

Environmental Audit Committee – Questions to the RSC Related to Electronic Waste and the Circular Economy.

Introduction:

The Royal Society of Chemistry (RSC) welcomes the opportunity to give further evidence to the Environmental Audit Committee on e-waste and the circular economy. This evidence draws on our '[Elements in Danger](#)' campaign, which we started in 2019, the International Year of the Periodic Table. It included a survey on recycling of electronic devices. These highlighted both the amazing technology we use every day that relies on these elements, and the risks associated with the loss of some of the elements that are critical to future technological innovation.

The EU's 2017 list of Critical Raw Materials (CRMs)¹ contains 27 materials that are 'critical' due to their high economic importance combined with high supply risk for the European economy. Some of these are currently irreplaceable in electronic devices. This includes indium, which is critical to touchscreen and solar panel technology, and tantalum, a key element in micro-capacitors for a range of applications from mobile phones to wind turbines.

CRMs such as indium and tantalum are also currently essential in solar panels, wind turbines and electric vehicles. Given these technologies are critical to enable the fourth industrial revolution, the UK needs to urgently consider the future supply of CRMs.

There is no universal list of CRMs as the classification of 'critical' depends on a range of factors from geographical abundance to the potential for substitution and even geopolitical factors involved in supply chains. Each region should keep and regularly update their own list, depending on the technologies and demands for materials most important in that geographical area.

Recommendation 1: The UK government should work with devolved administrations to coordinate the development of a critical raw materials list for the UK, and implement a plan for regularly revisiting the classification.

Question 1: How can the Government better support the recovery and re-use of the critical raw materials found in electronics?

Although the Environment Bill contains some measures that could support the collection and recovery of CRMs from e-waste, we think Government could go further in implementing the waste hierarchy.

¹ <https://ec.europa.eu/transparency/regdoc/rep/1/2017/EN/COM-2017-490-F1-EN-MAIN-PART-1.PDF>



The 'waste hierarchy' ranks waste management options according to what is best for the environment. It gives top priority to preventing waste in the first place ('Reduce'). When waste is created, it gives priority to preparing it for re-use ('Re-use'), then recycling ('Recycle'), then recovery, and last of all disposal (e.g. landfill).²

In line with the waste hierarchy the first priority for government should be to reduce use and reliance on CRMs, followed by incentivising the reuse of products containing them, as recovery and recycling have inherent energy and resource costs.

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a) Trusted take-back schemes and data security

The Environment Bill should clearly include provision for coordinated collection or take back of electronic waste across the UK.

Offering convenient and trusted product takeback schemes has been shown to improve WEEE recycling rates.³ One of the main concerns preventing consumers from recycling their used electronics is data security. In an RSC-commissioned MORI survey of 2,300 people across the UK we found that of those with no plans to recycle their devices, 37% said they were concerned about data security. However, the Environment Bill doesn't explicitly mention a secure data wiping initiative.

At present it's not clear that resetting devices to factory settings is enough to ensure the data is safe. Consumers need guarantees that data can be safely wiped – governments need to create and enforce regulations around data wiping. We heard in one of our scientific workshops on the issue that even quite severe physical destruction of a hard drive using a hammer is not enough to ensure the data cannot be retrieved.

Recommendation 2: Offer convenient product take-back schemes for electronic waste that guarantee secure data wiping.

b) Effective labelling, and a National Materials DataHub

We support efforts by BEIS, Defra and the Office of National Statistics to establish a National Materials Datahub⁴. This is part of a necessary new infrastructure to track the supply of materials in real time and supports industry to provide a transparent circular supply chain.

² [Guidance on applying the Waste Hierarchy](#), Defra, June 2011

³ [CRM Recovery Project Final Report](#), April 2019

⁴ The long-term vision of a National Materials Datahub is to provide the UK's first single version of truth for materials information in the UK. This should address the 'lack of coordinated and usable data' on material availability, including secondary materials.

Currently the Environment Bill allows national authorities to introduce regulation for the purpose of tracking 'relevant waste' via an electronic system⁵, but does not state that this system will include tracking electronic waste or CRMs specifically.

Electronic tracking of e-waste and critical materials in this way could avoid illegal waste export, and ensure CRMs are being recovered and recycled properly, as well as increasing consumer confidence. This data should be shared across the chain of stakeholders – from manufacturers to recycling centres - to ensure better link up.

Effective and consistent labelling of products can perform two functions: informing the consumer about the durability, repairability and eco-design of products, and their end of life treatment; and informing waste management workers about the presence of CRMs, where they are from and recycling requirements for where they go to next in the circular economy.

Accurate instructions on contents and disassembly are especially important for parts that contain potentially toxic materials. This highlights the need for clear communication between manufacturer and recycler.

Recommendation 3: Globally harmonised material labelling regulations to improve the ability to identify where CRMs are present in products, and tracking of their use and reuse in the National Materials Datahub.

c) Infrastructure – clear, easy and consistent collection processes linked to supply chains

If we all started recycling our devices today, the current national infrastructure to collect and recycle WEEE would prove far from sufficient to process the input.

Critical and consistent national infrastructure across local authorities makes chemical/mechanical recycling and CRM extraction economically viable across the UK. For any recovered 'second hand' materials, their competitive position in the market is strongest when they are as close as possible to the primary materials in performance and quality, which is only achievable with good recycling processes and technology.

The CRM Recovery Project³ found that collection infrastructure worked well when it was at trusted sites that were visible and easily accessible in the community, such as shops or universities. Infrastructure also needs to be harmonised to avoid confusion or incorrect disposal, and be designed in a way that supports reuse and CRM recovery.

Recommendation 4: Better and more consistent infrastructure is needed for WEEE collection for reuse and recycling. The process should be clear, easy and made visible to consumers and it should be transparent to consumers as to where the 'waste' is going to be recycled.

d) Research, Innovation and collaboration

⁵ 'The relevant national authority may by regulations make provision for the purpose of **tracking relevant waste**, including provision about the establishment of an electronic system ("the system") for that purpose.' – Environment Bill (as introduced), January 2020

To ensure that the UK is in a position to deliver its strategic innovation ambitions, funding budgets for research (and training of researchers) towards the substitution of CRMs and the separation of materials at scale should be appropriate to the projected demand of CRMs.

This will require development of new materials to substitute CRMs, collaborative work with designers to enable design for circularity including reuse and recovery of product components and recycling of CRMs, and scale-up of recovery processes.

The recycling process also needs continual innovation to keep up with changing technologies. The elements are often widely dispersed so only small amounts can be refined at once, and this is set to get harder as devices get smaller and more complex.

Chemical scientists have a key role to play in this, and there are already some chemistry innovations that could help us to recover rare materials from devices more efficiently. One example is the RecEOL project being led by the University of Cork and Composite Recycling, where materials are recovered from devices in a unique molten zinc reactor.

Recommendation 5: Invest in development of CRM substitute materials, collaborative work with designers to enable design for circularity, and innovation and scale-up of CRM recovery processes.

CRMs are lost as waste products from currently-used recovery processes that focus on recovery of metals such as gold, platinum and copper. Extraction processes that would enable a much broader range of materials, including CRMs, to be recovered have been developed at laboratory scale, but further work and investment is needed for these to be commercialised. This requires many sectors of society to work together to create the drivers for change and steer research investment.

One of the principles of the circular economy is to think in systems, which requires knowledge of and communication with all parts of the complex production and recycling system. This is essential for all of the parts to work together, for instance to communicate gaps in understanding, or blockers to innovation.

Recommendation 6: The government should initiate formal collaborative networks between local and national governments, academia, manufacturers and retailers or producers to ensure the challenge is being tackled effectively.

Question 2: What policy actions could the Government take now that we have left the EU to incentivise repair, reuse or resale of electrical and electronic goods?

Now the UK has left the EU, we should consider how actions taken in the UK will impact trade and supply chains, and should remain connected with EU waste policy, as UK policy also evolves.

- a) Safe data removal from devices sent to be reused, resold or recycled

As stated above and we reiterate here, one of the main concerns preventing consumers from recycling their used electronics is data security. Secure data wiping is an important enabler to this whole area of electronic waste to ensure consumer confidence and would encourage reuse and resale of electronics, as well as recycling.

Recommendation 2 (as above): Offer convenient product take-back schemes for electronic waste that guarantee secure data wiping.

b) The opportunity to be innovative and lead in Eco-design and Life Cycle Analysis

One of the key principles of the circular economy is to design out waste or know how the waste is going to be handled in a value chain.

Currently, manufacturers are not incentivised to think about what will happen to their products at the end of life. Extending Producer Responsibility to encompass the whole lifecycle of a product can be a way of ensuring a more circular economy approach to manufacturing. We are pleased to see that the Environment Bill⁶ includes provision for producer responsibility obligations, but for electronic waste these need to be used alongside other measures such as improved recycling.

Product requirements needed to achieve a circular economy include;

- a product's lifecycle impact should be reported and products should have a maximum permissible impact on the environment throughout their lifecycle;
- material choice and substitution decisions based on assessment of criticality in terms of resource availability, lifecycle and social impact (versus product performance) should be incentivised;
- design requirements should ensure that products can be cost-effectively upgraded, repaired, remanufactured and disassembled, and should be relevant in the context of available repair and recovery infrastructure;
- products should have labels setting out how easy it is to repair and disassemble them, to inform consumers and empower them through their product choices.
- products should incorporate data management and protection systems by design, which ensure safe eradication of consumer data before reuse or recycling.

In tandem with implementing these measures, the UK should act as a leader in efforts for global standards in this area. International Trade and development activities provide opportunities in this area, for instance the trade of both second hand devices and devices with high standards of eco-design, and these should be actively explored.

⁶ 'The relevant national authority may by regulations make provision for imposing producer responsibility obligations ... for the purpose of ... preventing a product or material becoming waste, or reducing the amount of a product or material that becomes waste; sustaining a minimum level of, or promoting or securing an increase in, the re-use, redistribution, recovery or recycling of products or materials' - Environment Bill (as introduced), January 2020

The second hand market for devices like smart phones is growing rapidly, and particularly with poorer citizens and in developing nations. Ensuring that manufacturers continue to provide long lasting, durable electronics that can be repaired and reused will support this. Integration of eco-design will also ensure efficient recycling at the end of life, so high quality elements can be recovered for a second use.

Recommendation 7: Encourage and adopt minimum eco-design principles in innovation to ensure maximum resource efficiency. Invest and become a world leader in developing workable circular economy and Life Cycle Assessment tools that can help in developing responsible global circular economies.

This should go alongside improved collection of devices at the end of life, as outlined in previous answers, and an investment in innovative eco-design and improved collaboration.

Recommendation 5 (as above): Invest in development of CRM substitute materials, collaborative work with designers to enable design for circularity, and innovation and scale-up of CRM recovery processes.

Question 3: What actions should the Government be taking to improve public awareness of the right way to dispose of and recycle electric products?

Any effort to raise public awareness of the issues surrounding e-waste should primarily focus on the waste hierarchy principles of first reducing consumption and reusing any products.

The RSC commissioned a survey which showed that the majority of people with unused electronic devices have no plans to recycle or sell them on after they fall out of use (only 18% planned to recycle and 14% to sell). Of those who didn't recycle their electronic devices, 59% said that knowing that some mobile devices contained conflict elements, toxic ones, and rare elements would make them more likely to recycle. It should be reiterated that devices should be used and recycled properly, and that even holding on to or 'hoarding' them is better than the scarce elements being lost to landfill.

Researchers at the University of Southampton found that currently the most common End of Life routes for EEE were donating to relatives, friends or charities, hoarding, recycling via Household Waste Recycling Centres, or discarding items in household waste. This shows the need for clearer messaging on appropriate outcomes.

Recommendation 8: In increasing public awareness of this issue, the government should be transparent about the current limitations of e-waste recycling infrastructure. With this in mind, messaging should be to reuse, pass on or keep hold of devices in preference to discarding to landfill.

Question 4: Has the UK got the balance right between prioritising recycling e-waste and making efforts to encourage greater reuse and repair?

Mechanically destroying devices and chemically recycling materials must not be the first priority. Decreasing the use of CRMs, finding alternative materials, as well as increasing re-use and repair of products they are used in, are just as important if not more so.

As previously mentioned there is a need for improved recycling infrastructure, but also alternative outcomes for products, and potential links to developing world projects who may have more use for second hand devices.

Currently, most of the government focus seems to be on increasing recycling throughput, for instance through the UK WEEE collection targets set by Defra. These targets are based on the amount of EEE placed in the market in the previous three years, meaning they could potentially act as a disincentive for keeping this EEE in circulation.

Recommendation 9: The government should focus efforts in the near term on interventions that prioritise reduction, reuse and repair together with innovation for new technologies that do not rely on scarce elements.

Question 5: Are there any circular economy measures which could be introduced easily by the Government to rapidly improve how we manage and minimise e-waste? Reforms that could be considered 'low-hanging fruit'?

As previously mentioned:

Recommendation 2 (as above): Offer convenient product take-back schemes for electronic waste that guarantee secure data wiping.

This can lead to improved collection rates for recycling, but also a convenient route to collect devices suitable for reuse or resale.

Recommendation 3 (as above): Tracking of CRM use and reuse in the National Materials Datahub.

It is important to know the scale of what we have in terms of e-waste, current CRMs in circulation and how they are used, and any potential for reuse.

In addition, collaborate effectively across all devolved nations of the UK:

Recommendation 1 (as above): The UK government should work with devolved governments to coordinate the development of a critical raw materials list for the UK, and implement a plan for revisiting the classification.

Question 6: Are there more fundamental changes to the way companies design or gain revenue from products that the Government could consider incentivising?

Some of the suggestions made in response to the previous questions would require quite significant change from companies and thus could influence how they design and gain revenue from products.

Requiring companies to report on the lifecycle impact of their products not only informs customers but nudges manufacturers towards more sustainable practices. This could be incentivised further by certification for the most demonstrably sustainable products.

Manufacturer led deposit or take back schemes could mean that producers reap some of the revenue from second hand markets (e.g. through social projects with poor communities and/or international trade), or reuse of materials if products are recycled.

Question 7: How effective could the use of ‘modulated fees’ in an Extended Producer Responsibility scheme be in incentivising EEE products to be designed in a way that enables easier reuse, repair, or remanufacture?

We feel others would be better placed to answer this question.

Contact

The Royal Society of Chemistry would be happy to discuss any of the issues raised in our position in more detail. Any questions should be directed to policy@rsc.org.

About us

With about 50,000 members in 120 countries and a knowledge business that spans the globe, the Royal Society of Chemistry is the UK’s professional body for chemical scientists, supporting and representing our members and bringing together chemical scientists from all over the world. Our members include those working in large multinational companies and small to medium enterprises, researchers and students in universities, teachers and regulators.