating jobs and skills as a result.

CIWM is taking a lead on the issues end-of-life batteries are having on workers within the Resource & Waste sector, and the lost opportunity that this currently presents as an example of why EPR needs to be extended. CIWM is:

- standing up for consumers;
- protecting workers in the resources and waste sector;
- safeguarding critical raw material and driving the UK towards a more circular economy

Ultimately, we see a clear path towards 'EPR of Everything' as a policy priority area, focusing on materials, products and sectors where either there is no current or direct producer responsibility code or requirement, or where what does exist has demonstrably fallen short in delivery or fallen behind current technology, policy or practice as is the case with batteries.

1.5 Conclusions

The impacts of selling cheap, single-use plastic items containing a non-rechargeable, single-use battery were entirely foreseeable. The same is true of embedding powerful, rechargeable batteries inside electrical and electronic products – making them removeable and replaceable is the minimum requirement.

The experience with disposable vapes demonstrates that the problems were entirely foreseeable but that we will have had to wait around a decade, facing a growing problem, before legislation finally catches up.

It cannot be allowed to happen with clothing and aftermarket bike parts, both of which increasingly appear in general waste containing high-powered, rechargeable batteries.

Unless we change things, the main impact will, of course, be on local authorities, charity shops and recycling collection companies, not on retailers and manufacturers.

We must ensure we use our foresight to never make the same mistakes again.

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3 Acknowledgements

This report was commissioned by the Chartered Institution of Wastes Management (CIWM) and written by John Twitchen, from the consulting company env23.

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He has worked in the resources and waste industry for over thirty years. John set up the UK's first specialist environmental communications consultancy, Sauce, and has since established the Earthshot Prize nominated and award-winning circular economy company, Stuff4Life.

4 Overview

4.1 History, challenges, problems, policies and situation report

For more than a decade, 'batteries' have been subject to producer responsibility requirements in the UK; the system relies on consumers (households and businesses) to segregate batteries from other waste items and either take them to a drop-off point or arrange for a collection.

Organisations over a certain size may be subject to producer responsibility requirements, in most cases requiring them simply to provide a collection point e.g. for consumers (householders or small businesses). Some local authorities provide householders with kerbside collections and most offer drop-off points at Household Waste Recycling Centres.

4.2 Recent history of battery technology development

Over the last twenty years, consumer batteries have undergone significant evolution in terms of technology, performance, and applications. The key developments can be summarised as follows:

- Lithium-ion Dominance: Lithium-ion (Li-ion) batteries have become the dominant technology for consumer electronics. They offered higher energy density, longer cycle life, and lighter weight compared to traditional nickel-based batteries, enabling batteries to be smaller relative to energy output.

- Increased Energy Density: Continuous research and development efforts led to improvements in the energy density of batteries. This allowed for more compact and lightweight devices with longer-lasting battery life.

- Advancements in Lithium Polymer Batteries: Lithium polymer (Li-poly) batteries emerged as a variation of Li-ion batteries, offering flexibility in form factor. This made them suitable for slim and curved devices, such as smartphones and wearables.

- Fast Charging Technologies: The demand for faster charging times led to the development of various fast charging technologies, such as Qualcomm's Quick Charge, USB Power Delivery, and proprietary solutions from smartphone manufacturers. These technologies significantly reduced the time required to charge devices.

- Energy-Efficient Devices: Manufacturers focused on optimizing the energy efficiency of electronic devices, leading to better overall battery life. This involved improvements in both hardware and software to minimize power consumption during various usage scenarios.

- Introduction of Solid-State Batteries: In recent years, there has been growing interest in solid-state batteries as a potential successor to traditional Li-ion batteries. Solid-state batteries promise higher energy density, improved safety, and longer lifespan; commercialisation is in progress.

- Electric Vehicles (EVs) Revolution: The automotive industry witnessed a shift towards electric vehicles, driving advancements in battery technology. High-capacity Li-ion batteries became crucial for extending the range of electric cars, and ongoing research aims to improve their performance and reduce costs.

- Environmental Considerations: With increasing awareness of environmental issues, there has been a focus on developing more sustainable battery technologies. Efforts include recycling programs and the exploration of alternative materials to reduce the environmental impact of battery production and disposal.

- Integration of Smart Battery Management: Smart battery management systems became integral for optimising battery performance, preventing overcharging, and enhancing overall safety. These systems are crucial in ensuring the longevity and reliability of batteries in various devices.

- Wireless Charging Standardisation: The standardisation of wireless charging technologies, such as Qi wireless charging, became more widespread. This allows for greater convenience and eliminates the need for physical connectors in some devices.

Overall, the evolution of consumer batteries over the last two decades has been marked by advancements in energy density, charging technologies, environmental consciousness, and the exploration of new battery chemistries to meet the growing demands of modern electronics and electric transportation.

This in turn has led to a proliferation of use and liberal regulations have led to unintended consequences the resource management sector now faces daily in the form of dangers to people and property posed by explosions and fires caused by batteries that have been disposed of incorrectly.

Figure 1: Aftermath of a huge fire at Carmarthen recycling facility in 2021, where a battery was found to be the cause

Figure 2: Aftermath of a domestic fire caused by a rechargeable battery (from London Fire Brigade)

4.3 History of producer responsibility

Battery producer responsibility regulations have been implemented in various regions globally to address the environmental impact of batteries and promote their responsible disposal and recycling. The history of these regulations can vary by country and region, but here is a general overview:

- 1990s - Early Awareness: In the 1990s, concerns about the environmental impact of batteries, particularly those containing heavy metals like cadmium and mercury, started to gain attention. These concerns were linked to the improper disposal of batteries, which led to soil and water contamination.

- EU Battery Directive (2006): In the European Union (EU), the Battery Directive was adopted in 2006. The directive aimed to minimise the environmental impact of batteries and accumulators, especially those containing hazardous substances. It introduced requirements for labelling, collection, recycling, and proper disposal of batteries.

- Global Momentum: Following the EU's lead, other countries and regions began to implement or explore battery producer responsibility regulations. The focus was

on minimising the environmental impact, increasing recycling rates, and reducing the presence of hazardous materials in batteries.

- Revisions and Amendments: Over the years, the EU Battery Directive has undergone revisions to adapt to technological advancements and changing environmental priorities. Amendments have been made to include new battery technologies, such as lithium-ion batteries commonly used in consumer electronics and electric vehicles.

- National Legislation: Many countries around the world have implemented their own battery producer responsibility regulations. These regulations often require manufacturers to take responsibility for the entire lifecycle of their batteries, from production to proper disposal and recycling.

- Extended Producer Responsibility (EPR): The concept of Extended Producer Responsibility has become a guiding principle in many regulatory frameworks. Under EPR, producers are responsible for managing the environmental impact of their products throughout their life cycle. This includes financing and organising collection, recycling, and disposal systems.

- Incentives for Recycling: Some regions have introduced incentives for battery recycling, encouraging manufacturers to design products with recycling in mind and supporting the development of efficient recycling infrastructure.

- Technology-Specific Regulations: As battery technologies evolve, regulations may need to be adapted to address the unique challenges posed by different types of batteries, such as lithium-ion batteries used in electric vehicles and portable electronics.

- Global Harmonisation Efforts: Recognising the global nature of the electronics industry, there have been efforts to harmonise regulations to some extent, facilitating international trade while ensuring responsible management of batteries.

The specifics of battery producer responsibility regulations vary widely between countries and regions. The regulatory landscape continues to evolve as new technologies emerge, and environmental priorities shift. However, in the UK and indeed

across Europe, regulations have fallen behind chemistry and technology, as well as how batteries are used (e.g. being embedded in products and used in a wider range of consumer products).

Did you know…?

Nike produced the first pair of trainers to include a rechargeable battery in a redesign of Marty McFly's 1989 Nike MAGs in 'Back to the Future' (set in futuristic 2015). 1,500 pairs were auctioned online in 2011 with proceeds going to the Michael J. Fox Foundation.

The battery was apparently good for 3,000 hours of operation.

Figure 3: image of Nike MAG (from Wikipedia)

4.4 Challenges and problems

The main challenges presented by batteries are quite straightforward:

- the producer responsibility requirements are out of date and haven't kept up with market activity, being chemistry agnostic
- producer responsibility targets are being met by collecting heavier, less volatile batteries
- high-powered, rechargeable batteries are now prevalent and often embedded in items (including cheap consumer goods such as bike lights, even clothing; and in single-use items e.g. vapes)
- when crushed or damaged, high-powered, rechargeable batteries can combust and cause fires, damaging vehicles and buildings used to transport, store or process waste and endangering lives
- despite a requirement to 'raise awareness' efforts have been mediocre due to a lack of urgency by producers who are meeting targets without the need to collect high-powered batteries that are the main cause of problems.

The key issue is the 'anomaly' or 'vast misreporting' of lead acid batteries in the UK, comments which were reported in an MRW article 'published 17 November 2023, by a spokesperson for the Approved Authorised Treatment Facility (AATF) Forum. The AATF's figures suggest that ten times more portable lead acid batteries were collected for recycling than the number that were sold, as per Table 1 below. This is widely seen as the key blocker of investment in treatment and recycling facilities for other battery chemistries, as targets are currently chemistry agnostic.

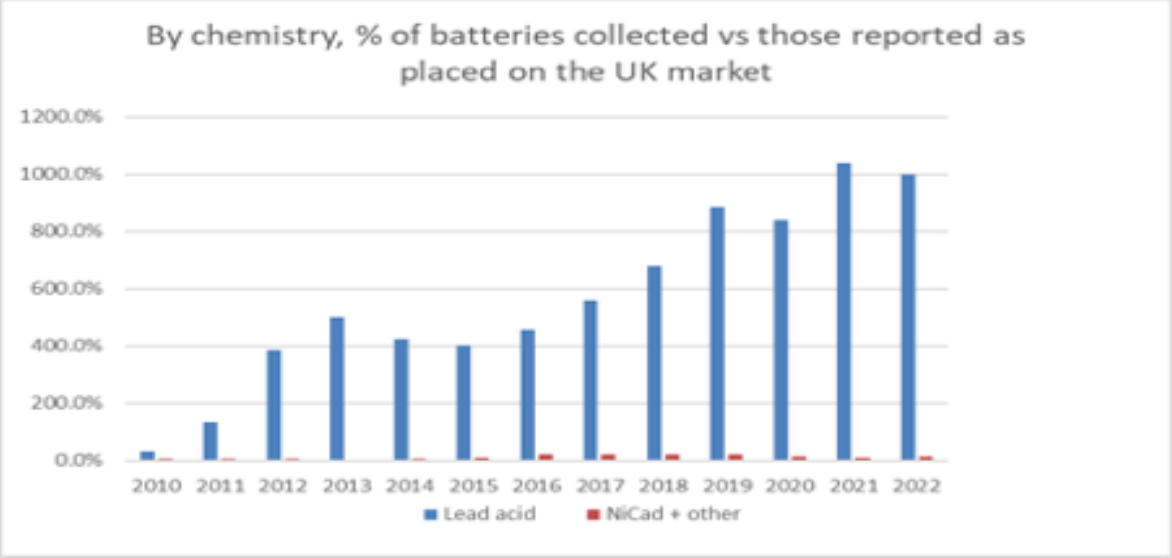


Table 1: AATF figures

While consumer electronics have benefited greatly from advancements in battery technology, there are still several challenges and problems associated with batteries in these devices, with common issues including:

1. **Limited energy density:** Despite improvements, the energy density of batteries remains a challenge. Consumers often desire longer battery life, but achieving this without increasing the size and weight of the battery can be difficult.

2. **Slow charging times:** Although there have been strides in fast charging technologies, many consumers still find charging times to be relatively slow. This is especially true for larger devices like laptops and electric vehicles.

3. **Limited lifespan:** Batteries have a finite lifespan, typically measured in charge cycles. Over time, a battery's capacity diminishes, leading to shorter battery life. This degradation is a concern for consumers who want their devices to remain functional for an extended period.

4. **Safety concerns:** Safety issues, such as overheating and the rare occurrence of battery fires, can pose serious risks. These concerns are particularly significant in cases of poorly manufactured or damaged batteries.

Figure 4 - Battery exploding in a recycling facility endangering employees (picture from ESA Zombie Batteries campaign/ITV News)

5. **Environmental impact:** The production, use, and disposal of batteries contribute to environmental challenges. Mining for raw materials, manufacturing processes, and the disposal of used batteries raise environmental concerns. Efforts are being made to develop more sustainable and recyclable battery technologies.

6. **Costs and affordability:** Advanced battery technologies, such as lithium-ion, can be expensive to manufacture. This cost is often passed on to consumers, affecting the overall affordability of electronic devices, especially those with larger and more powerful batteries.

7. **Size and weight constraints:** As devices become smaller and more portable, there is a constant demand for smaller and lighter batteries. Balancing the need for compactness with the desire for increased energy storage capacity remains a challenge.

8. **Dependency on rare materials:** Many advanced batteries rely on materials that are scarce or sourced from specific regions. This dependence on rare materials can lead to supply chain issues and price volatility.

9. **Incompatibility of charging standards:** The lack of a universal charging standard for all devices can be inconvenient for consumers. Different devices may require different charging cables and adapters, leading to clutter and frustration.

10. **Memory effect:** While less common in modern lithium-ion batteries, certain older battery chemistries were prone to the memory effect, where the battery "remembered" its capacity and would not charge fully if not completely discharged first.

Addressing these challenges requires ongoing research and innovation in battery technology, as well as the development of sustainable practices throughout the entire lifecycle of batteries, from production to disposal.

4.4.1 Recycling of Batteries

The recycling of traditional batteries (e.g. lead-acid based chemistry) is well established. According to figures published on the Environment Agency's National Packaging Waste Database (NPWD), in 2023 45.5% of portable batteries placed on the market in the UK were reported as being recycled, just exceeding the target of 45%. However, despite this, it is estimated that approximately 20,000 tonnes of batteries end up in landfill every year (or end up incinerated), apparently enough energy to power a city the size of Birmingham for an entire day.

In the UK there are five registered battery compliance schemes (scheme names followed by scheme operators in brackets): BatteryBack (Wastecare Compliance Plc); Ecosurety Batteries Ltd (Valpak Batteries Limited) ; ERP UK Ltd (ERP UK Ltd) ; REPIC (RESC Limited); and Valpak Ltd (Valpak Ltd), and a number of recognised, registered battery recycling companies, focused primarily on traditional batteries and driven through compliance

with existing batteries regulations. The following organisations offer battery collection and recycling in the UK, and access to overseas reprocessing:

Enva - waste management and recycling company that operates in the UK. They offer battery recycling services, among other waste management solutions.

Ecosurety - recycling compliance scheme in the UK that works with businesses to ensure proper waste management, including battery recycling.

Veolia - global environmental services company with a presence in the UK. They offer recycling services, including the recycling of batteries and other electronic waste.

Cawleys Waste Management - waste management company in the UK that provides recycling solutions, including the recycling of batteries and electronic waste.

Electrocycling - specialise in the recycling of electronic waste, including batteries. They operate in compliance with environmental regulations and provide recycling services in the UK.

Gem Recycling - waste management company in the UK that offers recycling services, including the recycling of batteries.

Recolight - primarily focuses on the recycling of lighting equipment but also participate in the recycling of batteries, including those used in electronic devices.

However, recycling lithium-ion style rechargeable batteries is more challenging and technology is still emerging. In the UK as in many other jurisdictions, this is hampered by a lack of meaningful targets in place for all battery chemistries. Despite this, there are a number of emerging recycling technology companies and a growing industry around rarer materials:

G&P Batteries - UK-based company that specialises in battery recycling services. They handle a variety of battery types, including lithium-ion batteries.

Technology Minerals - set to open the "UK's first" industrial-scale lithium-ion (Li-ion) battery recycling facility. The company has announced that its 48.25% owned battery recycling business, Recyclus Group Ltd (Recyclus), has received final clearance from the

Environment Agency (EA) to commence full operations at its lithium-ion (Li-ion) battery recycling plant in Wolverhampton.

Umicore - global materials technology and recycling company. They are known for their expertise in recycling various materials, including precious metals and battery materials. Umicore has a strong focus on sustainable practices and plays a significant role in the recycling of lithium-ion batteries.

Retriev Technologies - specialises in the recycling of lithium-ion batteries for various applications, including those used in electric vehicles (EVs) and consumer electronics. They offer solutions for both battery manufacturers and end-of-life battery disposal.

Battery Solutions - provides battery recycling services, including the recycling of lithium-ion batteries. They work with a variety of industries, including electronics manufacturers, to responsibly handle battery waste.

Li-Cycle – focuses on advanced lithium-ion battery recycling technologies. They use a proprietary process to recover high-purity materials from batteries, aiming to create a closed-loop system for battery materials.

American Manganese – focuses on the recycling of lithium-ion batteries, with a particular emphasis on recovering valuable metals like cobalt, lithium, nickel, and manganese using their patented recycling process.

4.4.2 Critical raw materials

Critical raw materials (CRMs) are natural resources including lithium that are crucial for the development and manufacturing of advanced technologies, high-tech products, and strategic industries. These materials are essential for economic growth, innovation, and the transition to a more sustainable and technologically advanced society. However, the availability and sustainable sourcing of critical raw materials pose significant challenges, including:

1. **Geopolitical dependence**: Many critical raw materials are concentrated in a few countries or regions, leading to geopolitical dependence. This dependence can pose risks related to supply disruptions, trade tensions, and the potential use of resource-related strategies as geopolitical leverage.

2. **Supply chain vulnerability**: The global supply chains for critical raw materials are complex and interconnected. Disruptions caused by geopolitical events, natural disasters, economic shifts, or global crises (such as the COVID-19 pandemic) can impact the availability and pricing of these materials.

3. **Market concentration:** The extraction and processing of some critical raw materials are dominated by a small number of companies or countries. This market concentration can lead to limited competition, pricing volatility, and potential supply issues.

4. **Environmental and social impacts:** The extraction and processing of critical raw materials often have environmental and social implications. Unsustainable mining practices, habitat destruction, water pollution, and social conflicts can arise, leading to negative environmental and human rights consequences.

5. **Resource depletion:** Some critical raw materials are non-renewable resources, and their extraction can lead to resource depletion. Overexploitation of these resources without effective recycling and substitution strategies can result in long-term supply challenges.

6. **Lack of diversification:** Overreliance on a specific material for a particular application can create vulnerabilities. Diversification in material use and exploration of alternative materials with similar properties can help mitigate risks associated with the scarcity of a single critical raw material.

7. **Technological advances and changing demand:** Rapid technological advancements and shifts in market demand can alter the landscape of critical raw material usage. New technologies may emerge, reducing reliance on certain materials or creating increased demand for others.

8. **Recycling challenges:** Efficient recycling processes for many critical raw materials are often lacking or economically challenging. Developing effective recycling technologies and establishing robust recycling infrastructure is crucial for mitigating the reliance on primary raw material extraction.

9. **Trade and export restrictions:** Some countries impose export restrictions on critical raw materials to ensure domestic supply or protect resources. These restrictions can disrupt global supply chains and create challenges for industries reliant on these materials.

10. **Policy and regulatory hurdles:** The absence of clear and consistent policies or regulations related to critical raw materials can impede sustainable sourcing and supply chain management. Regulatory frameworks that promote responsible sourcing, recycling, and substitution are essential.

Addressing these challenges requires international collaboration, sustainable resource management practices, investment in research and development, and the implementation of policies that balance economic interests with environmental and social considerations.

The European Union and other regions have taken steps to address critical raw material challenges through initiatives focused on responsible sourcing, recycling, and reducing dependency on specific materials.

4.4.3 Lithium

The lithium supply chain faces several challenges that can impact the availability and cost of lithium, a critical raw material used in batteries for EVs, renewable energy storage, and various electronic devices. Some of the key challenges with lithium supply include:

1. **Geopolitical concentration:** A significant portion of the world's lithium reserves is concentrated in a few countries, with the "lithium triangle" in South America (Chile, Argentina, and Bolivia) containing a substantial share. Geopolitical factors, including political instability and policy changes in these regions, can affect the global supply of lithium.

2. **Extraction and production costs:** Lithium extraction and processing can be energy-intensive and costly. The cost of lithium production, including mining, brine extraction, and chemical processing, can influence the overall cost of lithium-ion batteries.

3. **Limited number of producers:** The lithium market is characterized by a limited number of major producers. This lack of diversity in the supply chain can lead to concentration risks, including potential supply disruptions due to issues faced by a small number of producers.

4. **Resource depletion:** As demand for lithium continues to rise with the growth of electric vehicles and renewable energy storage, concerns about resource depletion have emerged. Sustainable and responsible mining practices are essential to address these concerns.

5. **New discoveries and exploration:** Ongoing exploration efforts are needed to discover new lithium deposits and expand the available reserves. Geological challenges, exploration costs, and environmental considerations can impact the pace at which new lithium resources are identified and developed.

6. **Environmental and social concerns:** The extraction of lithium, particularly from brine deposits, can have environmental and social impacts. Issues such as water usage, habitat disruption, and potential conflicts with local communities can arise and must be addressed for responsible and sustainable lithium production.

7. **Technology shifts and substitution:** The rapid evolution of battery technology may lead to the development of alternative chemistries that do not rely on lithium. While this could reduce dependence on lithium, it may introduce new challenges associated with the production and availability of alternative materials.

8. **Transportation and infrastructure challenges:** The transportation of lithium from production sites to manufacturing facilities and end-users can face logistical challenges, including issues related to infrastructure, transportation costs, and potential bottlenecks in the supply chain.

9. **Trade and export policies:** Export restrictions imposed by lithium-producing countries can impact the global supply chain. Changes in trade policies or export quotas can affect the availability and pricing of lithium on the international market.

10. **Investment and financing:** The expansion of lithium production capacity requires significant investment. Financing challenges or uncertainties about

market demand can affect the willingness of companies to invest in new lithium projects.

Addressing these challenges involves a combination of technological innovation, sustainable mining practices, international collaboration, and investment in exploration and production.

Efforts to improve recycling technologies and promote circular economy principles can contribute to a more sustainable and resilient lithium supply chain.

However, given the aforementioned shortage of capacity in the UK and Europe, there remains both a challenge and an opportunity here in the UK to ensure critical raw materials such as lithium can be recovered, retained and utilised in what presents a major opportunity for investment in the UK economy.

4.4.4 Hazards – why do rechargeable batteries catch fire?

Rechargeable batteries, particularly lithium-ion batteries, have been known to catch fire or experience thermal runaway events. Several factors contribute to the risk of fire or thermal incidents in rechargeable batteries:

1. **Chemical composition:** Lithium-ion batteries contain flammable electrolytes, typically in the form of a lithium salt dissolved in a solvent. The combination of highly reactive lithium and flammable electrolytes can lead to thermal runaway if the battery is damaged or subjected to conditions that cause internal short circuits.

2. **Physical Damage:** Physical damage to the battery, such as puncture, crushing, or impact, can compromise the integrity of the battery's internal components. This damage can lead to the formation of internal short circuits, triggering rapid and uncontrolled chemical reactions within the battery. Damage could be due to an accident or, of course, from being crushed if a battery or a gadget containing a battery is incorrectly disposed of in a waste or recycling bin, and crushed during collection, transportation, sorting or landfilling.

3. **Overcharging:** Overcharging a rechargeable battery can cause the formation of lithium metal on the battery's anode, leading to internal short circuits and thermal

runaway. Overcharging can be a result of faulty charging circuits or the use of incompatible chargers.

4. **Over discharging:** Discharging a battery below its recommended voltage range can cause the formation of metallic lithium on the battery's anode. This can result in the growth of dendrites, which are conductive filaments that can pierce the separator between the battery's electrodes, leading to internal short circuits.

5. **Manufacturing defects:** Poor manufacturing practices or defects in the production of rechargeable batteries can introduce weaknesses in the battery's structure, making it more susceptible to thermal events.

6. **External factors:** Exposure to high temperatures, excessive humidity, or other adverse environmental conditions can contribute to the degradation of the battery's internal components and increase the risk of thermal runaway.

7. **Incompatible chargers:** Using chargers that are not designed for a specific type of rechargeable battery or using counterfeit chargers can lead to overcharging, overheating, and other safety hazards.

8. **Poor quality control:** In some cases, rechargeable batteries may be produced with inadequate quality control measures, leading to variations in the manufacturing process that can impact the safety and performance of the batteries.

9. **Design flaws:** Some battery designs may have inherent flaws that increase the risk of thermal runaway. This could include issues related to the separation between the battery's electrodes, the choice of materials, or the design of the battery management system.

Manufacturers implement safety features and incorporate battery management systems to minimize the risk of fire or thermal events in rechargeable batteries. These safety features include thermal protection, overcharge protection, and short-circuit protection.

However, users must also follow proper charging practices, avoid physical damage to batteries, and use quality chargers to ensure the safe operation of rechargeable batteries.

4.5 Situation report – an increasing number of incidents in the UK

As previously mentioned, each year in the UK alone, approximately 20,000 tonnes of batteries end up in landfill. It is clear that producer responsibility requirements need to be updated – too many fires have already been caused and too many lives endangered, post-collection. The government estimates that five million disposable vapes are thrown away each week, up from 1.3 million from last year. "Over a year, this is equivalent to the lithium batteries of 5,000 electric vehicles."

Eunomia Research and Consulting found that lithium-ion batteries currently cause about 48% of all waste fires in the UK each year, resulting in £158 million in annual damages.

We could cite 20, 50, 100 recent examples of fires caused by batteries at waste management facilities... here is one of the most recent, featuring an aftermarket e-bike conversion very close to home in Bournemouth.

The problem is very serious – poor quality rechargeable batteries included in or added to everyday items such as bikes, scooters etc left in hallways to charge overnight, have caused fires and lives have been lost. Whilst these 'upstream' issues are out-of-scope for this report, it is nevertheless important to consider how end-of-life and circularity solutions could help to address issues of quality and consumer awareness, increasing people's knowledge of hazards and reducing risks.

The Government is now taking action to address certain battery issues, with a call for evidence due to be launched early next year focused on increasing collection and recycling rates for batteries. The primary focus is to support the UK's transition to electric vehicles (EVs), and follows publication of its Battery Strategy.

Concerns over the number and size of EV car batteries that will require end-of-life management in the coming years and decades is the equivalent of focusing on saving rhinos and tigers - the 'charismatic megafauna' effect whereby the severe mass-extinction event continues with the loss of hundreds of other species through the diversion of funds into big game parks.

All the while people are trying to solve how to recycle large EV batteries 'in the future', there are compact and powerful lithium-ion batteries in smaller, cheaper electrical items causing damage, destruction and deaths every day.

4.6 Policies

Several regulations in the United Kingdom govern the production, sale, and disposal of batteries:

1. **The Waste Batteries and Accumulators Regulations 2009 (as amended):** This legislation implements the EU Battery Directive in the UK and sets out requirements for the collection, treatment, recycling, and disposal of waste batteries and accumulators. It also includes obligations for producers, distributors, and end-users. After extensive industry engagement, the regulations focused on end-of-pipe collection rather than a wider view on design, manufacture, use and chemistry.

2. **The Waste Electrical and Electronic Equipment (WEEE) Regulations:** In the UK these regulations primarily focus on waste management, recycling, and the proper disposal of electrical and electronic products, including batteries. The regulations aim to reduce the environmental impact of electronic waste by encouraging recycling and responsible disposal.

3. **Extended Producer Responsibility (EPR) Regulations:** The UK government has been considering and implementing extended producer responsibility schemes, which are part of a broader strategy to shift the financial and operational burden of waste management from local authorities to producers. The aim is to encourage producers to design products with end-of-life considerations in mind and to fund the collection and recycling of their products.

4. **UK REACH Regulations:** The UK's REACH (Registration, Evaluation, Authorization, and Restriction of Chemicals) regulations, which came into effect after the end of the Brexit transition period, regulate the use of certain chemicals in products, including batteries. Compliance with REACH may involve registration and reporting requirements for substances used in batteries.

5. **Ecological design requirements:** The UK may adopt ecological design requirements for batteries, aligning with EU regulations. These requirements focus on improving the environmental performance of batteries by setting criteria related to their energy efficiency, recyclability, and other factors.

6. **Product safety and standards regulations:** Batteries sold in the UK must comply with safety and standards regulations. These regulations ensure that products, including batteries, meet specified safety requirements to protect consumers.

7. **Batteries (Placing on the Market) Regulations 2010 (as amended):** This set of regulations outlines rules regarding the placing on the market of batteries and accumulators, including labelling requirements and restrictions on the presence of certain hazardous substances.

Additionally, Europe has recently consulted on new rules concerning removeable and replaceable batteries, supported by European waste and recycling representative groups, FEAD and EuRIC. The regulation, adopted in July 2023 by the European Council, sets a 2027 implementation requirement for manufacturers of portable appliances to feature replaceable batteries that can be easily removed by the end-user. The regulation's scope covers smartphones and tablets, electric bikes and e-scooters. The regulations will ramp up over time.

We set out to test policy options in the consumer research, including the potential for deposit return options.

4.7 Awareness

The requirement to raise awareness of battery recycling in the UK was introduced as part of the Waste Batteries and Accumulators Regulations 2009. This legislation implemented the EU Battery Directive in the United Kingdom and became effective on May 1, 2009. The directive aimed to minimize the environmental impact of waste batteries and accumulators by establishing rules for their collection, recycling, and proper disposal.

One of the key aspects of these regulations was the focus on increasing public awareness of battery recycling. Producers and distributors of batteries were required to label their products with specific information regarding recycling and proper disposal.

The labels were intended to inform consumers about the importance of recycling batteries and provide guidance on how to do so.

The awareness-raising requirements were designed to encourage responsible disposal practices and contribute to the reduction of environmental pollution caused by improper disposal of batteries. This emphasis on public awareness aligns with the broader principles of extended producer responsibility, where producers share responsibility for the environmental impact of their products throughout the entire lifecycle.

We set out to test awareness of how to dispose of batteries, the dangers of batteries and consumer campaigns aimed at raising awareness in the consumer research.

4.8 Repairability

While the WEEE Regulations do not specifically require batteries to be repairable, they do include provisions related to eco-design and environmental performance. Manufacturers are encouraged to design products, including batteries, with consideration for environmental impact, energy efficiency, and recyclability. These principles are in line with the broader concept of Extended Producer Responsibility (EPR), which places responsibility on producers for the environmental impact of their products throughout their lifecycle. The eco-design requirements may involve factors such as:

1. **Material selection:** Choosing materials that are environmentally friendly and can be easily recycled.

2. **Energy efficiency:** Designing batteries to be energy-efficient during use.

3. **Recyclability:** Ensuring that batteries are designed to facilitate recycling at the end of their life.

To date, emphasis has been on encouraging environmentally responsible practices rather than specifically mandating repairability. However, repairability and modularity in product design are increasingly becoming topics of interest in the broader context of sustainable consumption and production.

4.9 The 'Right-to-repair'

The 'Right to Repair' refers to the concept and movement advocating for consumers' ability to repair and maintain their own devices, rather than being forced to rely on manufacturers or authorised service providers. This movement seeks to address the challenges posed by products that are designed in ways that make independent repair difficult or impractical. The Right to Repair extends to a variety of products, including electronics, appliances, and even agricultural equipment.

Key aspects of the 'Right to Repair' movement include:

1. **Access to repair information:** Advocates argue that consumers should have access to manuals, guides, and other information necessary to repair their products. This includes details about the device's construction, components, and troubleshooting procedures.

2. **Availability of parts:** The movement also calls for manufacturers to make replacement parts and tools readily available to consumers and independent repair professionals. This facilitates repairs without having to go through authorized channels.

3. **Unlocking software and firmware:** Some products have software or firmware that may hinder independent repair. The Right to Repair movement often calls for manufacturers to allow consumers to access and modify this software, ensuring that repairs can be carried out without artificial restrictions.

4. **Fair and accessible diagnostics:** Consumers should have the ability to diagnose issues with their devices without proprietary tools or software. Access to diagnostic information allows for a better understanding of the problem and increases the likelihood of successful repairs.

5. **Legislation and regulation:** The 'Right to Repair' movement has gained traction in various regions, leading to proposed or enacted legislation. These laws aim to enforce manufacturers' transparency and ensure that consumers have the means to repair their products.

6. **Environmental impact:** Supporting the 'Right to Repair' aligns with environmental sustainability goals by reducing electronic waste. Repairing and extending the lifespan of products contribute to a more circular economy and lessens the environmental impact of manufacturing and disposal.

7. **Consumer empowerment:** The movement emphasises the empowerment of consumers, allowing them to make informed decisions about the repair, maintenance, and disposal of their possessions. This counters the trend of "throwaway culture" where products are discarded rather than repaired.

The 'Right to Repair' movement has gained momentum globally, with various countries considering or implementing legislation to address these concerns. However, the extent and success of the movement can vary, and manufacturers may have different stances on embracing the principles.

4.9.1 Europe

The path towards 'right to repair' legislation in the EU has recently taken a major leap forward with new rules adopted by a significant majority in the European Parliament in April 2024. The rules aim to reduce waste and make it much easier for consumers to access repairs, more cost-effective and supported by extended warranties for repaired items. Whilst the range of products currently captured by the rules is limited, it can be extended and important includes smaller items including mobile phones as well as larger 'white goods' such as washing machines.

The European Parliament's Rapporteur René Repasi said, "Consumers' right to repair products will now become a reality. It will be easier and cheaper to repair instead of purchase new, expensive items. This is a significant achievement for Parliament and its commitment to empower consumers in the fight against climate change. The new legislation extends legal guarantees by 12 months when opting for repair, gives better access to spare parts and ensures easier, cheaper and faster repair."

Member States will have to promote repair, including offering vouchers, running promotional campaigns or providing repair spaces.

4.9.2 California

California has been a notable player in the 'Right to Repair' movement in the United States. However, the status of 'Right to Repair' legislation can change, and further developments may have occurred since our review.

In 2020, the California State Assembly introduced Assembly Bill 1163, also known as the California Right to Repair Act. The bill aimed to require original equipment manufacturers (OEMs) to provide owners and independent repair businesses fair and reasonable access to service information, tools, and parts to repair electronic equipment.

The key provisions of AB-1163 included:

- Access to Information: Manufacturers were required to make available to the public, owners, and independent repair providers the same diagnostic and repair information provided to their authorized repair providers.
- Access to Parts: Manufacturers were obliged to offer parts, including any updates to the parts, to owners and independent repair providers at the same price and terms offered to authorized repair providers.
- Software and Documentation: Manufacturers were required to make available to owners and independent repair providers any embedded software and firmware, as well as any updates, for diagnosis, repair, or lawful modification of the device.

4.9.3 United Kingdom

'Right to Repair' has been gaining momentum in the United Kingdom, focusing on the need for consumers to have the ability to repair their own devices. At its heart is the consumer and delivering better value for money spent on what can in some cases be significant purchases; as a result, the right to repair reduces and in some cases eliminates waste by increasing a product's life by up to ten years.

New legislation introduced in 2022 aligns the UK with the EU, where the same legislation came into effect in March 2021.

- manufacturers of certain types of electrical equipment (primarily 'white goods' such as washing machines, washer-dryers, dishwashers, fridges, as well as televisions and displays) are now legally required to provide consumers with

spare parts for 'simple and safe' repairs, and more complex parts available to trades/professional repair organisations

- non-consumer electronics including lamps, motors, supermarket refrigerators, vending machines transformers and welding equipment are also covered; however cookers, tumble dryers, microwaves, laptops and smartphones unfortunately are not covered by the legislation
- spare parts must be made available for seven years (more in some cases) after a product has been discontinued; the list of spare parts does not include batteries (as these are not present in most if not all of the appliances covered by current legislation, e.g. cordless vacuum cleaners are not included)
- in most cases, new devices must be sold with a repair manual to enable simple repairs by consumers
- appliances must be designed in such a way that they can be dismantled using conventional tools.

According to the Government, this should reduce the amount of electrical waste produced each year, estimated at 1.5 million tonnes.

In addition, Eco-Design requirement have also been considered in the UK that would encourage manufacturers to design products with longer lifespans, easier repairability, and better recyclability. These requirements are part of broader efforts to transition toward a circular economy, however, are yet to gain traction.

We set out to test attitudes to repairability in the consumer focus group.

4.10 Vapes, scooters, e-bikes, cars and Parliament

Recently, disposable, single-use vapes have been in the spotlight. In many ways, these devices sum up the current challenges, and policy failure, around batteries, resource efficiency, producer responsibility and safety regulations. With very few restrictions on their sale and use, limited or no consideration of the environmental (not to mention health) consequences and no meaningful producer responsibility enforcement at the end of (their very short and rather pointless) life, clear dangers have literally been designed into the system.

A recent report by Material Focus reported by The Guardian estimates that at least 1.3 million disposable vapes are thrown away in the UK every week – the equivalent of two

vapes per second. It would seem from reports that the Government is currently focused on measures to make producers improve the design of products and fund recycling.

Refillable, reusable vapes have existed for some years and are clearly less problematic, and can be better managed in use and at the end of life, not least through take-back schemes at specialist shops; however this 'engagement' and opportunity for exchange doesn't take place with single use, disposable vapes which are instead discarded in the nearest bin, hedge or gutter.

MPs were separately trying to push through legislation although this initially stalled, having run out of parliamentary time. However, single use vapes, which will be banned in the UK as part of plans to tackle the rise in youth vaping and protect children's health, the Prime Minister announced on 29 January 2024 on a visit to a school. It is notable that the legislation notes the impact vapes have on the environment noting that "five million disposable vapes are thrown away each week, up from 1.3 million from last year. Over a year, this is equivalent to the lithium batteries of 5,000 electric vehicles."

More recently, 'The Safety of Electric-Powered Micromobility Vehicles and Lithium Batteries Bill' has been drafted and is supported by Lord Foster along with several organisations including the Fire Chiefs Council, RoSPA, National Housing Federation and many others, including the CIWM and ESA. The Bill seeks to ensure that the Government "make regulations regarding the safe disposal of lithium batteries" and regulate the sale of e-scooters and e-bikes, tightening up current 'self-declaration' by manufacturers. The accompanying briefing note highlights the fact that fires caused by lithium-ion batteries in e-scooters and e-bikes have quadrupled since 2020. It goes on to state that the UK is facing nearly one such fire per day, and that there are more than 200 landfill fires in the UK each year, making up almost half of all fires and costing £158m annually.

On 6 December 2023, the Office of Product Safety and Standards issued a Government Safety Message on e-bikes and e-scooters. The message focused on e-bike and e-scooter use and charging, and does not mention how to dispose of batteries and seems to be lacking a 'Step 6: **NEVER** dispose of a battery in the same bin as your regular rubbish or recycling as they can cause a fire'. However, the accompanying safety information briefing issued by Fire England does cover disposal, stating:

Disposing of a lithium-ion battery
Lithium-ion batteries should not be placed in the same bins as your regular rubbish or recycling. They can cause a fire if they overheat or when crushed in bin lorries or waste and recycling plants.

You can find out how to dispose of your lithium-ion battery safely by checking your local authority's website for information about the safe disposal of batteries in your area or you can find your nearest recycling centre at: www.recycleyourelectricals.org.uk

4.11 Taking responsibility – bikes

The Bicycle Association has made publicly available resources for the industry to assist with safe sourcing of batteries, their correct transport and storage. They are also piloting a battery collection and recycling scheme which will take waste batteries from retailers at no cost for safe and proper disposal and have worked with the Association of Cycle Traders to assist the cycling industry and charity Electrical Safety First in raising awareness of the fires issue and advocating urgent Government action.

The Bicycle Association's initiative is a great example of an organisation and sector taking responsibility and working with manufacturers to ensure a lowest-cost system is in place to support retailers and consumers, removing the burden from local authorities of what could become a significant challenge in the future as e-mobility grows, driven in part by the net-zero transition and encouragement of people to get 'on their bike' to help reduce local congestion, air pollution and carbon emissions.

4.12 Clothes

Recently, heated clothing has hit the streets, with the phenomenon starting in workwear and spreading to more general retailers. This winter (2023/24) these products have become much more widespread in the UK.

These garments have a built-in heating elements (e.g. made from carbon fibre strips) and for more recognised brands, generally include wiring and a pocket for the battery, but no battery or charger, which are sold separately.

Mainstream outdoor wear and workwear brand Regatta is leading the charge with a wide array of jackets incorporating the technology, with 25+ different jackets from fashion to hi-vis. Screwfix, Sports Direct and multiple workwear suppliers stock Regatta heated jackets, along with Regatta's own online store. These jackets sell at premium prices, alongside compatible rechargeable batteries and charging systems – although the user can use their own compatible battery pack.

Figure 5: *MIEVNIO battery-powered heated hat*

A search on Amazon for 'electric hat' returned over 350 results and 570 results for 'heated hats' (electric hats includes hats containing tech such as headlights). Many are sold with batteries included or even incorporated into the garment.

The cheapest was a yellow beanie hat available in a range of colours with an integrated rechargeable headlight including battery, made from soft acrylic and sold for £8.49.

The most expensive was a £155 MIEVNIO battery heated cap made from polyester and elastane sold with a 2200mAh lithium-ion battery and AC charger. There is no point-of-sale advice over batteries or battery disposal visible.

On eBay, electric heated beanie hats with USB rechargeable connections were available from under £20, in many cases batteries were not included. There were 1,700 results for 'heated hat' and 948 results for 'electric hat'.

A search on Google for 'electric hat' returned 482,000,000 results and 'heated hats' 63,800,000 results.

These garments will be entering the municipal and workplace waste streams in the coming months and years, and in many cases include batteries, presenting a challenge not just for waste collectors but also clothing recyclers including clothing banks in car parks/stores.

4.13 Hope – cars

For some products, ensuring recycling solutions for batteries is becoming essential, before and beyond regulations, driven instead by supply and demand. A recent article in Waste Management World reported that "eighteen times as much lithium will be needed by 2030 as today, and sixty times as much by 2050. The demand for cobalt will increase fivefold by 2030 and fifteenfold by 2050."

It notes a study by the Fraunhofer Institute which estimates the existing capacity for battery recycling in Europe is around 33,000 tonnes per year, predicting the volume of lithium-ion batteries and battery components to be recycled across Europe is set to rise to 300,000 tonnes per year by 2030, and 1.5M tonnes per year by 2040.

We set out to test awareness to the dangers of batteries through the consumer research.

5 Attitudes and awareness: survey sector and public attitudes

5.1 The Narrative

With EU policy evolving, wide acceptance by consumers of the need for companies to address environmental and social challenges, the drive for ever-smarter (and seemingly cheaper) embedded tech and adoption of battery-powered tech across society, it is essential that this problem is addressed.

The UK's ongoing review of end-of-life battery requirements presents an opportunity to understand, test, interpret and influence views and potential direction of policy in the UK.

Post-Brexit, the UK has an exceptional opportunity to treasure the rare-earth materials being transported and imported into the UK, materials we have low or no reserves of, which could provide the country's growing tech sector with many of the raw materials it requires for the technology revolution, for international competitiveness and for the development of innovation and new technology.

All we need now are the right set of extended producer responsibility requirements, targeted at solving the right issues in the most effective and sustainable ways, with a nod to future-proofing in order to keep up with technological innovation and consumer behaviour, whilst seizing the opportunity presented by the valuable materials available in the proliferation of batteries and potential for servitisation here in the UK.

So we asked consumers what they think, what's important and how best to solve the problem.

5.2 Methodology

The following consumer and industry research was undertaken in two phases:

Phase 1: CIWM short stakeholder survey and discussion group round table event held in Birmingham in September 2023.

This phase was adapted and conducted by a short survey testing key issues, aimed at those affected by policy and potential changes to policy. The questionnaire can be viewed in **Appendix A**, and a summary of the results is set out below. The questionnaire was promoted via CIWM's online platform and Linked In.

We also held an initial round table discussion with stakeholders reflecting CIWM's membership representing a range of activities from operations, consultancy, safety and compliance.

Phase 2: Consumer research (2,064 adults) carried out in September 2023 and a consumer focus group (20 participants) held in Bournemouth in October 2023

The purpose of this phase was to provide a robust assessment of the existing 'state of play' with respect to existing consumer behaviours, motivations and barriers. The survey was delivered using online panels that are proprietary and used solely for market research purposes. To ensure statistical surety and confidence in the findings, we targeted a sample of 2,000+ UK citizens. Quotas targets were used – on age and gender (interlocked), region, working status and ethnicity - to ensure that the profile of the sample matches the known profile of the UK population.

We asked a series of 12 high level questions exploring existing behaviours, attitudes and knowledge, plus additional socio-demographic profiling to explore how answers vary across, for example, different age or income cohort.
In addition to the survey, the consumer work also included an additional phase of qualitative research to provide more granularity. Rather than retracing the steps taken in the survey, this instead focused on how citizens feel about current and future policy, and the best way forward from their perspective.

Rather than a typical focus group, we will conduct an extended evening workshop lasting two hours and taking on the form of a 'citizens summit' style event. Participants will be initially presented with information about the issue and be asked to work together collaboratively to identify appropriate solutions. Participants work together and bounce ideas off each other to arrive at more considered recommendations.

The workshop involved c. 20 participants, with recruitment undertaken according to a strict questionnaire. Central to the design of the questionnaire was the choice of

screening filters (i.e. to exclude certain individuals from attending) and quotas (i.e. to establish the composition in the groups). Participants were paid a £65 'thank you' for attending.

All fieldwork was conducted to the recognised standards of the UK Market Research Society Code of Conduct and in line with two international quality accreditations - ISO 20252 (the Market Research Specific standard) and ISO 27001 (the Data and Information Security standard).

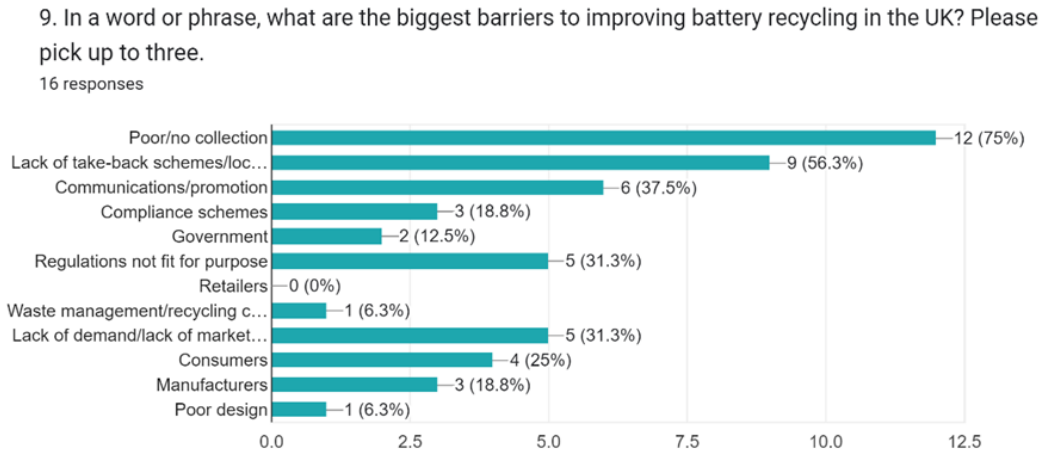
The key findings from both phases of the research are set out below.

5.3 Results of engagement with CIWM members and sector stakeholders (Phase 1)

5.3.1 Questions 5 & 6 – awareness of correct disposal

All of the industry stakeholders who responded to the questionnaire were aware of how best to dispose of batteries and the key issues/impacts affecting the sector.

5.3.2 Question 9 - biggest barriers



Comments made by the industry stakeholder responders included:

"I get the feeling that nobody much in government cares and although many supermarkets do provide battery collection points there is no publicity nor are instructions given to ensure that the public is aware of the consequences in terms of fire, damage to the environment, and child safety of not disposing of batteries responsibly."

"People are confused about what to do and don't understand the dangers of incorrect battery disposal. There are limited options for recycling. It is too easy to dispose of batteries in municipal collections, either due to ignorance or laziness. Waste permitting can actually limit collection options, especially for hazardous waste."

"Legislation needs to be more serious, and encourage companies to innovate business models to take back / make it easier to recycle / etc. Consumers need to be incentivised to be more responsible with purchases and EoL. It would be helpful to have LiPo take-back centres that were near / collected periodically."

"Inability to remove/replace batteries from artefacts. Inability to refurbish batteries for reuse. Inability to dismantle batteries to reuse the parts . Lack of local services to collect and recycle. Battery design does not consider its future recyclability."

5.3.3 Question 10 – the most important things to fix with respect to addressing the hazards presented by incorrect battery disposal

The responses to this question included:

"Consistent guidance and recycling opportunities across different regions/companies."

"Promote the risks and make it easy to recycle batteries."

"Education of the public / communications at point of purchase."

"Good segregation."

"Have a battery collection scheme once a year."

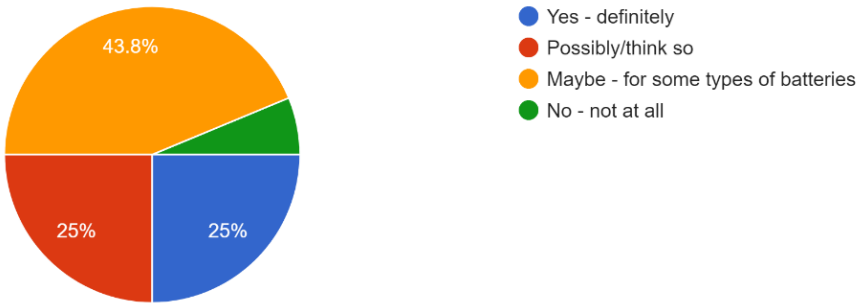
"Make it easier for consumers to return batteries. Maybe have specialised collection periodically (e.g. two months) alongside normal household collections?"

"Legislation to make all companies ensure they do not sell products that will cause harm due to the use of batteries. It makes no sense at all for irresponsible companies to be able to create products which cost the public purse to clean up later."

"Making it socially unacceptable to incorrectly dispose of batteries, much like smoking has been made socially unacceptable."

"Market pull for end of life batteries."

5.3.4 Question 11 - do you think a deposit return scheme for batteries could provide a solution?



Comments made by the responders included:

"It would have to be backed up by some pretty heavy penalties for non-compliance and to be publicised at a high degree of spending that I don't [see] any government with the same policies as the current government showing the remotest chance of spending."

"How would those items be marked? Why my question? I think, that if that scheme would be introduced, there would be hight number of people, who would collect items from residential bins, so they can bring it to a retailer and get those forementioned £2. So I think that there should be some sort of marking on items introduced to the market once the DRS would be implemented, otherwise the retailers could struggle with keeping up with payments."

"This would also help Local Authorities which are currently responsible for the cost of collection and recycling, and are likely the most affected by battery fires."

"I'm not a fan of DRS for packaging (massive duplication of existing waste collection) but do see merits for batteries. As long as it is not a big burden on small retailers, well worth exploring."

"Perhaps begin the campaign with things which are a 'no-brainer', and then allow the more nuanced/tricky items to come in later years. It would need some incentives for industry to get this flywheel going."

"It would need to be combined with improved battery design to enable the components to be recycled or the battery refurbished and reused. DRS works for consumable in which the container has a value and is readily reused or recycled . Batteries are currently not readily recycled or reusable."

"Consumers won't do it , have a return deal via Amazon."

"More drop off points, increased incentive through take back scheme or DRS."

"Consumers would be unlikely to return small items typically seen as disposable like rechargeable toothbrushes."

"All SMW (small mixed WEEE) should be designed so that the batteries can be removed. Consumers can then be rewarded for returning batteries to collection points based on weight or number returned."

"Perhaps a blanket fee levied on all products placed on the market containing a removable rechargeable battery with increased compliance fees for those that do not, similar to the scaled incentives packaging manufacturers have to increase recycled plastic content in their products."

"It would only work for specific items and whilst reducing the risk, would not necessarily address the whole market issues."

5.3.5 Question 13 – vapes, what action should be taken

13. What do you feel should be done to address the immediate issue of disposable vapes containing batteries?

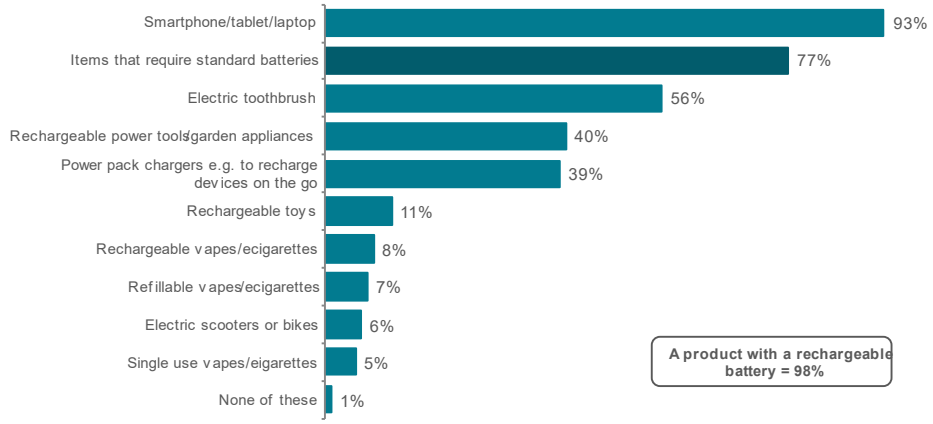
16 responses

5.4 Results of consumer research on existing consumer behaviours, motivations and barriers (Phase 2)

5.4.1 Levels of ownership

Virtually everyone (98%) owns a product with a rechargeable battery

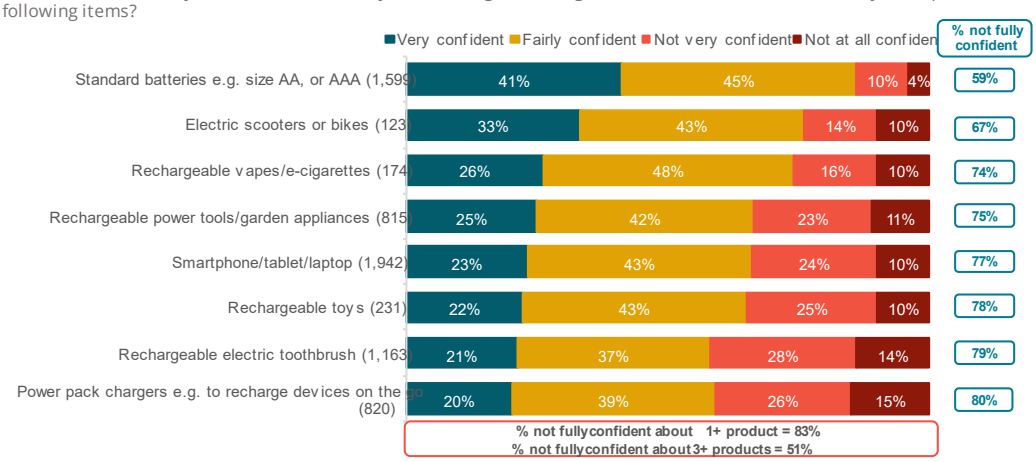
Q. Which of the following do you own and use regularly? Please select all that apply?



5.4.2 Disposal

There are lots of gaps in disposal knowledge – over four in five (83%) are not fully confident about 1 or more products with a rechargeable battery inside

Q. To what extent do you feel confident that you've been given enough information to know the best way to dispose of the following items?



This was also reflected in the citizen workshop, with participants feeling they need more information about how best to dispose of these items. Comments included:

"I literally have an electric toothbrush at home that I'm not sure what to do with."

"They [the council] don't let you know what to do with any of these items."

"Can I put them [power packs] in with the battery collection at the supermarket?"

Disposal routes were found to vary by item – the general rubbish is significant for rechargeable vapes and electric toothbrushes; the HWRC for power tools, power pack charges and rechargeable toys; and there is greater use of trade in/selling on for smartphones, tablets and computers.

Typical disposal – by product

	Standard batteries (1,599)	Rechargeable Vapes/e-cigarettes (174)	Smartphone/ tablet/laptop (1,942)	Power pack chargers (820)	Electric toothbrush (1,163)	Rechargeable toys (231)	Rechargeable power tools/ appliances (815)	Electric scooters/ bikes (123)
General rubbish	16%	24%	4%	16%	25%	12%	6%	2%
Household recycling	10%	13%	3%	8%	12%	5%	6%	3%
Street bin	2%	5%	1%	2%	3%	2%	1%	2%
Supermarket recycling	53%	9%	3%	10%	5%	4%	3%	3%
Left for someone to clear up	*	1%	*	1%	*	*	1%	5%
HWRC	10%	23%	15%	31%	37%	27%	54%	20%
Donate it	1%	4%	11%	6%	2%	20%	9%	9%
Gave it away	1%	5%	11%	8%	2%	10%	5%	9%
Sell it	*	4%	19%	5%	1%	9%	8%	26%
Trade in scheme	1%	4%	15%	3%	2%	5%	2%	7%
Retailer take back	6%	4%	11%	3%	2%	3%	2%	9%
Other	1%	5%	9%	9%	8%	2%	5%	7%

This was also reflected in the citizens' workshop:

For items perceived to have financial value, many would consider trade in/part exchange or selling. However, data concerns (and a lack of knowledge about how to safely remove personal data) are a barrier for some.

The larger the item, the more disposal is consciously considered. They are often taken to the HWRC when they are perceived to be at the end of their life.

Smaller and/or lower value items are often disposed of in the general rubbish (although the recycling collection is also considered/used where there is awareness).

Because of the closer natural association with batteries, some try to recycle power packs front of store (while others opt for the general rubbish).

Many respondents conceded they have lots of items at home not in use (i.e. in drawers).

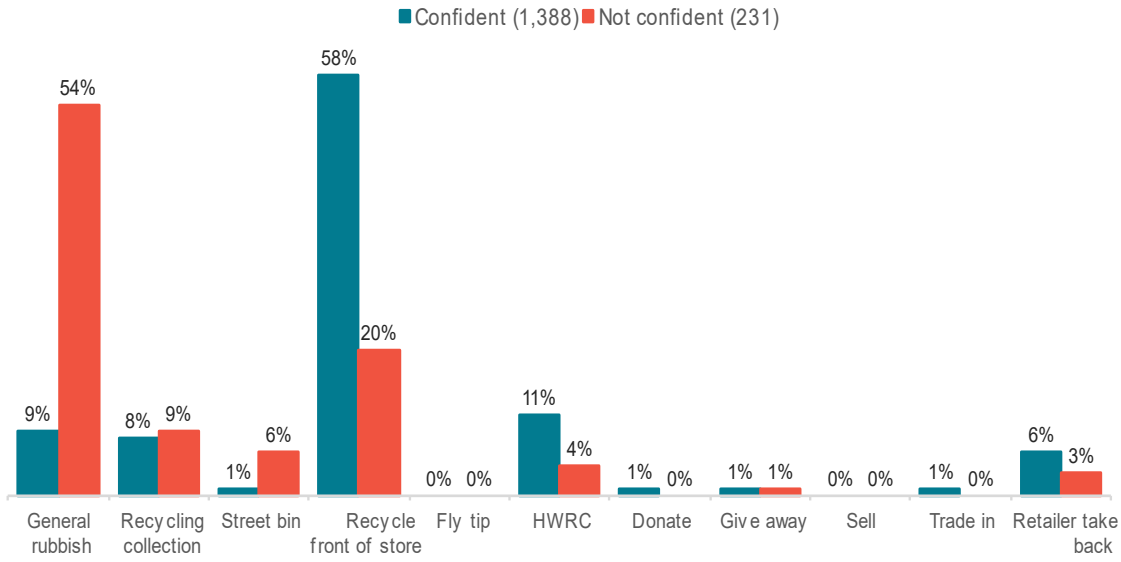
The environment was a motivator for around half, although convenience and financial pay-off have wider appeal.

Comments made by participants included:

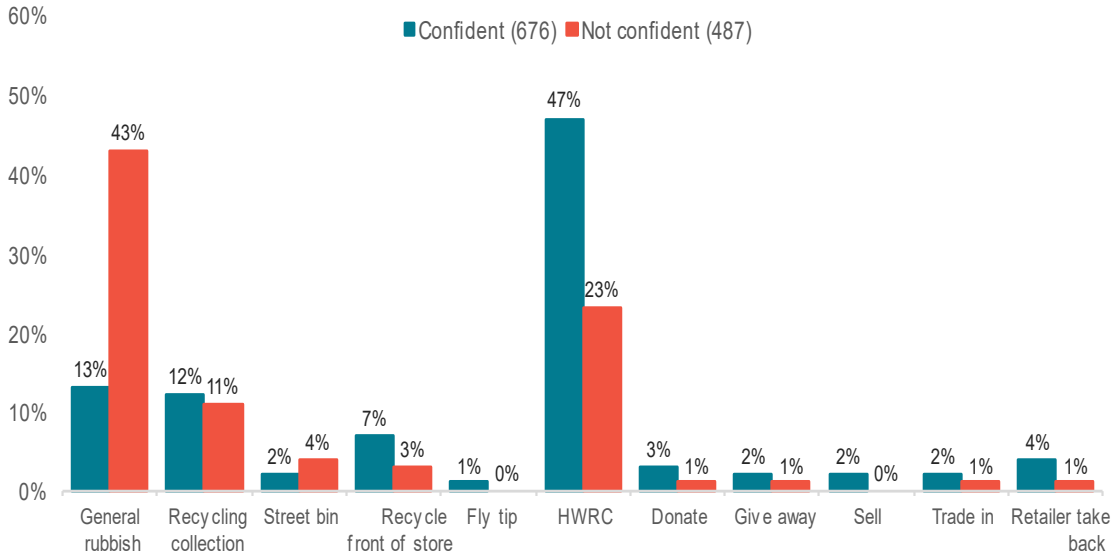
> *"For a smartphone I'd try online trade in or selling it. It's convenient and you're also getting some money back for it."*
>
> *"For an old electric toothbrush I'd just throw it in the bin and not think twice."*
>
> *"But if the council collected it in the recycling, like that lady said, I'd do that instead."*

Disposal knowledge influences disposal choices. For standard batteries, those who are confident they know how to best dispose of them often opt for front of store; those not confident often opt for the general rubbish.

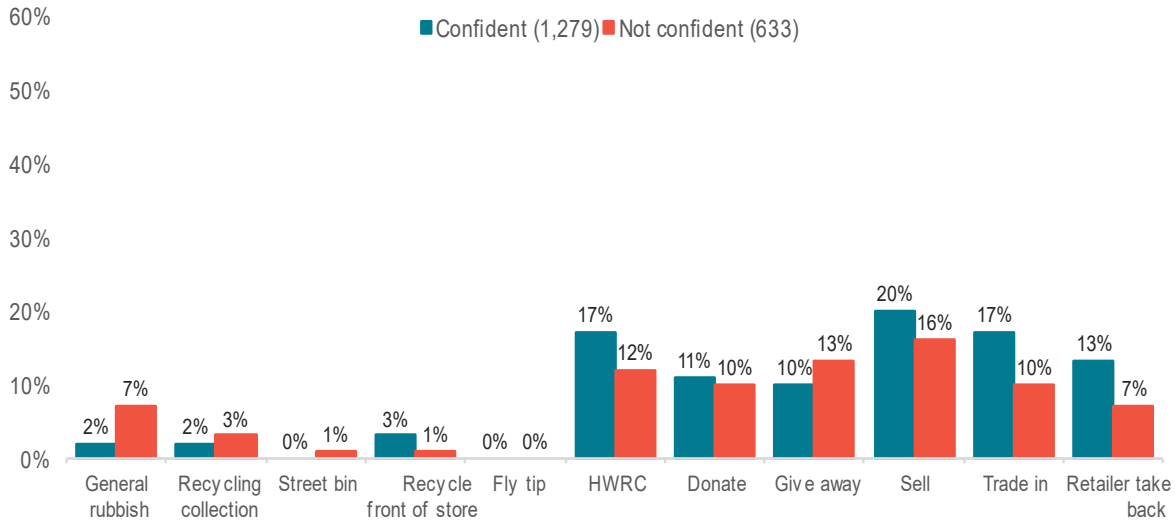
Q. How do you typically dispose of each of these items? Standard Batteries

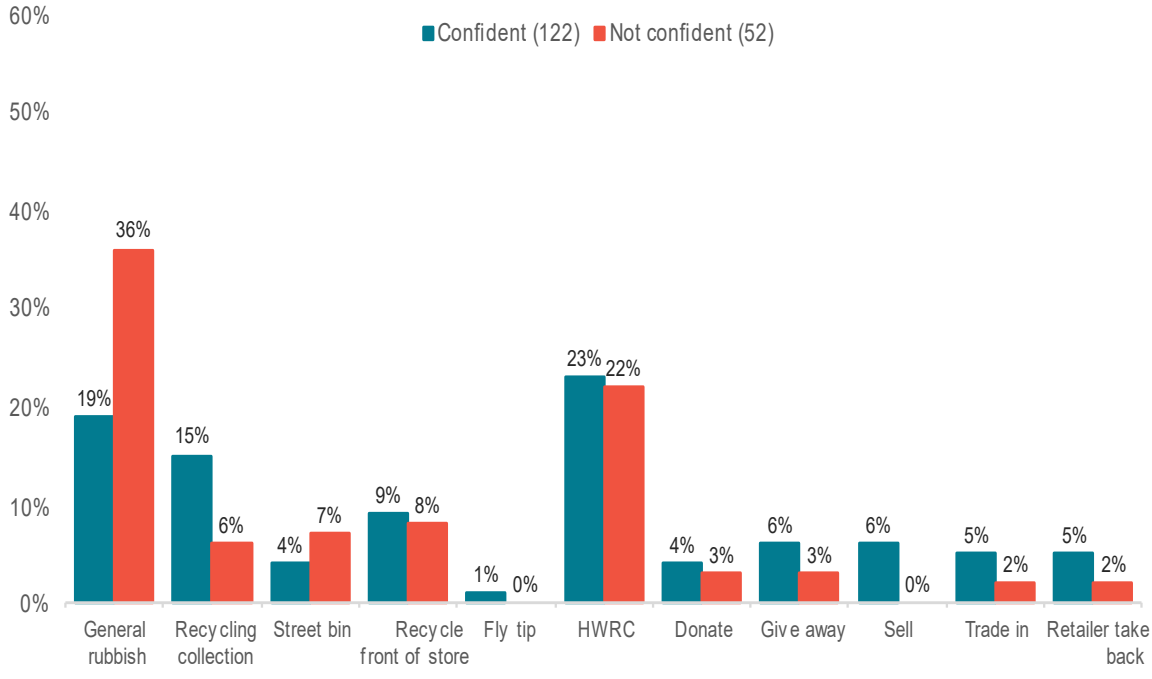


Q. How do you typically dispose of each of these items? Electric toothbrushes



Q. How do you typically dispose of each of these items? Smartphones/computers/laptops

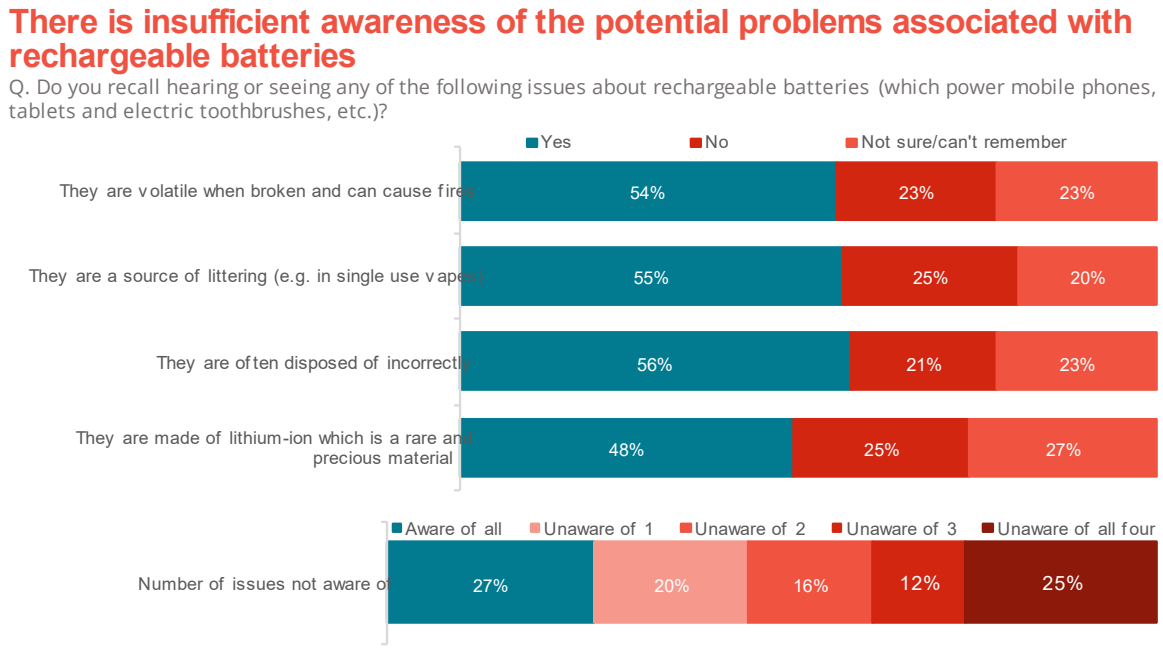




The link between disposal knowledge and disposal choices is present across all items. For rechargeable toothbrushes, those who are confident they know how to best dispose of them often opt for the HWRC; those not confident again often opt for the general rubbish

For items like smartphones and computers/laptops, better disposal knowledge increases the propensity to use routes such as selling, trade in, retailer take back and the HWRC.

5.4.3 Awareness of problems



Gaps in awareness are evident across <u>all</u> sub-groups (although there is somewhat higher awareness among those aged 55+, those with a higher university qualification and those in social grade AB). Those who say they recall the Take Charge campaign report the highest levels of awareness. The same is true (to a lesser extent) among those who say recycling is very important to them.

The citizens' workshop provides evidence of some emerging knowledge about the safety issues of specific devices:

Some, for example, had already seen media coverage of electric scooters catching fire.

Others noted experiences of battery packs being removed on safety grounds at airport check in while travelling in Asia or the US (but not in the UK).

One participant had personal experiences, including a laptop catching fire in the workplace after being left charging all night.

Coverage of phones liable to overheating also helps to establish awareness (even if this appears to be conceptualised as a performance issue and not liable to cause an actual fire.

Comments made by the participants included:

> *"There's a lot in the news about scooter fires."*
>
> *"The recycling infrastructure hasn't caught up with the products on sale now."*
>
> *"Now I think about it, everything's got a battery inside it. I've had a power bank taken off me at the airport because they said it was too powerful and a safety risk."*

But this awareness isn't yet a comprehensive or systematic narrative about lithium batteries.

There is a default sense for many that items will automatically stop charging once they reach full charge.

Some find it confusing because products appear designed to be permanently charging when at rest (e.g. cordless vacuum cleaners sat in the docking station that is plugged in).

There is some evidence of 'lazy' charging behaviours where devices are just left plugged in all the time when at home, especially phones.

Most concerns about leaving things plugged in - prior to the workshop – were framed in terms of performance (e.g. the possible impact on device/battery performance and life whereas a re-framing towards safety might be more persuasive.

Supporting comments made by the participants included:

"But when it gets to 100%, doesn't it just stop charging?"

"I just plug my phone in overnight and go to sleep."

"I do have my rechargeable lithium batteries for work charging on a fire-proof slate board (because they can be volatile). But I don't really think about the devices that have them built in."

The videos and examples shown at the workshop had a strong 'shock' impact that made several participants immediately reconsider some behaviours.

Many participants immediately related the safety issues to their own products and behaviours, as well as to the things they put in their bin.

The fact that fires caused by batteries are so difficult to put out was a concern.

The "maximum number of charges" was a useful articulation for some, and led to a number of immediate concerns (e.g. handing down their smartphone to their granddaughter, or buying refurbished, or buying an electric car, might not be as good a choice as they first thought it was).

Supporting comments made by the participants included:

"I'm petrified, it seems that anything can explode at any time."

"Now the phone warning about overheating makes sense and is scary."

"The main message I took away was don't leave things plugged in."

While there is acknowledgement that citizens can play their part, there is frustration that this is limited by how products are designed:

There is a feeling that manufacturers don't want consumers to be able to replace batteries, because this would increase product lifetimes and decrease how often new devices are purchased.

The majority wouldn't know how to separate out the battery from their products.

No one mentioned product advice or instructions, and there was a feeling that this is small print that is less important and not designed to be widely read.

Supporting comments made by the participants included:

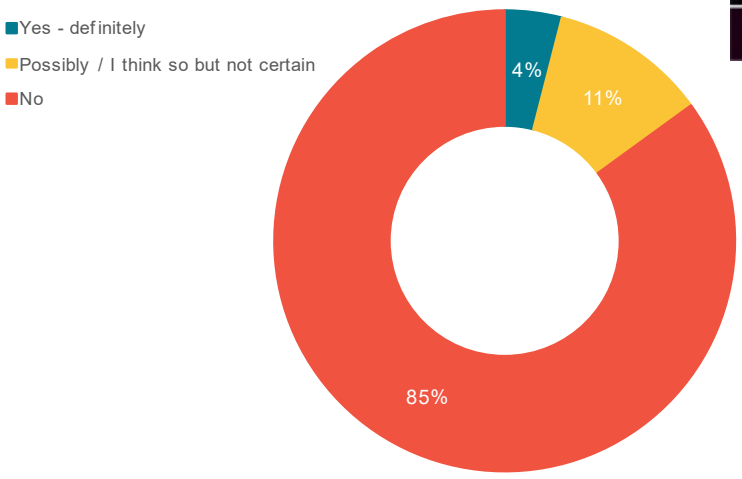
> *"How would this (removing battery) work for a toothbrush? It's injection moulded."*

> *"They should design products to be accessible during their life, and to be separated and recovered at the end of their life. But it's very difficult to replace a battery or separate it before disposing of the product. They're encased in plastic or metal."*

5.4.4 Recall of, and reaction to, the 'Take Charge' campaign

Recall of Take Charge is low: one in twenty - five say they have definitely seen the campaign

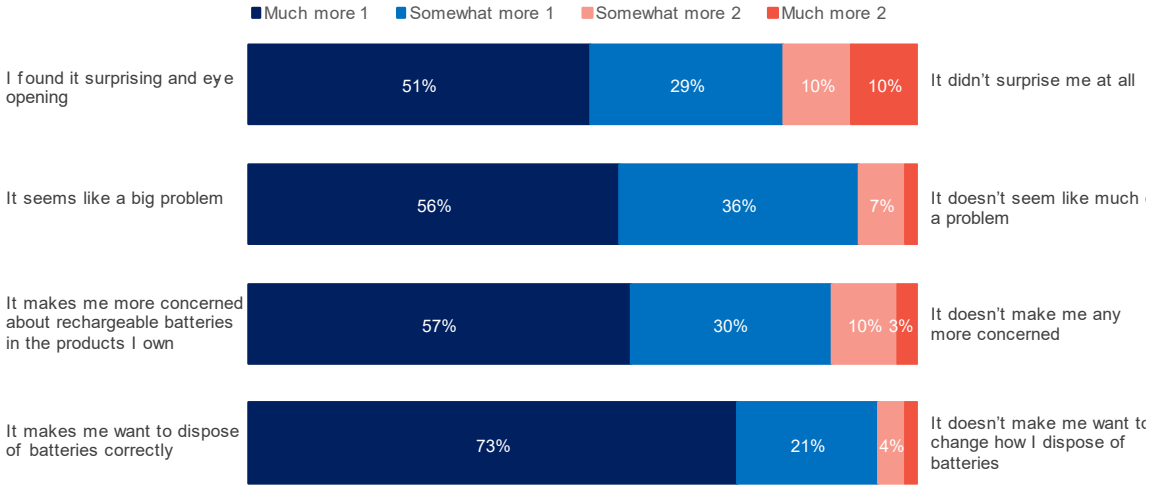
Q. Do you recall seeing the following "Take Charge" campaign about correctly disposing of batteries?



Most likely to recall
- **London (10%)**
- **Student (9%)**
- **18-34 (8%)**
- **Higher university degree (8%)**
- **Children at home (8%)**
- **HH income £55,001+ (8%)**

The video of fires and incidents at HWRCs as a result of rechargeable batteries is highly impactful

Q. Please rate the video on each of the following criteria using the scale, depending on whether you agree more with the statement on the left or the statement on the right



None of the participants in the citizen workshop recalled this campaign; but reactions were positive. This asset was positively received, subject to the following critique.

In general, this was considered useful, short and to the point.

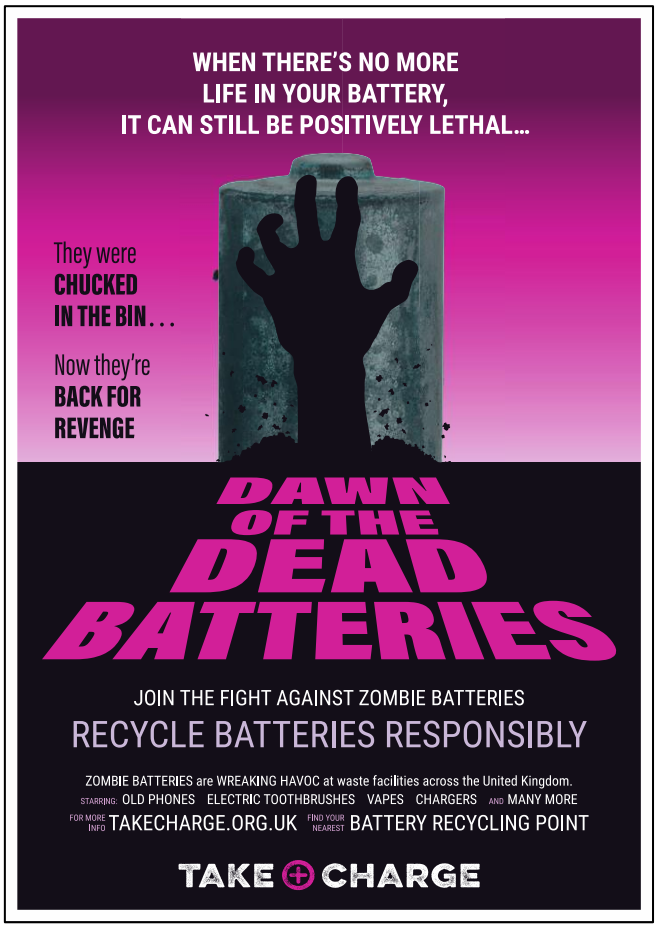
However, there was a sense it needs more direct, unequivocal guidance on where to put them (as opposed to lots of conditions about 'do this if you can; if not do that…).

As per previous feelings about how realistic it is to ask citizens to remove batteries, there was some push back to this request.

Some noted it could be made more eye catching (e.g. colour scheme, images of products with batteries, images of fire).

As a general point (that applies throughout) there needs to be a stronger focus that it's referring to batteries IN things, not just typical batteries.

Some noted that the campaign logo reminds them of the musical group Take That.



Reactions to the zombie theme of the campaign were positive (visual stand out, amusing, cleverly done), although a number of suggestions were made to improve it.

The main criticism is that it does not spell out why they can be ”lethal”, with no mention of fire risk (either to themselves or at the HWRC).

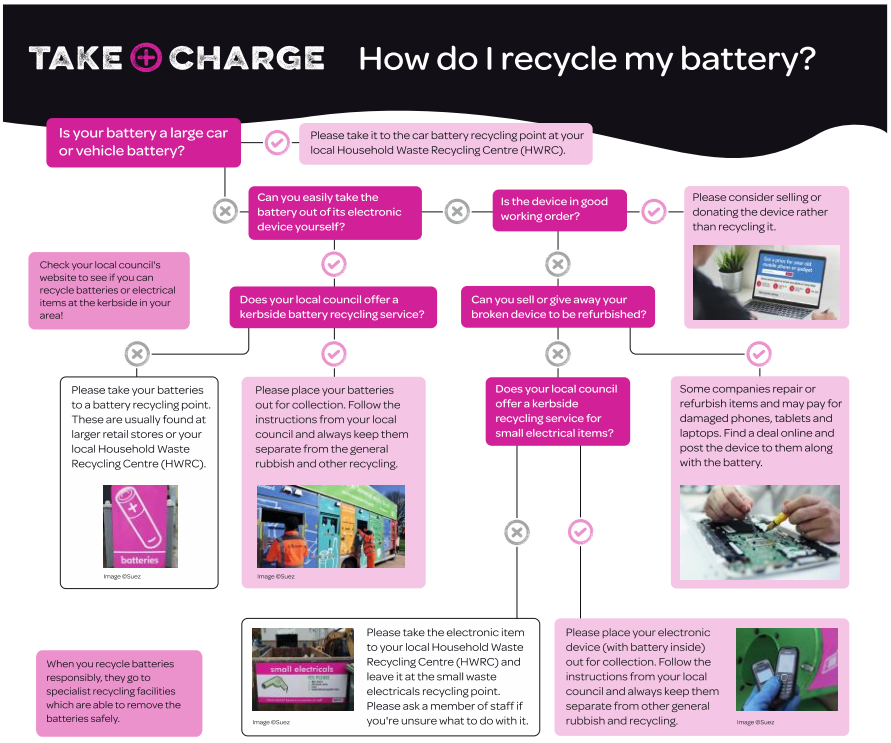
Some suggested more about fires. There was a sense it needs more “shock value” (in line with some of the videos shown in the workshop).

There was also a sense (based on this asset alone) that the campaign is all about standard batteries (as per the image here) rather than batteries inside of products.

Comments made by the participants included:

> *“It’s not clear enough it’s dangerous. Could they put fire in the background.”*

> *“I liked the concept of zombie batteries. But if you don’t know they set on fire, what does it mean, they’re back for revenge?”*



The flow chart was (not surprisingly) one of the assets less well received, because of the level of content and – once again – the lack of a clear answer and lots of conditions.

"No-one uses flow charts. We produce endless ones at work and I don't know anyone who refers to them."

"I got lost and bored with the flow chart."

The logo also did not test well in the citizen workshop. While the general ethos of a 'warning label' is familiar, it is felt to represent standard batteries once again, as opposed to batteries inside of products. And it is not intuitively clear enough the battery can cause a fire. Comments included:

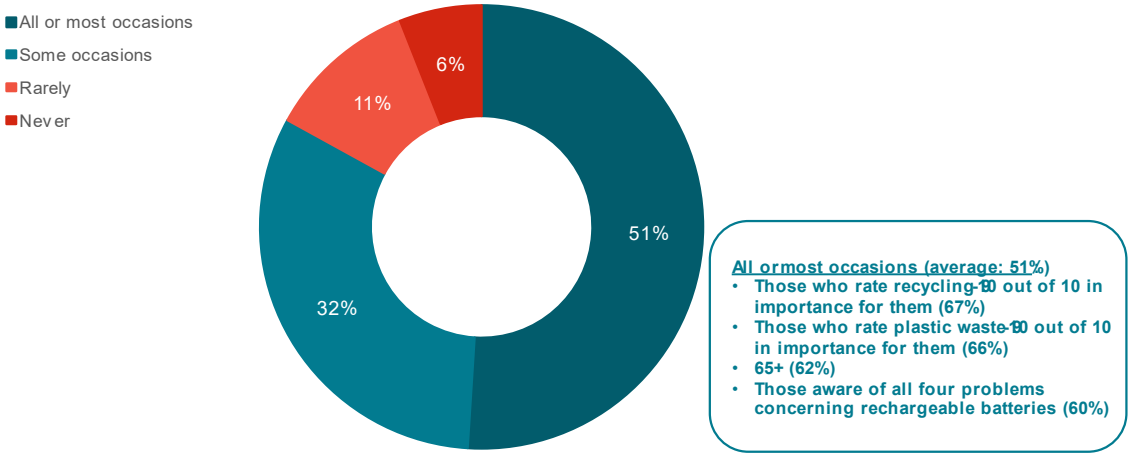
"The icon doesn't work as it implies a standard AA battery, whereas it's rechargeable batteries inside of things, like your phone, which are the issue here."

"To me it kind of says 'don't throw batteries in fires."

5.4.5 A DRS for batteries

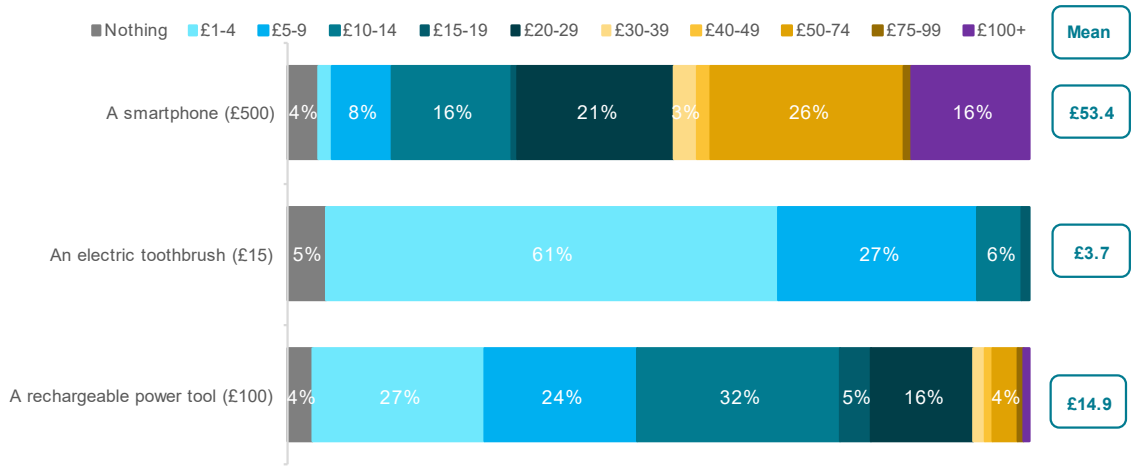
Just over four in five believe, based on the information provided, that they would be minded to use a DRS for batteries

Q. Please indicate which option most closely describes your likelihood of using the Deposit Return Scheme rather than yo usual disposal method? Please give your honest answer; we are interested in what you think you WOULD do not what yo think you SHOULD do?



Level of (stated) incentive to use a DRS for batteries

Q. Imagine you are interested in the following products. What level of deposit would encourage you to return the battery which is designed to be safely removed and replaced to extend the life of the product to either swap for a replacement battery or redeem the deposit? Please write in the amount, to the nearest £, that you would need to receive to incentivise you personally to return the item/battery?



In the citizen workshop, respondents asked a number of questions as they probed the idea:

- how much would it increase the price of the item?
- would the deposit be on the item or the battery inside?
- if the retailer/brand went out of business, could they still reclaim the deposit?
- would it increase levels of theft by making it more attractive to steal and sell?

Through the discussion (which was relatively preliminary), the following insights and preferences emerged:

1. It would work best if levied on the battery itself (in turn meaning that a DRS would intersect with the movement towards eco-design and right to repair).

2. It would work better on smaller and low value items (given that routes already exist to get value back from items like smartphones; and these lower value items don't have any sensitive personal data on them, removing a potential barrier to participating in a scheme.

Supporting comments from the participants included:

"I think it may increase theft and give criminals an extra incentive."

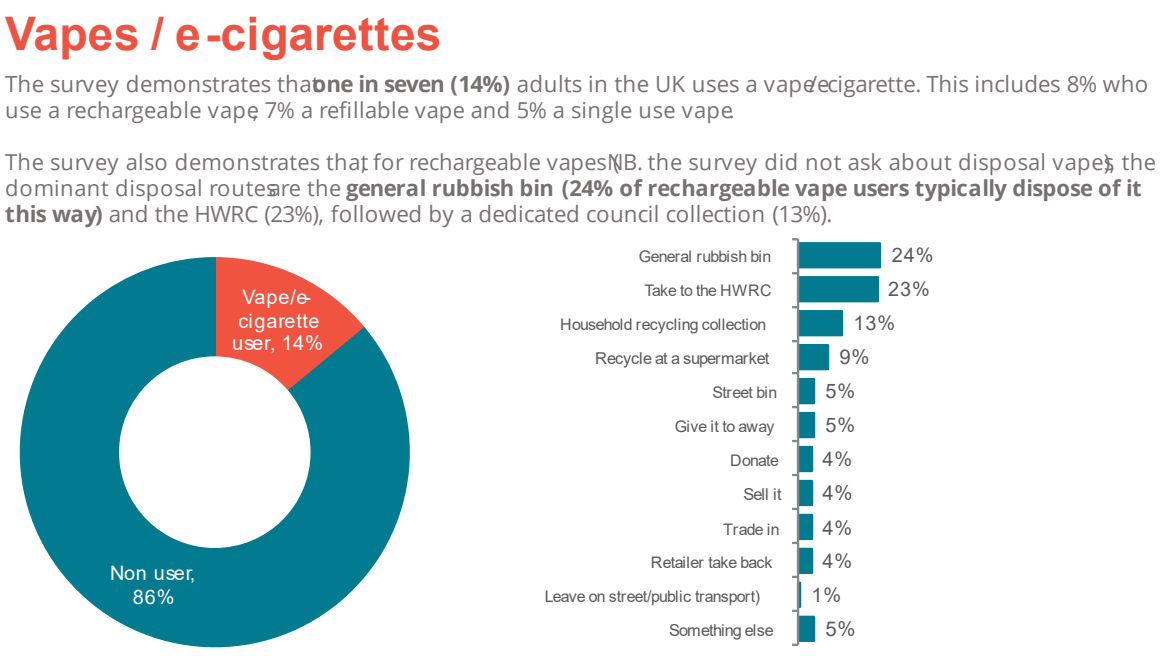
"If I can't wipe it [data] then I'd be hesitant about giving it away to this kind of scheme."

"I think the whole concept of our right to repair should be championed."

5.4.6 Vapes / e-cigarettes

The survey demonstrates that one in seven (14%) adults in the UK uses a vape/e-cigarette. This includes 8% who use a rechargeable vape, 7% a refillable vape and 5% a single use vape.

The survey also demonstrates that, for rechargeable vapes (NB. the survey did not ask about disposal vapes), the dominant disposal routes are the general rubbish bin (24% of rechargeable vape users typically dispose of it this way) and the HWRC (23%), followed by a dedicated council collection (13%).



Turning to views on the best policy responses to disposable vapes, there was strong support for restrictions or an outright ban, even among the vape users themselves. This was based on two elements:

1. **Health concerns**. Especially for younger age groups, who were felt to be targeted by the industry. Some felt that vapes had led to non-smoking children/young adults becoming addicted to them (as opposed to the original intention of helping existing smokers to quit).

2. **The waste and litter implications**. Single use vapes were felt to encapsulate the "throwaway society". The fact that every vape has a small battery inside that would ultimately never be recovered was felt to be a waste of resources, even without the secondary risk of fires that participants had become more aware of in the course of the discussions.

Comments from the participants included:

"They are marketed as harmless but they're not."

"I would ban vapes because of the impact on children. A by-product would be the environmental benefit."

"What a waste of a battery. That's phenomenal."

6 Conclusions

The United Kingdom is still trying to bury the problem of hard-to-recycle products and materials, less often in landfill (it is 2024 after all!), more often by either pretending there isn't a problem, hoping a magical solution turns up to save the day or physically sending them 'away' to somewhere else where out of sight is definitely out of mind.

The problems are significant; the funding to solve the problem is not. We think these problems are 'away' but they are coming home to roost.

Often, 'away' is someone else's 'home'. A beach in Ghana covered in British clothes. Villagers in India melting the plastic off wires and circuits to recover rare and precious metals from British e-waste.

'Away' is full, broken, changing. 'Away' has had enough.

And we – us, here – we know we need to do better; we know we can. We need our words to be heard through our actions.

Britain must lead by example and accept responsibility for the products and materials it consumes. Businesses must step up and take responsibility for the impact of the products and materials they import, make, use and sell here.

The problems are increasingly closer to home than we might think. Fires caused by powerful rechargeable batteries in cheap gadgets or even in clothes have increased dramatically, putting lives in danger – the lives of our colleagues, members of CIWM.

And the rivers and oceans we are so inspired by contain increasing amounts of plastic, entering food chains and ultimately us – humans. There is no doubt we have entered the Anthropocene – where humankind has exerted a lasting, and potentially irreversible, influence on the planet's systems, environment, processes, and biodiversity.

6.1 So why an 'EPR of everything'?

Where does responsibility lie for "cleaning up society's mess"?

Presently, all roads lead to local authorities, who are left holding the fort. But local authorities should be the last resort, focused on protecting human health and the environment, not the front line for anything producers choose to throw at them. Surely, it was never the intention for local authorities to become international commodity traders (and try to do it in 400 different ways).

As ably supported as they are by waste, recycling and resource management companies, combined our front line CIWM colleagues don't stand a chance when faced with the barrage of increasingly complex and often dangerous materials making up products with a rapidly diminishing life expectancy.

In some, indeed in many cases local authorities may be best placed to collect, to process; however this must be funded and individuals and organisations must accept responsibility for their impacts. We all have a duty of care but ultimately, accountability should fall on those responsible for producing and putting products on the market, and who are in the position to influence and specify designs and materials which are consistent with the concept of a circular economy – its design, longevity, repairability, resilience, safety and recyclability.

The end-of-life impact of products and materials cannot be a carefree and unconscious process by those carefully and consciously exploiting raw materials.

The OECD definition of EPR is 'an environmental policy approach in which a producer's responsibility for a product is extended to the post-consumer stage of a product's life cycle', and typically characterised by:

1. the shifting of responsibility (physically and/or economically; fully or partially) upstream toward the producer and away from municipalities; and
2. the provision of incentives to producers to take into account environmental considerations when designing their products.

Whilst EPR should be the default position there is a hierarchy of need with products such as batteries, WEEE, and textiles the most important to have EPR regulations applied to them as soon as possible. These products are causing the greatest and most urgent concern from multiple perspectives, particularly from a people safety and planetary impact perspective.

6.2 So let's talk about deposits

Often and in large part due to a complete lack of communication or any ongoing relationship with the consumer since the point of purchase, decisions over how to recycle or dispose of a product have to be made by the consumer at the end of a product's life. This could be moments or indeed many months or even years after purchase.

Deposit return schemes may not be every producer's or retailer's cup of tea, but they are an extremely important mechanism in joining up the point of purchase and the point of recycling or disposal decision – they keep the consumer and the manufacturer connected; they provide an in-built call-to-action. Deposits have an important role to play.

Critical to what happens next, and ending the fallacy of 'away', is a change of attitudes, behaviours and cultures, in which deposits can play an important, efficient and effective role. An urgent, systemic review of who should do what is required. It should be irrelevant 'who' currently collects an item or a category of products: it has to be about the best outcome, the best way, making the right decisions.

This needs leadership in order to drive it, and it needs to be outcomes focused. It needs to start right now. The transition to circularity will require what's sacred to be discussed, not getting hung up on 'business as usual' – open minded by default.

Prevention – avoiding the creation of waste, and reducing the amount and hazardousness of waste – is an essential element of the EPR of everything. EPR policy needs to drive better design, better execution of purpose, better resource efficiency through extended life where possible, and of course much better provision for the collection, reprocessing and incorporation of materials back into new products.

This needs to be fully funded through producer responsibility and driven by targets and, where necessary, taxes and levies.

6.3 Cost versus Value – changing the narrative

A frequent criticism levelled at EPR and deposit return schemes is that they place cost burdens onto citizens, a factor that is accentuated by the current cost of living crisis.

However, the debate is actually about consumer value for money. It's about cost versus value. Cost, where an item is considered 'a bargain' because it is cheap, may not offer the best value compared to another item which has, let's say, a 20% price premium but is designed to last twice as long. The 'cost per use' is much better.

Consumers have been trained into believing 'cheap' is equal to 'value' – however, cheap is often poor value for money. An argument against EPR is that it will increase the cost to the consumer: the consumer pays the price eventually, but the costs of 'cheap' are hidden.

The real price of a cheap electrical product where the rechargeable batteries cannot be removed or replaced is the cost of damage to Refuse Collection Vehicles, damage to waste and recycling facilities, installation of increasingly elaborate fire detection systems, a 500% increase in insurance premiums, additional complexity of kerbside collection schemes in an attempt to collect the nth this or that forced onto local authorities with no market for the end product and no funding to support schemes. And the cost to the consumer of buying another one; repeat as above.

All of this extra cost is paid by the consumers – primarily by council taxpayers through increased costs (or felt through a reduction in recycling or other council services, where that is the only choice open to a municipal authority).

Deposits do not add cost to the consumer. They add complexity to 'Business as Usual' operations for manufacturers and retailers, which may require short term investment to operationalise. However, deposits, as part of a wider EPR scheme, also drive attitudes, behaviours and cultures, both of consumers and of manufacturers and retailers. They drive innovation and invention. They drive investment. They drive domestic capacity and even manufacturing.

They drive value for money for the consumer, aka the council taxpayer, aka the voter. And they help to protect human health and the environment, at home and 'away'.

6.4 So why start with batteries?

Fires caused by batteries are a crisis for the resources and waste sector, for taxpayers, for homeowners, and for Government. Addressing the problem is an emergency, and an

emergency response is required. Batteries are a perfect candidate for extended producer responsibility and a deposit return scheme.

There were more than 1,200 fires caused by or suspected to have been caused by batteries at UK waste and recycling sites and vehicles in 2023 (Material Focus, 2024), an increase of 71% from 2022. These are batteries – in particular, high-powered, rechargeable batteries – that should not have been put in a bin, which should instead have been taken to a collection point.

The cost of the damage and lost time from these unacceptable and entirely avoidable fires caused by batteries is estimated at £158 million in annual damages (Eunomia, 2021). Fortunately, so far no-one has been killed in any of these incidents however clearly there is significant concern that this fortune may run out.

There are three reasons why these high-powered rechargeable batteries are ending up in bins – the wrong waste in the wrong place:

1. Clear and impactful information on how to correctly dispose of used batteries is not reaching consumers at point-of-sale or disposal and consumer awareness of the hazards is low due to a lack of funding for campaigns;
2. Batteries are finding their way into more and more everyday items, from single-use vapes to toys and gadgets and even into clothes and shoes, and consumers may be unaware an item even contains a battery;
3. Producer responsibility rules have not kept up with changing chemistry and pervasiveness of technology, with little or no incentive for manufacturers or retailers to change, placing the burden of cost onto local authorities.

Championing extended producer responsibility, and supporting the sector's transition to a circular and net zero economy are key commitments for CIWM – along with promoting safety for colleagues and consumer value for money.

This is why we are starting with batteries.

Our consumer research shows that the public are concerned over the impact and danger of batteries, are keen to do the right thing and strongly support action for change.

There is a lack of knowledge, information and confidence amongst consumers on how to dispose of batteries and gadgets that may contain batteries. This is particularly problematic in relation to cheaper/lower value and smaller items, such as vapes and rechargeable toothbrushes, whereas higher-value items are more likely to be traded in or sold on, with fewer ending up in a bin.

Where batteries can be removed and replaced, i.e. traditional 'AA' batteries, they are much more likely to be taken back to a retailer or other collection point – by almost 70% of people.

By contrast, higher value or larger items are more likely to be traded or otherwise taken to a Household Waste & Recycling Centre (HWRC). Breaking this down for typical example items, the charts below show that the degree of confidence an individual may have does not necessarily follow through into markedly improved outcomes, showing a lack of information reaching consumers due to low point-of-sale and disposal cut-through.

The public are 'petrified' when they discover the true impact of putting the wrong waste in the wrong place, in this case a battery or an item containing a battery in the bin.

Our research indicates that the public strongly support the use of deposits for items like batteries. The level of deposit doesn't need to be very high or set at a percentage of the value of a product, because the big-ticket items when it comes to 'wrong waste – wrong place' are cheaper, smaller products such as vapes and toothbrushes.

6.5 We need a new deal for consumers

Continuing with 'business as usual' is unacceptable and change must happen in order that this urgent crisis for our industry, for taxpayers and for Government can be addressed.

1. Battery manufacturers and retailers need to act immediately and work with the CIWM to **promote safer, simpler recycling**, ensure 'the right waste in the right place' and celebrate success, such as measures being put in place by the Bicycle Association to collect e-bike batteries, which make the problem and solutions more visible.

It is great to see voluntary schemes being implemented which take the issue of batteries, battery disposal and battery safety seriously and it is exactly these sorts of schemes that should become mandatory under EPR.

2. **Chemistry-specific targets** must be brought in and introduced as part of the process of updating existing battery producer responsibility legislation to an EPR for batteries, as a matter of urgency to ensure consumers can access collection points and industry-funded take-back schemes for high-powered rechargeable batteries and items containing these batteries – lead acid batteries account for 70% of recycling evidence but are just 3% of the UK market.

   Currently compliance is a box-ticking exercise – targets are being easily met at the expense of disincentivising investment in capacity to handle and recycle non-lead acid batteries. This is a quirk of the current out-of-date regulations and needs reviewing urgently, however this amendment to the current regulations is only a quick fix to address the current emergency situation being caused by batteries; it is not a long-term solution.

3. Work should start immediately on a **deposit-return scheme for batteries** which our research shows the public strongly supports this measure and the problem items are generally smaller/cheaper where a modest deposit will have the highest impact.

   We think a modest, flat rate deposit on all batteries or items containing batteries would be simple and effective, targeting the most problematic products and spurring action to address the issues flagged above. Retailers and manufacturers would need to ensure battery collections or collection points were available.

   Deposits would have the additional effect of challenging manufacturers to come up with better product designs, drive more products to have removeable and replaceable batteries and bring about the beginning of the end of designed-in obsolescence dictated by battery life. This would vastly improve safety of products at the end-of-life, reducing the risk to CIWM members and the public, and improve value for money through repairability.

4. Support needs to galvanise around the development of **domestic rare-earth material circularity** and tech circularity businesses – this is not about amending

end-of-life regulations, but a fundamental shift in attitudes from 'cost' to 'value' through right-to-repair and eco-design principles.

With global demand for rare earths materials expected to reach 466,000te by 2035, up from 170,000te in 2022, clearly there is demand for these materials. Urgent Government action is needed to support R&D investment in rare-earth material recycling.

Combined with the above points, the UK should lead by example and move from being one of the most wasteful societies in the world when it comes to electrical and electronic equipment, to become one of the most progressive and resourceful, respecting the safety of others and grasping the opportunity presented by mining the urban environment for valuable materials, supporting manufacturing and export, creating jobs and skills as a result.

CIWM is taking a lead on the issues end-of-life batteries are having on workers within the Resource & Waste sector, and the lost opportunity that this currently presents as an example of why EPR needs to be extended. CIWM is:

- standing up for consumers
- protecting workers in the resources and waste sector
- safeguarding critical raw material and driving the UK towards a more circular economy.

Ultimately, we see a clear path towards 'EPR of Everything' as a policy priority area, focusing on materials, products and sectors where either there is no current or direct producer responsibility code or requirement, or where what does exist has demonstrably fallen short in delivery or fallen behind current technology, policy or practice as is the case with batteries.

6.6 CIWM's "New Deal for Consumers" in detail

Regulatory and legislative measures, combined with the attitudes of better informed and motivated consumers, act as positive drivers for change.

Some commentators will no doubt try to counter this by stating, as they have in relation to packaging EPR changes, that "it is unfair on consumers for Government to be adding to 'the cost-of-living crisis' by introducing environmental taxes," and use this as an excuse for inaction.

However, this is misguided and serves only to obfuscate from the real issue – cheap goods with built-in obsolescence are having a huge impact on peoples' quality of life by making people pay multiple times for something like an electric toothbrush or a t-shirt that should last a lifetime.

And the double-whammy is that council tax bills are going up because of the pressures to collect more and more difficult waste streams, and pay for the damage to vehicles and facilities used by local authorities to manage recycling and waste.

Deposit-return schemes and EPR schemes are not a tax on goods – they are the opposite, serving to highlight system failures ('bads'), direct the right waste to the right place and support better value for consumers.

EPR should be used positively to ensure value for money for consumers and taxpayers: by ensuring sufficient funding is in place for collection and processing of products and materials; by increasing the 'in-use' phase for example through better design, warranties, repairability; and through innovation and servitisation to eliminate waste and improve resource efficiency.

Making things that last longer is key. Think of it in terms of cost-per-use. The cost-per-use of an item manufactured to last twice as long as a similar product will most likely make more sense as long as it is less than double the price. For more expensive products, servitisation (where an item is leased rather than purchased, and maintained as part of the deal), may make more sense.

These business models have existed in the past and still exist today for some purchases and products; our prediction is that they will make a come-back and should be considered more widely. We believe these models will be developed as a consequence of delivering EPR – there are already strong signals in key market sectors including white goods, lighting, furniture and clothing.

Our report shows that action on batteries should be targeted:

- clear and unambiguous definitions for battery types and categories to prevent the current lead-acid imbalance
- problem products tend to be lower-value, smaller items e.g. rechargeable toothbrushes, vapes etc, not higher value, expensive or large items, e.g. smartphone, laptop, cordless garden tools
- place a flat-rate deposit on batteries or products containing batteries, e.g. £2
- potential for an eco-design 'levy' on products where currently batteries cannot be removed or replaced, as an incentive to producers to improve design and/or to consumers to buy a different product in lieu of inaction by manufacturers
- unclaimed deposits/levy income should be used to promote research and development – these should be cost-neutral as the objective must be to set up systems for success... EPR should be there to cover collection/recycling costs.

By encouraging removable batteries and supporting the right to repair, products will be better made e.g. motors will have to last several battery-life cycles and/or be repairable too, ensuring products last longer and offer consumers better value-for-money.

CIWM supports the expansion of take-back schemes which are the right approach to support the mission of 'simpler recycling':

- making the problem and solution visible to consumers;
- ensuring the producer pays; and
- enabling the management of deposit scheme administration and levy collection (collected for and on behalf of the exchequer at point of sale, akin to VAT).

Whilst this will interrupt 'Business as Usual' and be mildly inconvenient for retailers and manufacturers, it's much less inconvenient than setting fire to vehicles and facilities used to manage society's waste and recycling.

6.7 CIWM's support for developing circular economy opportunities

Alongside these measures, it is essential that the scarce and expensive critical raw materials (CRM) in batteries are captured for the current and future generations, providing readily accessible materials for the UK economy.

The narrative must be changed to support a circular economy not just for these materials but also for the products they are used in. There are significant potential economic benefits from CRM infrastructure investment in the UK and the first step is to invest in domestic battery recycling capacity, especially when linked to freeports and facing outwards to Europe and beyond.

This is supported by CIWM's ambitions to assist members and the wider UK economy to transition to a circular economy as a key driver of, and agent of change in, supporting the drive towards net-zero and the modernisation of our industry from waste to resources, adding significant value to the sector.

6.8 Vapes – a salutary lesson

Vapes are a microcosm of everything that is wrong with the way new products are placed on the market without any consideration for end of life management.

They also perfectly demonstrate the consequences of incorrect disposal, and the lack of any EPR requirement with real teeth which essentially has placed all responsibility on the waste management industry and local authorities.

It was completely predictable. We must not allow this sort of mistake to happen again.

The survey for this report demonstrates that one in seven (14%) adults in the UK uses a vape/e-cigarette. This includes 8% who use a rechargeable vape, 7% a refillable vape and 5% a single use vape.

The survey also demonstrates that, for rechargeable vapes (NB. the survey did not ask about disposal vapes), the dominant disposal routes are the general rubbish bin (24% of rechargeable vape users typically dispose of it this way) and the HWRC (23%), followed by a dedicated council collection (13%).

The field work did not consider single use vapes, which will be banned in the UK as part of plans to tackle the rise in youth vaping and protect children's health, the Prime Minister announced on 29 January 2024 on a visit to a school.

6.9 Closing comments

The impacts of selling cheap, single-use plastic items containing a non-rechargeable, single-use battery were entirely foreseeable. The same is true of embedding powerful, rechargeable batteries inside electrical and electronic products – making them removeable and replaceable is the minimum requirement.

The experience with disposable vapes demonstrates that the problems were entirely foreseeable but that we will have had to wait around a decade, facing a growing problem, before legislation finally catches up.

It cannot be allowed to happen with clothing and aftermarket bike parts, both of which are increasingly appearing in general waste containing high-powered, rechargeable batteries.

Moreover, the wider issues explored in this paper are compounded by the fact that overseas 'away' solutions' days are numbered. The Textile Recycling Association (TRA) have "sounded the alarm about the imminent collapse of the textile recycling sector" due to global market challenges and a tightening of regulations in Europe.

This is despite warnings issued by TRA over two years earlier. The main impact will, of course, be on local authorities, charity shops and recycling collection companies, not on retailers and manufacturers.

We must ensure we use our foresight to never make the same mistakes again.

Together, we stand for a world beyond waste

Appendix A

CIWM Industry Questionnaire – Batteries

This industry survey is being conducted on behalf of the Chartered Institution of Wastes Management by contractor John Twitchen as part of a wider project looking into the challenges and opportunities presented by batteries, in particular high-powered, rechargeable Lithium-ion batteries and batteries embedded in other products, e.g. rechargeable electrical equipment.

This survey will inform the direction of the report and recommendations, and is complemented by an industry round table which is planned to be held in mid-October in Birmingham. If you would be interested in attending the round table, please ensure you complete the last question so that we can contact you.

Results of the survey will be anonymised for use in the final report; views will not be attributed to individuals or organisations. If you have any questions about the survey, you can contact John Twitchen via johntwitchen@gmail.com or Richard Hudson via richard.hudson@ciwm.co.uk - we thank you for your time and consideration of these important issues.

1. Your name (confidential - the answer to this question will not be shared or published)

2. Your organisation (confidential - the answer to this question will not be shared or published)

3. Describe the main activity(ies) of your organisation. Choose all that apply.

- Waste management
- Waste/recycling collection
- Consultancy
- Compliance
- Policy development
- Communications/PR
- Planning
- Finance/insurance
- Safety
- Equipment
- Construction
- Other

4. Have you or your organisation been affected by a fire or other incident caused by batteries? Select one.

- Yes – once/very rarely
- Yes – often
- No – never

5. To what extent do you feel that you you've been given enough information to know how to correctly dispose of batteries? Select one.

- Definitely know how to correctly dispose of batteries
- Fairly sure I know how to correctly dispose of batteries
- Not completely sure I know how to correctly dispose of batteries
- Not sure at all/unclear how to correctly dispose of batteries

6. How would you dispose of the following items?

	Put in household rubbish or recycling bin	Leave it for someone else to clean up	Take to HWRC	Donate it/give it away	Sell it/ trade it in	Take to a retailer	Other (specify)
Rechargeable toothbrush							
Electric scooter							
Lap top							
Single use vape							

7. Do you recall seeing the 'Zombie Batteries' campaign?

- Yes
- Possibly/think so
- No

8. What do you feel are the main issues with battery recycling (practice, regulations, infrastructure etc) in the UK at the moment? Please include any examples.

9. In a word or phrase, what are the biggest barriers to improving battery recycling in the UK? Please pick up to three.

- Poor/no collection
- Lack of take-back schemes/locations
- Communications/promotion
- Compliance schemes
- Government
- Regulations fit for purpose
- Retailers
- Waste management/recycling companies

- Lack of demand/lack of markets for recycling
- Consumers
- Manufacturers
- Other

10. What do you feel is the most important thing to concentrate on that will fix the problem and address the hazards presented by incorrect disposal of batteries? Give examples; references welcome.

11. Thinking about the future, we would like your views on a proposition and then ask your opinion about. Industry colleagues will most likely be familiar with the concept of a Deposit Return Scheme. One option would be to introduce a Deposit Return Scheme for batteries – including standard batteries as well as rechargeable batteries within products like smartphones, electric toothbrushes, etc. It would work something like as follows:

- People pay a deposit when buying a product [with a rechargeable battery inside]. This would be added to the price of the product.
- They return the product at the end of its life and get their deposit back; or if the battery is removable, they return the battery and swap it for a replacement. It doesn't need to be the same place where it was bought from.
- Different methods of returning items are possible. For example, 'return points' could be via a supermarket or retailer take back scheme.
- If the product is not returned to one of these return points, the deposit is lost.

As an example: you buy an electric toothbrush which costs £15, which includes a £2 refundable deposit. On returning the product you get the £2 back, so the product has only cost you £13. If you didn't return the product to a designated return point you would lose the £2.

Do you think a deposit return scheme for batteries could provide a solution?

- Yes – definitely
- Possibly/think so
- Maybe – for some types of batteries
- No – not at all
- PLUS: Please provide any views you may want to share on the potential for a Deposit Return Scheme for batteries.

12. Have vapes - single-use/disposables, rechargeable/reusables - caused you any difficulties? If yes, please describe.

13. What do you feel should be done to address the immediate issue of disposable vapes containing batteries?

- Immediate ban on sale and import
- Ban on sale near to schools
- Industry take-back scheme should be introduced immediately
- Should only be available from chemists/on prescription
- Nothing, not a problem

14. Final question: would you be interested in attending the industry round table on batteries, scheduled for Birmingham in mid-October? If yes, please provide your email address (confidential - the answer to this question will not be shared or published).