Impacts of the Basel Proposals on UK Export of UEEE and WEEE

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Note to the reader

Valpak Consulting were commissioned by Defra in 2021 to undertake research on the potential impacts on Used Electrical and Electronic Equipment (UEEE) and Waste Electrical and Electronic Equipment (WEEE) exports of proposals put forward to amend the Basel Convention. This was in the lead up to the negotiations at the Conference of Parties which ultimately agreed to move forward with the Switzerland-Ghana proposal in 2022. Ahead of the Basel amendment being implemented domestically in the UK, Defra commissioned Valpak in 2024 to revisit this report and update the analysis on the impacts of the Switzerland-Ghana proposal on the UK WEEE sector. For completeness, the analysis of the proposals that were not adopted under the Basel Convention remains included in this report, though the analysis in these sections has not been revisited or updated since 2022. Similarly, much of the text throughout this report is written in 2022 before the amendments were agreed by Parties.

1. Executive Summary

Waste Electrical and Electronic Equipment (WEEE) is one of the fastest growing waste streams globally. Managing this growing waste stream effectively is critical in terms of environmental protection and safe access to the valuable materials contained within. In some instances, the process for management of such wastes is focused on retrieval of the valuable materials (particularly metals) at the lowest possible cost, thereby ignoring (and therefore wasting) other materials that make up these items, the environmental damage and human harm that can be caused by lower cost extraction methods such as unregulated burning, and the exploitation of people undertaking this activity. Much of this low cost, low consideration activity takes place in developing countries following the export of this material for recycling.

1.1 The Basel Convention

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal was created to protect people and the environment from the negative effects of the inappropriate management of wastes, including WEEE, worldwide. Three proposals have been put forward to amend the Basel Convention to tighten the rules around exporting such wastes:

- Switzerland and Ghana (S-G) Amendment whereby all transboundary shipments of WEEE regardless of whether it is characterized as hazardous or not, will be subject to the Prior Informed Consent (PIC) procedure of the Basel Convention with such shipments requiring notification controls.
- Basel Action Network (BAN) Amendment whereby non-functional or untested Used Electrical and Electronic Equipment (UEEE) and UEEE that is claimed by an exporter to be repairable (and being exported for repair for reuse) would be subject to PIC controls under the Basel Convention. Only ‘fully functional’ UEEE would be allowed to be exported under ‘Green list’ controls.
- The EU Amendment which is designed to improve clarity and explain what non-recovery operations and recovery operations mean.

One further proposal, by TechUK, suggests the implementation of a ‘trusted trader’ model. This has not been considered within the modelling of this study.

For UK exporters of WEEE who are compliant with existing UK regulations there will be impacts on the control status for export of such material from implementing the S-G proposals to amend the Basel Convention, if implemented as proposed, specifically relating to compressors, electronic scrap that is high value and destined for base/precious metal recovery, and motors.

This report and the associated modelling assesses the impact of these proposals in relation to the c.700kt of WEEE that is collected annually (within the AATF system and through other collection systems) within the UK.

1.2 Data Sources

The project team surveyed businesses accounting for around a half of all WEEE that passes through an AATF that are involved in EEE and WEEE reuse and recycling activities that also export material abroad. This facilitated the development of a robust impact assessment by providing the following:

- Estimates of the tonnage and value of WEEE exported from the UK, the amount of non-hazardous WEEE, that may not already fall under PIC controls.

- The export codes (Basel codes and OECD codes) the business uses on its overseas shipments to gain an understanding of shipments under control and how robustly and accurately such codes are used at present.
- A breakdown of tonnages by different input/output category types of WEEE exported.
- A split of the quantity and value of exported outputs by destination to EU/OECD countries and non-EU/non-OECD countries.

This exercise produced an overview of the tonnages handled by the businesses surveyed, and showed overwhelmingly that Compressors, Circuit boards, Motors and Electronic scrap (high value) were exported.

1.3 Projections – volumes, values and notification costs

In 2025, 50.1k tonnes of WEEE industry outputs (worth £29.4m) are projected to be exported under PIC control notification – 29.8k tonnes of compressors and 19.6k tonnes of motors as both are impacted by the S-G amendments. This will increase to an additional 67.1k tonnes of outputs exported under notification by 2035. In 2025, 310 additional notifications will be required to ship the outputs exported by the WEEE industry (excluding circuit boards) under the S-G amendments, at an additional cost to industry of £2.3m. This will increase to an additional £3.1m by 2035 due to the increase in overall volumes and therefore notifications required. The cumulative cost of additional notifications in the period 2025 to 2035 is £30.3m (central scenario).

1.4 Impacts on UK businesses

It is anticipated that UK exporters of compressors and motors impacted by the implementation of the S-G amendments continue to export and pay the costs of notification, rather than employ alternatives such as the development of local recycling infrastructure or domestic disposal. In an extreme scenario where adverse market conditions caused a collapse in exporter margins, the UK industry would choose not to recover these products prior to shredding and shred them instead. The shredder output could then be exported without PIC controls or sold to businesses in the UK. Either way it would not go to disposal.

Although circuit boards are also not considered to be impacted in the scenarios in this assessment Royal Mint and GAP Recycling have established capacity for recovery of precious metals and critical raw materials from circuit boards (and, potentially, high electronic scrap that is currently exported to metal refiners). Together, the two sites represent substantial UK capacity to process circuit boards currently being exported under PIC controls.

1.5 Conclusions

The management of WEEE and used EEE (for reuse) is a global problem and is growing quickly. Waste management companies and businesses operating in the WEEE recycling industry export outputs recovered from EEE wastes for further reprocessing. However, some receiving countries may not have the capacity and infrastructure to manage them in an environmentally or socially sound manner. There are exporters who side-step export and import regulations by wrongly declaring shipments of WEEE as functioning product or ‘for repair and reuse’ when in reality such shipments can be waste.

The main impacts on UK WEEE exporters would be seen by S-G amendments with an associated impact on the export of non-hazardous motors, compressors and electronic scrap destined for base/precious metals recovery (for example, hard drives) – all of which would move to PIC control notification.

Consideration within this impact assessment was primarily given to the S-G scenario and, when implemented as proposed, it is estimated that the total additional costs cumulated over the period 2025-2035 incurred by UK businesses exporting under PIC controls (excluding circuit boards) will be £30.3m, or approximately £3.31m per year.

Furthermore:

- Under a range of realistic scenarios for export of compressors, electronic scrap (high value) and motors under PIC controls, UK businesses would be very likely to continue to export and pay the costs of

notification – it is more profitable to do so. As automated processing of compressors continues to develop, this is likely to facilitate their recycling in the UK. This scenario has not been modelled.

- There is no credible scenario under which UK exporting businesses would opt to send these valuable products to disposal in the UK at a landfill cost of over £130 per tonne. In an extreme scenario where adverse market conditions caused a collapse in exporter margins, the UK industry would choose not to remove high value components from WEEE prior to shredding. The shredder output could then be exported without PIC controls or sold to businesses in the UK. Either way it would not go to disposal. Treatment processes for motors and compressors, to recover the ferrous and non-ferrous fractions, would be put in place in the UK.
- Most businesses potentially impacted by the S-G amendments are likely to be small and medium sized by size of employment i.e. 10 to 49 employees and 50 to 249 employees. However, there are several large metals recycling companies involved in the treatment of WEEE where the number of employees is 250+.
- In terms of cost pass through, the most likely scenario is that WEEE recyclers pass through cost impacts via the gate fees they charge for the WEEE streams impacted. All exporters are impacted equally, and they would be in a reasonable position to pass on these costs. Where cost uplifts are passed on, smaller businesses upstream and downstream of WEEE recycling businesses are the most likely to be impacted following the implementation of the S-G amendments.

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Glossary

AATF – Approved Authorised Treatment Facility
AE – Authorised Exporter
AEO – Authorised Economic Operator
ATF – Authorised Treatment Facility
A1180 – Waste electrical and electronic assemblies considered hazardous
BAN – Basel Action Network
B1110 – Basel Code for 'Electrical and electronic assemblies'
B4030 – Used single use cameras, with non-hazardous batteries
CRT – Cathode Ray Tube
EA – Environment Agency
EEE – Electrical and Electronic Equipment
EU – European Union
EWC – European Waste Catalogue
FPD – Flat Panel Display
GHG – Greenhouse Gas
k – Thousand
ktpa – Thousand tonnes per annum
LDA – Large Domestic Appliance
m – Million
OECD – Organisation for Economic Cooperation and Development
OECD Decision – The regulations governing the movement of wastes by OECD countries
OEM – Original Equipment Manufacturer
PIC – Prior Informed Consent
POM – Placed on Market
SDA – Small Domestic Appliance
S-G – Switzerland and Ghana
UEEE – Used Electrical and Electronic Equipment
UK – United Kingdom
WEEE – Waste Electrical and Electronic Equipment

2. Introduction

Globally, production of EEE is growing at pace every year due to growth in demand, the continuous development of new products, and the shorter life spans in many product categories. As a result, the amount of WEEE generated is growing, and is one of the fastest growing waste streams. The Global E-Waste Monitor[1] estimates that around 62m tonnes of WEEE was generated in 2022. By the end of this decade, 80m tonnes of WEEE per-annum is projected.

Management of WEEE in an environmentally sound manner makes economic and environmental sense. Recycling of WEEE yields a supply of valuable and critical secondary raw materials. Better still (in terms of circular economy) is extending the lifetimes and the use-phases of EEE through reuse of UEEE, both in terms of whole items and fully functioning components obtained from dismantling such items at end-of-life. However, recycling/reuse activities are not keeping pace with the growth of EEE and the associated WEEE, both globally and in the UK.

WEEE derived streams are traded as a commodity in markets internationally. Waste management companies and businesses operating in the WEEE recycling industry in developed countries, including the UK, export outputs recovered from EEE wastes for further reprocessing. Primarily, the intention is that these wastes are being sent for recycling and/or legitimate reuse in the countries receiving them, but some receiving countries may not have the capacity to manage them in an environmentally sound manner, leading to citizens, land and marine wildlife being exposed to toxic pollutants. In addition, there are exporters who side-step the regulations by wrongly declaring shipments of WEEE as functioning product or ‘for reuse’ when in reality such shipments are quite simply scrap. However, it is acknowledged that such activity may not in all instances be intentional, it could be because of a lack of understanding by importers or exporter leading to a misinterpretation of the requirements which could unintentionally also result in the export of items that can’t be repaired/reused.

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their and their Disposal was created to protect people and the environment from the negative effects of the inappropriate management of wastes worldwide. It is the most comprehensive global treaty dealing with hazardous waste materials, and other wastes which are considered to pose a greater threat to the environment, throughout their lifecycles, from production and transport to final use and disposal.

The proposals to amend the Basel Convention put forward are: one from Switzerland and Ghana (S-G), one from the Basel Action Network (BAN), and one from the EU.

The S-G Proposal

The (S-G) proposal is to amend Annexes II[2], VIII[3] and IX[4] to the Basel Convention as follows:

- Add a new entry Y49 on Annex II of the Basel Convention for WEEE and its components and constituents not characterized as hazardous.
- Reword the existing entry A1180 on Annex VIII for WEEE characterized as hazardous.
- Delete the existing entry B1110 on Annex IX of the Basel Convention since this entry is captured by the new entry Y49 as mirror entry of entry A1180.
- Delete the entry B4030 on Annex IX of the Basel Convention since this entry becomes redundant and is captured in the new entry Y49.

If implemented as proposed by (S-G), all transboundary shipments of WEEE regardless of whether it is characterized as hazardous or not, will be subject to the Prior informed Consent (PIC) procedure of the Basel Convention with such shipments requiring notification controls. Currently, under the Basel Convention non-

1 https://ewastemonitor.info/the-global-e-waste-monitor-2024/

[2] *Annex II to the Basel Convention contains a list of wastes requiring special consideration*
[3] *Annex VIII to the Basel Convention contains a list of hazardous wastes*
[4] *Annex IX to the Basel Convention contains a list of non-wastes.*

hazardous WEEE can be sent by some countries under 'Green list' controls[5], the S-G proposal may impact on these arrangements for other countries. Potential changes to the control status of UK exports and the impacts on UK exporters need to be considered from the perspective of existing UK regulations.

The BAN Proposal

The proposal is aimed at addressing the 'repairable loophole' used by some exporters declaring items of UEEE as 'repairable' or 'for repair' when in reality they are scrap and/or unrepairable. In the Basel Convention, if UEEE is declared by an exporter to be destined for repair for reuse, it may fall entirely outside the scope of the Basel Convention, if it is considered to be a non-waste and is not controlled.

The BAN proposal is to:

- amend the text for the new Y49 code being proposed by S-G, so that in addition to non-hazardous WEEE it captures non-functional or untested UEEE that is not destined for reuse, including repair.
- add a new code Y50 to Annex II of the Basel Convention specifically to capture shipments of non-functional and/or untested items destined for reuse, including repair.

If implemented as proposed by BAN, non-functional or untested used-EEE and UEEE that is claimed by an exporter to be repairable (and being exported for repair for reuse) would be subject to PIC controls under the Basel Convention. Only 'fully functional' UEEE[6] would be allowed to be exported under 'Green list' controls[7]. The proposed amendments by the BAN may impact current control arrangements for other countries but other factors from the perspective of the UK need to also be considered.

The EU Proposal

The proposal put forward by the European Union is to delete and amend some existing operational codes by:

- Amending the disposal and recovery operation codes in Annex IV.
- Adding two footnotes to entry Y48 in Annex II of the Basel Convention.
- Adding two footnotes to entry B3011 in Annex IX to the Basel Convention.

The proposals for amendments to the two footnotes in Annexes II and IX of the Convention are a by-product of the proposed changes to the operation codes proposed in Annex IV of the Basel Convention.

The EU suggest these amendments will improve clarity and explain what non-recovery operations and recovery operations mean. The inclusion of 'catch all operations' in the EU amendments is to cover potential future new disposal operation methods which are not known to date. In particular, the inclusion of the new R20 recovery code to cover 'preparing for reuse (e.g., checking, cleaning, repair, refurbishment)' is intended to distinguish between the preparation and reuse of waste which at the point of reusing is no longer considered waste.

The EU proposal is primarily to provide clarity. The EU proposal does not alter the control position regarding PIC controls on exports from the UK.

The TechUK Proposal

As an alternative to the proposals to amend the Basel Convention

- TechUK have put forward a 'trusted trader' model for international shipments of UEEE for repair and refurbishment (for reuse). This is an Authorised Economic Operator (AEO) model intended to provide

[5] This is not PIC controls. Green list wastes are non-hazardous and can be shipped for recovery to OECD countries under a low level of control without prior authorisation. Shipping non-hazardous wastes to non-OECD countries depends on type of waste and the control procedures the importing country has decided to apply. Shipping hazardous waste to non-OECD countries is banned.
[6] items shipped that do not require any repair and are suitable for direct reuse without any further assessment.
[7] This is not PIC controls. Green list wastes are non-hazardous and can be shipped for recovery to OECD countries under a low level of control without prior authorisation. Shipping non-hazardous wastes to non-OECD countries depends on type of waste and the control procedures the importing country has decided to apply. Shipping hazardous waste to non-OECD countries is banned.

assurance that shipments are both genuine UEEE and that the receiving site is adequately provisioned to manage the products responsibly in an environmentally sound manner.

- An AEO (or 'trusted trader') is a party involved in the international movement of goods in whatever function that has been approved by, or on behalf of, a national administration as complying with World Customs Organisation (WCO) or equivalent supply chain security standards.

These standards relate to:

- Demonstration of compliance with customs requirements.
- Satisfactory system for the management of commercial records.
- Financial viability.
- Consultation, cooperation, and communication.
- Education, training, and awareness.

In other words, what would be known as 'Green passports' or 'Circular economy passports' are assigned to 'trusted traders' i.e., exporters who have proven that their transboundary movements of UEEE are indeed for legitimate purposes. Tech UK suggest using a plurilateral approach where countries join on as they desire or are able.

The TechUK proposal does not alter the control position for UK exports regarding PIC controls on export of UEEE for repair and reuse.

There is a rationale for Government to consider placing further controls on UK export of UEEE and WEEE as such wastes (whether they are hazardous or not) may ultimately end up in destination countries that lack environmentally sound management methods. In general, tighter controls within the Basel Convention could help mitigate the adverse effects on the environment and health in countries receiving shipments of UEEE WEEE and achieve the desired outcome of reducing negative impacts from such exports.

This project provides Defra with an understanding of the potential impacts of proposals made to amend the Basel Convention.

As discussed, if implemented as proposed the S-G and BAN proposals will tighten controls as Prior Informed Consent (PIC) for certain export categories of non-hazardous UEEE/WEEE (and components derived from them) will be required under the Basel Convention. The proposed changes to the Basel Convention may impact on other countries but, importantly, whether or not there are impacts on UK exporters cannot be assessed in isolation from existing regulations in the UK relating to shipments of UEEE and WEEE. This impact assessment in this project explores the potential impacts on UK exporters taking into consideration existing UK regulations to determine whether or not the control status for UK export of WEEE and UEEE is actually changed by the implementation of the proposed amendments to the Basel Convention.

It is acknowledged that there are significant gaps in the data, particularly for exports of non-hazardous items and components derived from UEEE and WEEE. UK exporters do not have to report information on non-hazardous shipments to regulators, and since the export of genuine UEEE, i.e., fully functioning second-hand products suitable for direct reuse is entirely out of scope of current waste legislation there is no requirement to report. Export of UEEE or WEEE is not identifiable in other sources of trade data e.g., HM Customs data. Therefore, a critical part of this research is to capture data through surveying key businesses operating in the UK industry.

The project also examines the economic, social and environmental impacts on entities in the UK of the amendments to the Basel Convention if implemented as proposed against the backdrop of existing UK regulations. There is also a need to examine the infrastructure and capacity to process UEEE and WEEE in the UK as the requirement for PIC controls to export (where it is not currently a requirement) may alter businesses choices to export.

In summary, the key objectives of this project are:

- To quantify the amount of non-hazardous WEEE and UEEE exported from the UK.
- To assess from the perspective of the UK, the economic, social and environmental impacts on non-hazardous WEEE and UEEE of:
    - the Swiss/Ghana proposals to amend the Basel Convention.
    - the BAN proposals to amend the Basel Convention.
    - the EU proposal.
    - the TechUK proposal.
- To analyse the infrastructure of the WEEE and UEEE industry in the UK.

The rest of this report is set out as follows. Section 3 discusses in detail the proposed amendments to the Basel Convention, Section 4 provides some international perspectives, Section 5 summarises EEE placed on the market, collection and recycling, Sections 6 and 7 report the details of the industry surveys, Section 8 discusses scenarios, Section 9 provides details of the baseline scenario, Section 10 shows the results of modelling the impacts of the S-G scenario and impacts on UK businesses, Section 11 presents key conclusions.

3. The Proposed Amendments to the Basel Convention

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal is the most comprehensive global environmental treaty on hazardous and other wastes. It has around 190 member countries ('Parties') and its primary objective is to protect human health and the environment against the adverse effects resulting from the generation, management, transboundary movements and disposal of hazardous and other wastes.

For countries that are members of the Organisation for Economic Cooperation and Development (OECD) the Basel Convention is supplemented by an OECD Council Decision ("OECD Decision") on the Control of Transboundary Movements of Wastes Destined for Recovery Operations which provides a legal framework for the control of waste movements between OECD countries. The OECD Decision allows members of the OECD to diverge from Basel controls, subject to the need for consensus, in respect to movements of waste between OECD countries.

The proposed amendments to the Basel Convention specify new categories UEEE and WEEE that are subject to the Convention's prior informed consent (PIC) procedure. PIC is the backbone of the Convention. It requires that shipments of such classified wastes are pre-approved by regulators in both the country of dispatch, and destination, and where applicable third-party countries that shipments transit through. The PIC notification is required to be in place before any shipment can commence. Putting in place PIC notification (where none was previously required) adds an additional cost to exporters and therefore may potentially alter decisions around exporting from the UK.

In addition, Parties to the Convention are required to ensure that any transboundary movements of wastes which are subject to the PIC procedure are covered by insurance, bonds or other guarantee as may be required by the State of export. This insurance is required to meet the costs of repatriation of the waste if it cannot be recovered or recycled in the country of destination or if an accident occurs during its transport which requires remediation.

Hazardous waste and 'other wastes' subject to the prior informed consent (PIC) procedure (notification) under the Basel Convention are identified in Annexes I, II, III and VIII. Wastes listed in Annex IX are presumed to NOT be hazardous and, as such, are not subject to the PIC procedure.

The proposed amendments to the Basel Convention are discussed below.

3.1 Switzerland and Ghana (S-G) Proposal

The proposal put forward by Switzerland and Ghana is to amend Annexes II, VIII and IX to the Basel Convention as follows:

- Add a new entry Y49 on Annex II "Categories of waste requiring special consideration" of the Basel Convention (BC) for WEEE and its components and constituents not characterized as hazardous.
- Reword entry A1180 on Annex VIII for WEEE characterized as hazardous.
- Delete the entry B1110 on Annex IX of the Convention since this entry is captured by the new entry Y49 as mirror entry of entry A1180.
- Delete the entry B4030 on Annex IX of the Convention since this entry becomes redundant and is captured in the new entry Y49.

As a result of these amendments, all transboundary shipments of WEEE regardless of whether it is characterized as hazardous or not, will be subject to the PIC procedure of the Basel Convention with such shipments requiring notification controls. Currently, under the Basel Convention non-hazardous WEEE can be sent to some countries under 'Green list' controls[8], the S-G amendments will, if implemented as proposed, impact on UK exporters who ship certain categories of non-hazardous WEEE.

[8] *This is not PIC controls. Green list wastes are non-hazardous and can be shipped for recovery to OECD countries under a low level of control without prior authorisation. Shipping non-hazardous wastes to non-OECD countries depends on type of waste and the control procedures the importing country has decided to apply. Shipping hazardous waste to non-OECD countries is banned.*

3.2 Basel Action Network (BAN) Proposal

The BAN has proposed that the list of WEEE/UEEE requiring PIC controls in the Basel Convention must include non-functional (claimed as repairable) WEEE as well as those deemed hazardous. To address these BAN have put forward an amendment to the text for the new Y49 code proposed by S-G, and a new code Y50 to be added to Annex II of the Basel Convention.

A summary of the BAN proposal to amend the Basel Convention is as follows:

- Only 'fully functional' UEEE would be allowed to be exported under 'Green list' controls[9]. This means that any items shipped do not require any repair and are suitable for direct reuse without any further assessment.
- Used-EEE that is claimed by an exporter to be repairable and as export for repair for reuse would be subject to PIC controls, i.e., not just items exported that are deemed to be classified as WEEE but also non-functional or untested UEEE that is not destined for reuse, including repair. BAN have put forward new text for the Y49 code to clarify this point.
- BAN have also proposed a new code Y50 in Annex II of the Basel Convention to specifically address non-functional or untested EEE destined for overseas reuse, including repair for reuse.

The BAN proposal is aimed at addressing the 'repairable loophole' used by some exporters declaring items as 'repairable' or 'for repair' that are in reality scrap and/or unrepairable. Through this loophole, if UEEE is declared by the exporter to be destined for repair for reuse, it may fall entirely outside the scope of the Basel Convention as it is considered to be a non-waste, and in essence is not controlled.

3.3 European Union (EU) Proposal

The proposal put forward by the European Union is to amend the disposal and recovery operation codes in Annex IV, adding two footnotes to entry Y48 in Annex II, and two footnotes to entry B3011 in Annex IX to the Basel Convention.

These EU proposals include adding introductory text in Annex IV, adding new codes, and deleting and amending some existing operation codes.

The proposals for amendments to the two footnotes in Annexes II and IX of the Convention are a by-product of the proposed changes to the operation codes proposed in Annex IV of the Basel Convention.

The EU suggest these amendments will improve clarity and explain what non-recovery operations and recovery mean. The inclusion of 'catch all operations' in the EU amendments are to cover potential future new disposal operation methods which are not known to date. In particular, the inclusion of the new R20 recovery code to cover 'preparing for reuse (e.g., checking, cleaning, repair, refurbishment)' is intended to distinguish between the preparation and reuse of waste which at the point of reusing is no longer considered waste.

The EU proposal is primarily to provide clarity. It does not alter the control position regarding PIC controls on export from the UK.

3.4 Tech UK Proposal

As an alternative to the BAN proposal, TechUK have put forward a 'trusted trader' model for international shipments of UEEE for repair and refurbishment (for reuse). This is an Authorised Economic Operator (AEO) model intended to provide assurance that shipments are both genuine UEEE and that the receiving site is adequately provisioned to manage the products responsibly in an environmentally sound manner. An AEO (or 'trusted trader') is a party involved in the international movement of goods in whatever function that has been

[9] *This is not PIC controls. Green list wastes are non-hazardous and can be shipped for recovery to OECD countries under a low level of control without prior authorisation. Shipping non-hazardous wastes to non-OECD countries depends on type of waste and the control procedures the importing country has decided to apply. Shipping hazardous waste to non-OECD countries is banned.*

approved by, or on behalf of, a national administration as complying with World Customs Organisation (WCO) or equivalent supply chain security standards. These standards relate to:

- Demonstration of compliance with customs requirements.
- Satisfactory system for the management of commercial records.
- Financial viability.
- Consultation, cooperation, and communication.
- Education, training, and awareness.

In other words, what would be known as 'Green passports' or 'Circular economy passports' are assigned to 'trusted traders' i.e., exporters who have proven that their transboundary movements of UEEE are indeed for legitimate purposes. Tech UK suggest using a plurilateral approach where countries join on as they desire or are able.

The Basel Convention's technical guidelines on transboundary movements of WEEE and UEEE already outline criteria for identifying legitimate shipments of UEEE[10]. In particular, the distinction between shipment of wastes and non-wastes.

When dealing with facilities in non-OECD countries 'Trusted Traders' would be expected to adopt the following approach:

- **Selection Criteria** – when identifying facilities to perform repair and refurbishment activities, formal selection criteria are used, including ones necessary to ensure the environmentally sustainable management of these operations.
- **Contractual documents** - once the selection is complete, a formal contract is signed with the entity performing repair and refurbishment activities. All requirements are included in a MSA (Master Service Agreement) and in a SOW (Statement of Work) that are contractually binding, making the entity liable in case of violations.
- **Operational reviews** - every month, Operational Reviews take place to verify compliance to performance indicators and contractual requirements. The entity performing repair and refurbishment activities is required to provide all the necessary documentation and objective evidence (e.g., pictures, videos) to prove compliance.
- **Periodic on-site audits** - the facilities that perform repair or refurbishment activities are subject to periodic (usually annual) on-site audits, by OEM qualified auditors. Through the usage of standardised checklists, they verify that the facility complies with all requirements contractually agreed, with particular focus on environmental aspects. e.g., during the repair cycle, no use of banned substances or ensuring the use of qualified subcontractors for recycling the UEEE products/components that cannot be repaired and are removed during the repair operation.

3.5 Discussion

PIC controls and notification for UK export of UEEE and WEEE would clearly facilitate greater monitoring and scrutiny of exports. Notification controls enable greater transparency and empower regulators in the countries potentially receiving such shipments with the option to refuse them and/or reject/repatriate contaminated and improper waste shipments if necessary. As a consequence, PIC controls and notification place greater responsibility on exporters and competent authorities to ensure that exported outputs from UEEE and WEEE processing can be recycled in an environmentally sound manner in the destination country.

Considering the above, the S-G proposal would put both export of whole WEEE and WEEE derived components if the components are also classified as waste under Y49 and introduce PIC controls. Components sourced from UEEE or WEEE that are still fully functional and are (after the dismantling operation) to be exported for direct re-use would be classified as a (second-hand) product (e.g., a fully functional hard disk removed from a laptop) and would be outside the scope of Basel Convention, and any amendments.

[10] *Paragraphs 32a and 33b outline the paperwork and packaging requirements that verifies that used EEE is destined for reuse, extended use by the original owner, failure analysis, repair, or refurbishment for reuse.*
http://www.basel.int/Implementation/TechnicalMatters/DevelopmentofTechnicalGuidelines/TechnicalGuidelines/tabid/8025/Default.aspx

The benefits of implementing the S-G amendment to the Basel Convention include:

- Clarity on control position for export of WEEE, no further detailed discussions required by exporters and/or competent authorities, a clearer position on what is allowable to export and what is not.
- Enabling tracking and monitoring and provision of comprehensive and reliable data, with flows to formal and informal sectors in countries identifiable.
- Receiving countries are empowered to prohibit or restrict imports according to their capability to treat in an environmentally sound manner, leading to a shift towards higher value recovery.

In the S-G proposal clean fractions of materials recovered from WEEE e.g., metal, plastic, or glass would not be classified as Y49 and would not require PIC control notification. Mixed fractions recovered from treatment of WEEE would fall under Y49 with the exception being when the mixed fraction is already captured under an existing code in the Basel Convention, for example mixed polymer SDA plastics would continue to be shipped under Y48.

The S-G proposal does not include waste cables as there are already two existing categories in the Basel Convention, A1190 for cables deemed as hazardous and B1115 for cables deemed as non-hazardous (excludes any materials going to Annex IVA operations or any other disposal operations involving, at any stage, uncontrolled thermal processes, such as open-burning).

Table 1 shows a summary of Basel codes for WEEE derived streams that are not impacted by the S-G proposal.

Table 1: Summary of Basel Codes for Streams Not Impacted by the S-G Proposal

Basel Code	Description
B1010	Metals wastes: iron or steel, copper, aluminium.
B1040	Scrap assemblies for electrical power generation.
B1050	Mixed non-ferrous metal, heavy fraction scrap.
B1090	Waste batteries (excluding Pb, Cd, Hg).
B1115	Waste metal cables coated or insulated with plastics.
B2020	Glass waste (excluding CRT / activated).
B3011	Waste Plastic – e.g., fridge plastic.

The S-G proposal to amend the Basel Convention introduces PIC control for export of all WEEE (regardless of whether it is deemed hazardous or not) but it does not address the waste/non-waste issue around UEEE being declared as export for repair/refurb (for reuse). The S-G proposal does not address the ‘repairable loophole’. This loophole means that if a used electrical item is declared by the exporter to be destined for repair (for reuse) or direct reuse, it may not be considered to be waste and therefore falls outside the scope of the Basel Convention.

A key feature of the BAN proposal is that it explicitly addresses the ‘repairable loophole’. Exporters declaring used-EEE as repairable and as being exported for repair for reuse would be subject to PIC controls, the BAN proposal adds clarification that non-functional or untested EEE not destined for reuse, repair should be covered by the S-G Y49 code. In addition, a new Y50 code to address non-functional (or untested EEE) destined for reuse, including repair for reuse is added. BAN’s proposed amendments aim to ensure that all export of UEEE and WEEE (including non-functional or untested items) and other non-hazardous WEEE are effectively covered by PIC controls in the Basel Convention.

Under the EU proposal the inclusion of the new ‘R20-preparing for reuse (e.g. checking, cleaning, repair, refurbishment)’ recovery operation is intended to distinguish between the preparation and reuse of waste which at the point of reusing is no longer considered waste. This proposal is primarily to provide clarity rather than making WEEE subject to PIC.

3.6 Impacts from the Perspective of the UK

The proposals outlined above are for amendments to the Basel Convention. The proposed changes may impact on existing arrangements in other countries but, importantly, whether or not there are impacts on UK exporters cannot be assessed in isolation from existing UK regulations relating to shipments of UEEE and WEEE. This impact assessment explores the potential impacts on UK exporters from that perspective to determine whether or not the control status for UK export of WEEE and UEEE is actually changed by the implementation of the (S-G) or BAN proposals to amend the Basel Convention. For clarity, any item that is UEEE is not WEEE, and therefore is outside the scope of the Basel Convention[11].

In the context of this impact assessment if there is no change in shipping controls for exports from the UK compared to the current position, then there is no impact on UK exporting businesses.

3.7 The S-G, BAN and EU Proposals

Table 2 shows a summary of the current UK PIC status and how this may be altered by the proposals to amend the Basel Convention.

- Export of UEEE is not subject to the UK's waste shipment controls. However, as discussed elsewhere in this report, the UK's WEEE Regulations do place restrictions on the export of UEEE for repair.
- Export of hazardous WEEE and hazardous WEEE derived components are already subject to controls under the UK's waste regulations and the Basel Convention. The proposed amendments to the Basel Convention do not alter the position on control status, so there is no impact (following the possible introduction of these changes to the Basel Convention) on export of these items from the perspective of the UK.
- Export of non-hazardous WEEE and non-hazardous WEEE derived components are not currently subject to PIC controls under the UK's waste regulations or the Basel Convention. The amendments to the Basel Convention will, if implemented as proposed, introduce PIC controls for export of these items so there will be impacts (following the possible introduction of these changes to the Basel Convention) on export of these items from the perspective of the UK.
- The amendments proposed by the EU do not alter the current control position regarding UK export of WEEE.

The TechUK proposal is an alternative to the BAN proposal to amend the Basel Convention. It is not amending the Basel Convention and therefore is not included in Table 2. It will not, if adopted, alter the control position for UK exported regarding PIC controls on export of UEEE for repair and reuse[12].

[11] *For England, see https://www.gov.uk/guidance/when-electrical-and-electronic-equipment-eee-becomes-waste-weee*

[12] *Based on the position adopted by the EA this would be WEEE.*

Table 2: Summary of Current PIC Status and PIC Status Following the Proposed Amends to the Basel Convention for Export of WEEE

Type of UEEE/WEEE	Description	Current PIC status		PIC Status Under the Proposed Amends to the Basel Convention			Comments on the Current Control Position and Impacts from the Perspective of the UK
		UK Situation	Basel Convention Only	BAN	S-G	EU	
1	UK Export of WEEE (Hazardous)	Y	Y	Y	Y	Y	Hazardous WEEE is a waste and export of it currently requires PIC, the proposals to amend the BC will not alter the control position, so this flow is not impacted.
2	UK Export of WEEE (Non-haz)	N	N	Y (Y49)	Y (Y49)	N	Non-haz WEEE is a waste but export of it is does not currently require PIC. The control position will be altered by the proposals to amend the BC, so this flow will be impacted.
3	UK Export of WEEE derived components (Hazardous)	Y	Y	Y	Y	Y	Hazardous components derived from WEEE are wastes and export requires PIC, the proposals to amend the BC will not alter the control position, so this flow is not impacted.
4	UK Export of WEEE derived components (non-haz)	N	N	Y (Y49)	Y (Y49)	N	Non-haz components derived from WEEE are wastes but export does not currently require PIC. Export will require PIC following the proposed amends to the BC, so this flow will be impacted.

*Other than for export for repair for reuse that is permissible export under the Schedule 9 derogation in the UK WEEE regs.

In terms of the S-G proposal, which is primarily focussed on WEEE recycling, export of non-hazardous whole WEEE items for recycling would be impacted as PIC controls would apply. From the perspective of the UK regulations, the only WEEE streams which currently potentially fit with this description are Large Domestic Appliances (LDA). However, it is not believed that currently these items are exported from the UK for recycling, as they are largely ferrous and typically it doesn't make commercial sense to export such items only to shred them in overseas facilities due to the low load weights and availability of shredding facilities in the UK. In addition, under the UK WEEE regulations approved exporters are not able to issue evidence notes on the export of whole WEEE items for recycling.

WEEE exported under codes B1110 and B4030 would be impacted as the S-G proposal is to delete these codes and move export of these items to PIC under Y49. Export under B4030 which includes used single-use cameras with batteries not included on hazardous waste lists, would be impacted but exports using this code are likely to be negligible.

B1110 is the category for WEEE scrap and WEEE derived components. What is covered by the description of Y49 in the S-G proposal is potentially quite broad, particularly what is meant by the term 'scrap thereof'.

However, clarification of this during research for this project indicates that clean streams such as metals, glass, and plastics recovered from processing WEEE (which have existing Basel codes) are not intended to be impacted by the S-G amendments.

Table 3 presents a summary of the potential impacts of the proposals to amend the Basel Convention from the perspective of the UK.

Table 3: Summary of Proposals and Impacts from a UK Perspective

Proposal	Key Elements	Impacts on Export from a UK Perspective
S-G	Adds Y49 – Waste electrical and electronic equipment (and waste components of), including scrap thereof. Deletes B1110 and B4030	Whole items of WEEE currently exported as non-hazardous Exported outputs from WEEE treatment centres that fall under codes Basel codes B1110 (or the OECD equivalent) & B4030 Mixed or non-mixed fractions derived from WEEE not having another Basel code.
BAN	Adds clarification that the new Y49 code is to include non-functional or untested EEE *not destined* for reuse, repair. Adds Y50 to cover export of non-functional/untested EEE intended for repair for reuse.	Aims to stop improper use of 32 (b) in Basel WEEE TFS Technical Guidance. Export for repair (for reuse) is ruled out by the UK WEEE Regulations, apart from the Schedule 9 derogation which relates to EEE for professional use in countries where the OECD Decision applies. Use of this derogation is negligible.
EU	Adds R20 Preparing for Reuse (e.g., checking, cleaning, repair, refurbishment).	Primarily a clarification which doesn't alter the control status of exports.
TechUK	Alternative to the BAN proposal, doesn't amend the Basel Convention or add PIC controls.	No impact on control status of exports.

Considering the BAN proposal, only whole items of WEEE are allowed to be exported for recycling without PIC controls in the UK. Under the UK WEEE Regulations export of UEEE for direct reuse is only possible for fully functioning items, functionality testing, and certification of function is required, as well as assessment for persistent organic pollutants (POPs) and/or any other hazardous components or substances.

For UK businesses export for repair for reuse (even for minor repair, and even if that repair is certain in the receiving country) is, not allowed under the WEEE Regulations, except for the derogations in Schedule 9 of the Regulations. Discussion within the EA on whether this also applies to WEEE treatment centres not accredited under the WEEE Regulations indicated that it does. In essence, for exporting businesses who are compliant with existing UK regulations all items of UEEE are only allowed to be shipped to overseas markets as WEEE (except for Schedule 9 derogation on export for repair for reuse for professional EEE which is negligible). Therefore, it is unlikely that the amendments proposed by BAN will, if implemented as proposed, have any real impacts from the perspective of the UK.

3.8 The TechUK Proposal

As an alternative to the BAN proposal, TechUK have put forward a trusted trader model for international shipments of UEEE for repair and refurbishment supply chain security standards. As outlined these standards would include:

- A demonstration of compliance with customs requirements.

- Satisfactory systems for the management of export and of record keeping.
- An appropriate level of financial viability.
- Consultation, cooperation, and communication with the national administration.
- Appropriate levels of education, training, and awareness of employees.

For those able to demonstrate the above, they would be issued with permissions to export UEEE, for example, by being issued with a *green passport* or *circular economy passport*. Destination countries could opt in to join the scheme, as they desire or are able.

The following approach is envisaged:

- A defined selection criteria for overseas repair and refurbishment facilities. Key would be ensuring environmentally sound and sustainable management.
- Contracts are required between the exporter and overseas facility including a master service agreement (MSA) and statement of work (SOW). These would be contractually binding and making the entity liable in case of violations.
- There are monthly operational reviews to verify compliance with performance indicators and contractual requirements. The entity performing the repair and refurbishment activities would be required to provide the necessary documentation and suitable evidence to prove compliance, such as photographs and video.
- There would be periodic auditing, typically annually, on the overseas facilities carrying out the repair and refurbishment. These would be by suitably qualified auditors. The audits would be standardised and ensure the contractual agreements (MSA, SOW) were being met with a focus on environmental compliance. For example, no banned substances are used in the repairs and checks would be made on downstream recycling operations treating any whole items or components that would not be repaired or used.

The Basel Convention's technical guidelines on transboundary movements of WEEE and UEEE, already outline criteria for identifying legitimate shipments of UEEE (paragraph 32a and 33b). These establish the paperwork and packaging that verifies that UEEE is destined for reuse, extended use by the original owner, failure analysis, repair, or refurbishment. These could also be built into the requirements to be a trusted trader.

3.8.1 Initiatives and Control Systems with Similar Objectives

There are numerous examples of control systems related to the export of waste for treatment in overseas countries that follow one or more of the principles of a trusted trader scheme as outlined above. These typically target wastes that do not require PIC as well as wastes that do.

The objective of the control systems is normally one or more of the following:

- To ensure waste meets the required standards for import into a destination country. The point of reference for quality may be the Basel Convention but while it sets a general level of control for the movement of waste parties can set additional import/export standards if they see fit.
- Give better visibility to national bodies in the destination country of waste imports in terms of quality and type, in particular for wastes that are not subject to PIC (where there is better visibility).
- To help ensure waste only goes to approved facilities that have the ability to treat it to the required environmental standards. Treatment facilities typically need to meet certain standards to allow them to import waste. This might apply, for example, in relation to water treatment or control of emissions.
- To allow a country to control the total import tonnage of certain wastes. This might be, for example, linked to strategic objectives to ensure domestic wastes are also recycled. Related to this, authorities are able to limit import permissions to the level a facility can treat and therefore minimise trading of wastes to other sites that may not operate to the required environmental standards or hold the correct permissions.
- To get industry to pay for the monitoring and control systems required for environmentally sound management of wastes. An example measure may be charging for pre-shipment inspections.

UK exporters are already operating under some of these systems, such as those set up by destination countries to control imports into their respective countries.

3.8.2 Examples of Export / Import Initiatives Similar in Nature to a Trusted Trader Scheme.

3.8.2.1 Chinese Waste Shipment Inspections

The authorities in China were the first to introduce large scale controls on the imports of waste through approved exporters and pre-shipment inspections. The latter were carried out by an inspection organisation called CCIC (China Certification and Inspection Group). CCIC are accredited by the Administration of Customs of the People's Republic of China (GACC) and report into CCIC in Beijing which in turn is accredited by the General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China (AQSIQ). Whilst working closely with, and carrying out inspections on behalf of, the Chinese authorities they are an independent third-party certification and inspection organisation.

Exporters of waste to China were required to get a certification from AQSIQ to be allowed to export there. Requirements to get accreditation include demonstrating quality management processes in the business and demonstrating a suitable level of financial size. Over the years it became harder to get accreditation unless the exporter owned sites, as this was seen as a way of demonstrating control. ISO9001 was also increasingly required.

Once an exporter got accreditation from AQSIQ then they had to carry out pre-shipment inspections for all waste shipments. The pre-shipment inspections were a combination of self-inspection by the accredited exporters and inspections on site by CCIC. All waste shipments had to be notified via an online system and inspection photographs were uploaded. Exporters paid a fee to CCIC to cover administrative costs. Costs for onsite inspections by CCIC were also charged.

The controls on exporters were complimented by a system in China where importers were required to get an import accreditation from AQSIQ and imports were controlled through an allowance system for tonnage linked to recycling facilities' capacities. Facilities importing waste were subject to defined operational, environmental and administrative requirements. A similar system exists for certain feedstocks classified as resources and allowed for import, for example some secondary copper and aluminium grades.

3.8.2.2 Indonesian Waste Shipment Inspections

Indonesia also operates a pre-shipment inspection system for wastes shipped to the country, such as waste plastics and recovered fibres. Third party inspection agencies carry out the inspections against a defined inspection criteria. These third-party inspection agencies are accredited by KSO SCISI (KSO Sucofindo – Surveyor Indonesia). Exporters need to declare shipments several days in advance and inspectors carry out sampling and inspection prior to approving the export. Costs are paid by the exporter.

3.8.2.3 Malaysian Waste Shipment Inspections

The latest Asian country to introduce pre-shipment inspections is Malaysia with the system managed by SIRIM QAS International in Malaysia, who carry out a similar role to KSO SCISI in Indonesia in accrediting third party inspection bodies. These approved bodies are known as Foreign Inspection Bodies (FIB). Inspections are expected to start imminently on wastepaper and metals.

There are four different inspection methods, three of which fall under *Type 1* and involve a pre-shipment inspection. The fourth, *Type 2*, involves the accreditation of the facility generating the waste for export (they refer to these as MRFs). In this scenario, the export site can self-inspect and there are then additional checks carried out at the receiving facility storage yard in Malaysia. Facilities receiving imported waste have to hold certification to ensure they can handle the waste in an environmentally sound way (SIRIM Certification / Eco-Label Certification / annual inspection). Charges to cover costs are paid by exporters.

3.8.2.4 German Waste Packaging Exports

For many years, recyclers of plastic packaging (as well as recyclers of liquid food, fibre based composite packaging and mechanical processors of aluminium packaging) have had to be audited against a defined set of criteria. Key areas of focus are a full mass flow balance, to ensure the recycler is processing everything sent to it and that recovery efficiencies are being met and checks to ensure environmental compliance. This requirement to audit is set out in the German Packaging Act (VerpackG) and applied also to exports for recycling. Audits have to be carried out by an approved, registered expert. This helps ensure overseas recyclers are operating to the required standards with audits needing to be carried out every two years. Audit fees are typically paid by the recycler or exporter.

3.8.2.5 EuCertPlast

EuCertPlast is a certification scheme for plastics recyclers. Currently around 260 recyclers hold certification with most being in the EU and UK. EuCertPlast is not a trusted trader system, as such, in that it is voluntary. However, it is increasingly required by suppliers of waste such as EPR organisations. Convertors and brand owners are also now sometimes requiring facilities supplying them with recycled polymer to hold certification. To get certification, recyclers need to undergo a detailed on-site audit which focuses on traceability and environmental criteria. This includes both operational and administrative checks and typically takes around one day for an initial audit.

A trusted trader scheme, or similar, can work well and be a practical alternative to a more regulatory approach.

Potential advantages of the Trusted Trader approach are:

- Funding raised from fees can be set to meet the required level of monitoring and are very targeted.
- Schemes can fund the systematic auditing of overseas facilities, something which is often difficult for the regulators to find the financial resource to carry out. There may also be political sensitivities for a regulator from one country to regularly inspect facilities in another.
- Onsite auditing is arguably a more robust way of checking the supply chain than paperwork and license checks. This may be particularly the case in some non-OCED countries that may have limited resources to enforce compliance of facilities against required operating standards set out in permits.
- Auditors can be very specialised in the processing of a particular waste stream (or UEEE in this instance) and so more easily identify discrepancies and risks.

However, Trusted Trader schemes will only be as good as their design and so particular care needs to be taken with, for example:

- The balance between self-inspection by the exporters and third-party checks.
- The ability of national administrations to input into the setup and ongoing operation of a scheme to ensure that it is robust both in terms of the level of detail of inspections and audits and monitoring.
- The focus of inspections and audits. For example, for UEEE one of the greatest risks is likely to be with downstream treatment of UEEE that cannot be repaired, or electronic and electrical components removed during the repair process that need to be recycled. It would be advisable for these downstream sites to be audited also, in particular in non-OECD countries. Secondary trading of UEEE to other repair operations would also need to be covered in checks. Due to the potential risks in these areas, a mass flow analysis of the overseas facility would need to be carried out as part of the audit.

As the assumed position of the regulator in this report[13] is that all exports of UEEE for repair and reuse are subject to Schedule 9 of the WEEE Regulations, and so largely not allowed, then such a scheme may not have a significant impact on the export of UEEE.

3.9 Summary of Impacts on UK Exporters

This impact assessment assumes that all exporting businesses in the UK are fully compliant. While it is acknowledged that there may be exporters that currently carry out export activities circumventing the Basel Convention and/or the UK regulations it is presumed unlikely where this is intentional that such behaviour would be changed by the implementation of stronger controls within the Basel Convention (or indeed the UK regulations). It should be noted that greater information received by regulators from compliant businesses will help support the overall targeted monitoring and enforcement of WEEE by regulators.

- **Export of Non-hazardous WEEE**

  It is only whole items of non-hazardous WEEE and non-hazardous WEEE derived streams that are allowed to be exported for recycling without PIC controls under existing UK regulations. In practice whole items of non-hazardous WEEE, which only potentially applies to LDAs as a stream, are not exported from the UK because it is not commercially viable for UK businesses to send whole WEEE to

[13] *Based on discussions between IWS experts and the legal team in the Environment Agency.*

shredding facilities overseas. Therefore, it is only certain non-hazardous WEEE derived streams where the S-G amendment to the Basel Convention would introduce PIC controls and create an impact.

- **Export of UEEE for Direct Reuse**

  Under the existing UK WEEE regulations compliant businesses exporting items for direct reuse can only ship fully functioning items. Legitimate export for direct reuse requires functionality testing and certification of functionality, as well as assessment for POPs and/or any other hazardous components or substances. Such items are a non-waste and are out-of-scope of the Basel Convention. Businesses in the UK who export fully functioning EEE for direct reuse can do so without controls, the proposed amendments to the Basel Convention do not alter this position.

- **Export of UEEE for Repair for Reuse**

  Export for repair for reuse (even for minor repair, and even if that repair is certain in the receiving country) is, in practice for compliant businesses under existing UK regulations, closed off. For compliant businesses in the UK all waste EEE items are only allowed to be exported as WEEE[14],The latter is negligible or zero as are the impacts on UK businesses were the BAN proposal to amend the Basel Convention implemented.

For UK exporters of UEEE/WEEE who are compliant with existing UK regulations there will be no significant impact on the control status for export of UEEE/WEEE from the proposed BAN and EU amendments to the Basel Convention, if implemented as proposed.

The TechUK Trusted Trader model is put forward as an alternative to the BAN proposal and is not amending the Basel Convention or proposing stronger regulatory control, therefore there will be no impact on the control position of UEEE/EEE exports were a Trusted Trader model to be implemented.

There will be impacts on the control position of UK exports of UEEE/EEE from implementing the S-G proposals to amend the Basel Convention, if implemented as proposed, and these impacts are now discussed.

[14] *Based on discussions between IWS experts and the legal team in the Environment Agency.*

4. International Perspectives

This section of the report summarises the findings from a rapid review of existing literature on the economic, social and environmental impacts of WEEE and UEEE internationally. The purpose is to describe issues and benefits for countries importing WEEE (often from the UK) and their regulatory response (or lack thereof). A summary of the policy/regulatory response in a selection of countries internationally is also provided.

The economic, social and environmental impacts from import of UEEE/WEEE in developing countries are complex. Import for repair and/or reuse is able to provide affordable access to digital technology, electronic and electrical appliances and devices to meet the increasing demands from growing populations in developing countries for information, communication, and western lifestyles. But this demand, combined with the desire of developed countries to move the burden of their waste disposal, is generating a growing amount of WEEE.

Repair and recycling of UEEE is labour intensive, but it is more economically feasible in developing countries because of the low labour costs. Lower environmental requirements and controls in many non-OECD countries also provide a cost saving during the recycling process which acts as a financial incentive to export. However, as a consequence, extensive informal sectors have developed with poor working conditions (such as child labour[15] and exploitation[16]) to undertake recycling, repair and reuse activities. While there is some gain in economic and social benefit from the opportunities provided by these activities, there is pervasive use of environmentally unsound methods which lead to health and environmental damage.

Waste mismanagement is often prevalent in developing countries receiving UEEE/WEEE, including practices such as unregulated dumping and open burning[17], which have low costs economically but high environmental costs, and which combine with manual activities to facilitate material scavenging opportunities[18].

Development of recycling systems that integrate the informal and formal sectors may help less economically developed countries push towards a circular economy for EEE and reduce waste mismanagement. This should involve investment in recycling plants and developing collection systems that promote green recovery methods. Furthermore, digital technology will help this integration – such as smart phone apps that facilitate mobile payments and tax registration[19].

Countries importing UEEE and WEEE often lack appropriate policy and legislation (and insufficient means to enforce policy that exists). Legislation to limit WEEE import must ensure a proper definition of waste, an overarching policy that also includes specific guidelines and action plans, a data-based approach (utilising the digital technology outlined above), and enforcement with sufficient resources and financing[20].

Table 4 illustrates the scale of employment associated with WEEE treatment in a selection of countries and municipalities.

[15] https://www.who.int/news-room/questions-and-answers/item/children-and-digital-dumpsites-e-waste-and-health
[16] https://www.ilo.org/wcmsp5/groups/public/@ed_dialogue/@sector/documents/publication/wcms_315228.pdf
[17] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6466021/
[18] https://journals.sagepub.com/doi/full/10.1177/0734242X12469169
[19] https://opendocs.ids.ac.uk/opendocs/bitstream/handle/20.500.12413/17178/1074_E-Waste_Value_Chain.pdf?sequence=1&isAllowed=y
[20] https://opendocs.ids.ac.uk/opendocs/bitstream/handle/20.500.12413/17178/1074_E-Waste_Value_Chain.pdf?sequence=1&isAllowed=y

Table 4: Estimates of Employment in WEEE Treatment Sectors[21]

Country/Municipality	Estimated Number of Workers	Description of Job Activity
China	690,000	Collectors and/or recyclers
Ghana	10,000 – 24,000	Formal/informal e-waste sector
Serbia	5,000 to 8,000	Collectors
Argentina	34,000	In the e-waste value chain
Nigeria	100,000	In the e-waste economy
South Africa	5,324	In the eWaste Association of South Africa
Dhaka, Bangladesh	60,000	In e-waste
New Delhi, India	10,000 to 25,000	Informal e-waste workers

A rapid literature review identifies that internationally the most frequent destinations receiving imports of UEEE as Africa, South Asia, and more recently Eastern Europe, much of which originates in the UK[22]. However, it should be noted that available information is subject to lack of data on illegal waste movements. Furthermore, the value chain complexity of the e-waste sector, in which there are multidirectional flows and numerous actors, makes tracking of waste difficult[23]. While not a robust estimator of the scale of the issue, some visibility on UEEE movements was provided by the BAN e-trash Transparency Project. The study placed 200 tracking devices in UEEE equipment and appliances at locations in 10 European countries, 39 of which were placed in UEEE at locations in the UK. The study found that 5 UK tracked devices were 'likely illegal'[24] exports, 3 ended up in Nigeria, 1 in Pakistan, and 1 in Tanzania. It is not statistically reliable but based on these findings 77% of UK exports are legal, with 13% (5 out of 39) of the items tracked from the UK 'likely illegal' compared to an average of 6% of all tracked items from exporting locations in other countries. Denmark and Ireland followed the UK's 5 tracked items exported with 3 tracked items exported each[25].

4.1 Nigeria

It is estimated that of the 500,000 tonnes of UEEE shipped into Nigeria from all locations annually, more than 25% is already non-functional on arrival[26]. Another study focusing specifically on the Lagos ports between 2015 and 2016 found that of 60,000 tonnes of UEEE that were imported annually, an estimated 11% were non-functional on arrival, and an estimated ~20% of total imports originated from the UK[27].

In the Jos metropolis, Nigeria, a questionnaire on e-waste perspectives (of 228 people) found that 25% of people dumped their e-waste in open spaces (the most predominant disposal method), and that 89% of people would be willing to participate in the management of storage and handling of e-waste if they were given the required knowledge on safe disposal and recycling[28].

4.2 Ghana

In Accra, Ghana, the Agbogbloshie e-waste dumping site is considered to be the largest in the world, where approximately 10,000 informal workers[29] hand sort WEEE and UEEE to find sellable items and burn and break apart items to access the recyclable materials (copper is one of the most sought-after materials). It is estimated that a total of 20,300-33,600 people is employed in collection, recycling, and refurbishing of e-waste in Ghana

[21] *McMahon et al (2021) 'Estimating job creation potential of compliant WEEE pre-treatment in Ireland', Journal of resources conservation & recycling 166*
[22] https://houseofcommons.shorthandstories.com/environmental-audit-e-waste/index.html
[23] https://opendocs.ids.ac.uk/opendocs/bitstream/handle/20.500.12413/17178/1074_E-Waste_Value_Chain.pdf?sequence=1&isAllowed=y
[24] *A term referring to the contravention of the Waste Shipment Regulation's Article 36 on non-functioning EEE exports from EU to non-OECD countries*
[25] http://wiki.ban.org/images/f/f4/Holes_in_the_Circular_Economy-_WEEE_Leakage_from_Europe.pdf
[26] https://theconversation.com/why-nigeria-needs-to-manage-electronic-waste-better-135844
[27] https://www.sciencedirect.com/science/article/abs/pii/S0048969719305844
[28] https://www.sciencedirect.com/science/article/abs/pii/S0048969719305844
[29] https://www.bloomberg.com/news/articles/2019-05-29/the-rich-world-s-electronic-waste-dumped-in-ghana

as a whole, and that the livelihoods of up to 57,600 more people are dependent on these activities, with up to a further 144,000 dependent on refurbishment activities. Many of the informal workers on the Agbogbloshie dumpsite are male children and young men, the latter with limited alternative employment opportunities. They frequently suffer from burns, untreated wounds, eye damage, lung and back problems, chronic nausea, anorexia, debilitating headaches, and respiratory problems, with many dying from cancer in their twenties[30]. Furthermore, there are substantial environmental impacts; quality of soil, water, and air declines dramatically because of the open burning of WEEE, which creates pollution that contaminates not only the local environment but further afield through surface water run-off[31].

WEEE can contain hundreds of different substances, many of which are highly toxic (such as lead, mercury, arsenic and cadmium). There are potentially serious health impacts if WEEE is not disposed of properly, such as by contaminating drinking water by leaching into groundwater from sources such as non-ESM open landfills[32]. These issues are exacerbated by informal treatment and management methods.

Despite the significant health impacts of working in Agbogbloshie, many consider the site to be a hotbed of entrepreneurial activity, providing a valuable service[33]. Additionally, the import of UEEE, despite the high level of non-functionality, is considered vital in improving digital access and narrowing the 'digital divide' between African countries and developed countries[34]. While the quality of jobs remains an issue the livelihoods of residents in rural communities in China have been entirely transformed by the economic opportunities stemming from the repair and sale of UEEE and the scavenging and recovery of valuable components and base/precious metals[35].

There are multiple barriers to improvements in health and safety in Agbogbloshie (which apply to similar sites across the world), which include exclusion of informal workers from planning and capacity building initiatives[36], and the lack of access to and funds for sustainable technologies, despite the fact that workers would prefer to use more sustainable methods[37].

An International Telecommunication Union (ITU) study found that in the African context, regional integration can help address WEEE issues, with benefits including the improvement of quality of recycled products through competition, increasing economies of scale, facilitating better technology and knowledge sharing, and promoting a diversified workforce. Policy interventions and initiatives to support this include the African Circular Economy Alliance (a government-led coalition), the United Nations Sustainable Development Goals, and the African Ministerial Conference on the Environment[38].

4.3 Colombia

Another issue to consider is the potential marginalisation of informal workers as the waste industry is commercialised, as many currently depend on informal e-waste recycling for their income[39]. An example of this marginalisation is the 'recicladores' in Bogota in Colombia, informal waste pickers and recyclers whose income became jeopardised by the rise of Bogota's privatized waste sector which cut off their access to materials. The Bogota recicladores are fighting for inclusion as services are formalised and have become the first recicladores in Colombia to gain payment and recognition from the government[40]. Waste picker cooperatives such as this can strengthen their collective voice and negotiation power with local government, obtain necessary permits, and create opportunities for skills training through their collaboration[41].

4.4 Pakistan

Pakistan, another destination of UK WEEE exports tracked in the BAN e-transparency project, has been found to import 50 kt of WEEE as scrap annually, and although recycling is favoured over disposal, the facilities and

[30] https://www.theguardian.com/environment/gallery/2014/feb/27/agbogbloshie-worlds-largest-e-waste-dump-in-pictures
[31] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6466021/
[32] https://www.intechopen.com/chapters/18494
[33] https://theconversation.com/how-potential-of-massive-e-waste-dump-in-ghana-can-be-harnessed-121953
[34] https://brill.com/view/journals/cjel/3/2/article-p141_2.xml?language=en
[35] https://collections.unu.edu/eserv/UNU:1624/ewaste-in-china.pdf
[36] https://www.sciencedirect.com/science/article/pii/S240584402031392X
[37] https://www.sciencedirect.com/science/article/pii/S240584402031392X
[38] https://www.itu.int/en/ITU-D/Environment/Documents/Publications/2021/Toolkit_Africa_final.pdf?csf=1&e=OHEtlM
[39] https://www.sciencedirect.com/science/article/pii/S0013935121000220
[40] https://resource.co/article/how-bogot-s-recicladores-are-picking-fight-inclusion-11893
[41] https://opendocs.ids.ac.uk/opendocs/bitstream/handle/20.500.12413/17178/1074_E-Waste_Value_Chain.pdf?sequence=1&isAllowed=y

warehouses where WEEE is treated have limited safety measures and frequently utilise child labour[42]. WEEE exports to Pakistan have been found in containers claiming to contain plastic packaging[43].

4.5 Romania

The issue of illegal import is also pervasive in Eastern European countries; for example, in Romania tonnes of non-functional waste which includes EEE, some of which is from the UK, is imported to be landfilled, or burnt to extract copper and aluminium[44]. Burning is used frequently at informal/illegal waste sites, as it is an easier although crude method to extract metals compared to manual dismantling.

4.6 Indonesia

Compared to other developing countries in Southeast Asia, awareness of e-waste problems in Indonesia is still relatively lagging behind[45]. Indonesia has several legal bases for electronic waste management and hazardous wastes, including Presidential Decree 61/1993 on the Ratification of the Basel Convention, Presidential Regulation 47/2005 on Ratification of Ban Amendment, Law No. 32 of 2009 on Environmental Management, Presidential Decree No. 18/1999, Presidential Decree Number 85/1999 on B3 Waste Management, and Law No. 18 of 2008 on Waste Management.

4.7 Bans on Waste Imports and Knock-on Impacts

Countries such as India and China have imposed bans or restrictions on the import of plastic waste, under which a proportion of WEEE will fall. A study by IMRB estimated that 50,000 tonnes of WEEE is illegally imported into India annually from around the world (originating mainly from developed countries but channelled through many intermediaries) and that almost 95% of this is recycled in the informal sector; attributable factors include lack of environmental regulations, weak enforcement mechanisms, cheap raw materials, lack of information available to the public, and the disorganised nature of the sector[46].

4.7.1 China

Until China implemented a waste import ban at the end of 2017, they took in approximately 70% of the World's WEEE, the banning of which caused a surge of WEEE imports to Thailand. Greenpeace's Unearthed analysis of customs data found that UK plastic waste and WEEE exports to Thailand rose from 123 to 6,810 tonnes between April 2017 and January 2018[47]. However, the Thai WEEE import ban of 2020 spread imports across countries that still have no policy in place – although illegal imports in countries where imports are banned continues. Thai police are active in efforts to stop imports[48]. As in many other countries, metals are recovered and the plastic is burnt, contaminating the earth and air with lead, mercury, and other pollutants. In one example, chemical runoff poisons the shrimp in nearby ponds, meaning local people lost their food source. Importers are referred to as smugglers and activity is not typically considered to be entrepreneurial due to the negative impacts felt by residents.

Prior to China's waste import ban, a report by EFFACE found that an estimated 8 million tonnes of WEEE was imported illegally into China annually, and that many legal companies as well as loosely structured organised crime groups facilitate these illegal imports[49]. In Asia in general, WEEE is often managed by 'brokers' and passed through many hands before reaching its final destination at recyclers/refurbishers or is 'dumped' – this makes tracking and due diligence checking very difficult for the exporter. Overland movements of WEEE occur too, such as from a country with no import restriction to one with restrictions, again, making compliance/enforcement more difficult.

[42] https://pubmed.ncbi.nlm.nih.gov/30470632/
[43] https://www.hindustantimes.com/india/uk-dumping-e-waste-on-india/story-KyGtNHDnSpC2sOrTsNhvtN.html
[44] https://www.bbc.co.uk/news/av/world-europe-59557493
[45] https://waste4change.com/blog/how-electronic-waste-is-managed-in-indonesia/
[46] https://eeas.europa.eu/archives/delegations/india/documents/eu_india/final_e_waste_book_en.pdf
[47] https://unearthed.greenpeace.org/2018/06/29/china-ban-thailand-plastic-waste-pollution/
[48] https://news.sky.com/video/thailand-new-dumping-ground-for-e-waste-11422510
[49] https://efface.eu/illegal-shipment-e-waste-eu-case-study-illegal-e-waste-export-eu-china/index.html

4.7.2 Vietnam

Along with India, China, Thailand, Nigeria and Ghana - Vietnam is also a major importer of illegal e-waste from around the world[50]. WEEE imports are banned in Vietnam, and where illegal items are found fines are imposed and re-export is enforced[51].

4.7.3 Summary of Regulatory Undertakings

Table 5 shows a selection of regulatory responses (restrictions and controls) that have been introduced in African and South Asian countries identified in the literature review. The damage caused to communities in developing countries by the environmentally unsound methods used to deal with WEEE imports has gained significant attention in recent years, this is reflected by the increased number and implementation of import bans and restrictions.

Table 5: Selected Regulation Responses Internationally (Not Exhaustive)

Country	Regulation/Response
Nigeria	Establishment of FEPA (Federal Environmental Protection Agency) and NESREA (National Environmental Electrical/Electronics Sector) Regulations and the Harmful Waste (Special Criminal Provisions) Act 2011
Bangladesh	WEEE draft law proposed, banning UEEE and WEEE imports.
Sri Lanka	Central Environmental Authority responsible, but inadequately aware, slow to intervene and lack of coordination.
India	Electronic Waste Handling and Disposal Draft Law, 2013; E-waste Management and Handling Rules, 2011; Management of E-Waste, Guidelines, 2008.
Indonesia	Presidential Decree 61/1993 on the Ratification of the Basel Convention, Presidential Regulation 47/2005 on Ratification of Ban Amendment, Law No. 32 of 2009 on Environmental Management, Presidential Decree No. 18/1999, Presidential Decree Number 85/1999 on B3 Waste Management, and Law No. 18 of 2008 on Waste Management. Trade Regulation 75/M-DAG/PER/12/2013 covers import of second-hand electronics.
Bhutan	Waste Prevention and Management Act, 2009
Ghana	As of 2018 imported WEEE is subject to controls, audits, and inspections in exporting country. Legislation includes the Hazardous and Electronic Waste Control and Management Act 2016 (Act 917), the Hazardous, Electronic and other Wastes (Classification), Control and Management Regulations, 2016 (L.I. 2250), and Technical Guidelines on Environmentally Sound E-waste Management in Ghana.
Kenya	2020 EPR bans WEEE imports. Doesn't address illegal imports. (WEEE centre recycles metals and exports special WEEE fractions for special treatment abroad.)
Thailand	October 2020 – Government ban on 428 types of e-waste, with violations subject to 10 years in prison[52].
Vietnam	The Law on Environmental Protection 2014. Import and transfer waste from abroad in any form is strictly prohibited. Some scrap is imported, but WEEE is excluded from this[53].
Myanmar	The Ministry of Commerce Notification 36/2020 bans import of UEEE for the purpose of re-selling, with the focus of supporting production of EEE SMEs[54]. There is not currently a formal WEEE policy in place.
Laos	No regulation (as of December 2020)[55].
Cambodia	Article 21 of the Solid Waste Management Sub-Decree states that importing hazardous waste into Cambodia is "strictly prohibited".
Pakistan	Pakistan is working on an e-waste regulation policy as of 2021[56].

Despite export controls on WEEE being in place in many countries, illegal exports of WEEE still occurs, facilitated by a complex system of informal workers and illegal activity that makes tracking of WEEE difficult for

[50] https://www.theguardian.com/environment/2015/may/12/up-to-90-of-worlds-electronic-waste-is-illegally-dumped-says-un
[51] http://www.iep-global.org/wp-content/uploads/2020/01/8.-Vietnam.pdf
[52] https://www.bangkokpost.com/opinion/opinion/2036171/uk-report-shines-a-light-on-e-waste
[53] http://www.iep-global.org/wp-content/uploads/2020/01/8.-Vietnam.pdf
[54] https://www.env.go.jp/en/recycle/asian_net/Annual_Workshops/2020_PDF/5_Summary%20matrix%20of%20import%20regulation%20on%20UEEE%20in%20Asian%20Network%20countries.pdf
[55] https://www.env.go.jp/en/recycle/asian_net/Annual_Workshops/2020_PDF/5_Summary%20matrix%20of%20import%20regulation%20on%20UEEE%20in%20Asian%20Network%20countries.pdf
[56] https://www.ban.org/news/2021/6/16/e-waste-poses-health-threat-to-pakistanis-says-un-study

authorities. That illegal activity continues highlights that more rigorous enforcement of export controls are required for the exporting countries, as their capability to implement greater controls may be greater than the capability of developing countries receiving the WEEE waste to restrict and enforce monitoring.

It is important to note that the analysis in this impact assessment highlights the importance of considering existing UK regulations against the context of the Basel Convention and the proposed amendments. Implementing the proposed changes to the Basel Convention may alter arrangements in other countries with the desired outcome being greater management of UEEE/WEEE by environmentally sound methods.

5. EEE Placed on the Market, Collections and Recycling

5.1 Placed on the Market (POM)

The Environment Agency (EA) holds data on the amount of EEE placed on market (POM) reported by schemes and Approved Authorised Treatment facilities (AATFs). This dataset covers estimates of household and non-household to which estimates of non-declared EEE can be added to estimate overall EEE POM in the UK.

In 2023, an estimated ~1.9m tonnes (~289 million units) of EEE was placed on the market in the UK (Table 6). The single largest category was large domestic appliances, ~600k tonnes (~19.7 million units), followed by cooling appliances, ~256k tonnes (~5.3 million units), small domestic appliances, ~215k tonnes (~52.4 million units), and IT equipment, ~117k tonnes (~5.1 million units). These four categories account for just around 63% of total EEE POM.

Table 6: EEE POM, 2023 (k Tonnes, %)[57,58]

Category	Household EEE	Non-household EEE	Total EEE	
	k Tonnes	k Tonnes	Number of Items (000s)[59]	k Tonnes
Large Domestic Appliances	565	34	19,690	600
Small Domestic Appliances	198	18	52,408	215
IT and Telecoms Equipment	63	54	5,122	117
Consumer Equipment	32	6	4,477	38
Lighting Equipment	62	36	32,080	98
Electrical and Electronic Tools	68	23	14,690	91
Toys Leisure and Sports	57	6	7,500	63
Medical Devices	4	13	0	16
Monitoring and Control Instruments	25	33	74,342	59
Automatic Dispensers	0	6	1,490	6
Display Equipment	83	12	6,003	95
Cooling Appliances Containing Refrigerants	212	44	5,284	256
Gas Discharge Lamps and LED Light Sources	5	1	2,037	6
Photovoltaic Panels	169	0	55,365	169
Total declared to the EA	1,544	285	280,487	1,830
Total POM[60]	**1,591**	**294**	**288,902**	**1,885**

[57] *Based on EA data and WRAP assumptions, note a 3% uplift for non-declared and exempt EEE based on Electrical Waste - challenges and opportunities report (published in 2020 using 2017 data).*
[58] *The zeroes represent <1000 tonnes of EEE so the figures may not sum to the totals shown.*
[59] *The number of items is estimated using average weights of EEE items placed on the market provided by the REUSE network but there are no weight data available for medical appliances.*
[60] *3% uplift for non-declared and exempt EEE based on Electrical Waste - challenges and opportunities report (published in 2020 using 2017 data).*

5.2 Waste Arising

According to the Global E-Waste Monitor 2024 report, 1,700k tonnes of WEEE were generated in the UK in 2022[61].

5.3 Collection

Just over 480k tonnes of WEEE was collected and declared as being received by AATF's to the EA in 2023 (Table 7). Based on previous research[62], it is estimated that an additional 221k tonnes of WEEE is likely to have been collected but not declared to the EA. This WEEE is recycled but by routes other than via AATFs, it is typically composed of LDA and (business to business) B2B IT equipment and is processed in the UK - the former as part of the light iron stream (the vast majority of which is shredded)[63].

Including both WEEE declared to the EA by AATFs and estimates of the non-declared WEEE included in the light iron stream and B2B IT equipment, it is estimated that around 701k tonnes of WEEE is likely to have been collected in 2023[64]. What is termed 'Extra LDA and B2B IT Processed' in Table 7 is not important in the context of this research because while it goes through recycling processes that are not AATFs, the marketable outputs generated from these recycling processes are not impacted by the proposed amends to the Basel Convention.

Table 7: WEEE Collected by Category, 2023 (k Tonnes)[65]

Category	Household Collected WEEE	Non-household Collected WEEE	Total WEEE Collected	Extra LDA and B2B IT Processed[66]	Total WEEE Collected and Processed in UK[67]
Large Domestic Appliances	159	1	160	74	234
Small Domestic Appliances	34	0	34	15	49
IT and Telecoms Equipment	40	1	40	19	59
Consumer Equipment	21	0	21	10	31
Lighting Equipment	6	3	8	2	10
Electrical and Electronic Tools	25	0	26	11	37
Toys Leisure and Sports	5	0	5	3	8
Medical Devices	0	0	0	0	0
Monitoring and Control Instruments	1	0	1	1	2
Automatic Dispensers	0	0	0	0	0
Display Equipment	43	0	43	19	62
Cooling Appliances Containing Refrigerants	135	3	139	65	204

61 https://ewastemonitor.info/the-global-e-waste-monitor-2024/

[62] Based on research carried out on behalf of WRAP in May 2019, published in Plastics Market Situation Report 2019.
[63] Material commonly called 'light iron', refers to steel scrap 5C loose old light domestic material. Light iron is a scrap metal that holds a positive value so despite the mixed nature of origins, there is reason to separate these metal rich materials. Material is often a mixed metal composition and is considered by industry to be the (non-product specific) waste stream where most WEEE may find itself once it has been collected by waste contractors. Those treating the light iron may or may not be AATF, however the WEEE fraction is lost amongst the mixed scrap metals.
[64] Source: Electrical Waste - challenges and opportunities by Anthesis with contributions from Valpak, July 2020 (unpublished).
[65] The zeroes represent <1000 tonnes of WEEE so the figures may not sum to the totals shown.
[66] This is WEEE LDA and B2B WEEE from IT that is primarily collected and processed legally in the UK but not required to be declared to EA. It is possible that some of it may be collected by entities not having the appropriate licensing, but the associated tonnage is unknown.
[67] Refers to whole items that are sent into UK AATFs for recycling, the outputs generated may be sold in the UK or exported. It is not possible to legally export whole WEEE without controls if they are deemed hazardous. The only whole items that are allowable to export as non-hazardous are in the LDA category but sending these to a shredder overseas for recycling is not commercially viable to UK operators.

Gas Discharge Lamps and LED Light Sources	4	0	4	2	6
Total	**473**	**8**	**481**	**221**	**701**

5.4 Recycling

WEEE is subject to controls under the UK's Producer Responsibility regulations which are driven originally from EU producer responsibility directives.

Since the introduction of the UK regulations, WEEE collected materials have been divided into 13 (originally 10) categories according to product type[68] – the most common (by weight in collection) being:

- LDA (large domestic appliances).
- SDA (small domestic appliances).
- Cooling appliances.
- IT & telecoms.
- Display screens.
- Consumer electronics including mobile phones.
- Tools.

In the UK LDA is mostly processed in bulk by metal shredding plants, mixed with light iron. SDA WEEE is typically processed separately, most commonly through dedicated SDA WEEE treatment plants, but this category may also be batch processed through metal shredders.

Power tools tend to be mixed with the SDA stream for processing.

Some of the WEEE categories demand separate dedicated processing plants, for different reasons:

- Cooling equipment such as refrigerators needs specialist processing to meet strict treatment guidelines. Cooling gases in compressors, which may be ozone depleting substances and/or have a high global warming potential (GWP), must be removed before safe destruction. There are numerous dedicated fridge processing plants in the UK. Typically, compressors are de-gassed and removed as these items are valuable for the copper contained within. The other main component is ferrous metal which also has a value.
- Cathode ray tubes (CRTs), flat panel displays (FPD) – computer displays and TVs - and certain categories of lighting require specialist disassembly, containment, and separation equipment.
- IT equipment and mobile phones require secure destruction and are usually of such high material value (primarily for the metals) that it is more cost-effective to treat them separately. Mobile phones that are not suitable for reuse or remanufacture tend to be fed directly to precious metal smelters.

[68] https://www.360environmental.co.uk/legislation/producer_responsibility/weee_regulations/

6. Industry Engagement

There are significant gaps in the data required to address the objectives of this project, particularly for exports of non-hazardous WEEE and UEEE (UK exporters do not have to report this information to regulators and genuine UEEE functional and suitable for direct reuse is out of scope of waste legislation (the UK waste shipment regulations and the Basel Convention). There is no information on export of WEEE or UEEE in alternative data sources. HM customs data contains codes that cover exports of EEE (but export of second hand and new EEE or repairable EEE is not identifiable) and there is no information on WEEE or EEE scrap items other than batteries.

Our approach to filling the data gaps is a mixture of the following:

- Engagement/interviews with businesses in the industry.
- Collating and analysing existing datasets and seeking improvements.
- Gathering new data and analysis.

Given the lack of data, for example on specific output streams (e.g. whole WEEE items and/or components that are dismantled from whole items and resold by recyclers such as compressors from cooling appliances, filters or hard drives, memory chips and circuit boards from IT equipment, small domestic appliances and displays) engagement with key players in the WEEE/UEEE industry proved to be a critical factor in understanding the granularity of flows, quantities, value and costs, and the fates of products i.e. the marketable outputs generated from the processing of UEEE that goes on to be further processed in the UK or exported.

To gain a detailed UK perspective primary research via survey engaged with 28 contacts in AATFs and key players in the reuse industry. There are around 40 large UK WEEE recyclers registered as AATFs with the Environment Agency (EA), key players are businesses such as AO recycling, EMR, Sims Group, Sweep, Norton & Co, PA Moody (GAP), Biffa and Veolia. Reuse/repair business contacted included those reusing and refurbishing WEEE from both commercial businesses and households. Note that the identities of contacts approached and providing responses to the survey are anonymised throughout to ensure commercially confidential information is not revealed.

A sample of 28 recycling and reuse businesses (some of whom operate in both recycling and reuse) to contact was selected based on:

- Our knowledge of their processes and the input streams and materials they handle.
- Their outputs (i.e., the marketable commodities generated through processing the input streams).
- Importantly, the likelihood that their business activities might be impacted by the amendments to the Basel Convention, if implemented as proposed.

Two separate questionnaires were developed for recycling and reuse businesses[69].

The recycling survey collated evidence from businesses in the sample on the quantities of collected WEEE (from household and businesses) that form the inputs into their businesses and generate outputs (i.e., the marketable streams derived from processing WEEE that are either sold in the UK or exported). Inputs are the collected items that flow into the recycler (e.g., cooling equipment), and the materials extracted (e.g., plastics, metals from the shredding) and components (e.g., dismantled and degassed compressors from cooling appliances prior to shredding) form the marketable outputs of the business, which can be exported or sold in the UK.

This establishes a relationship between the tonnage input and the tonnage of products generated that are supplied to market. For example, suppose 100 tonnes of cooling equipment yields 20 tonnes of compressors, then the process yield for the cooling category input is 20% (of compressors). The data captured provides partial mass flow[70]. By intention, the survey focussed only on the output and export of products that are potentially impacted by the proposed amendments to the Basel Convention. Other marketable outputs from WEEE processing e.g., non-hazardous plastic, metals, glass, cables that are generated by these businesses may be exported by these businesses.

[69] *See appendices 2 and 3.*
[70] *Therefore, the output tonnages obtained + process losses and wastes do not sum to the input tonnages.*

The survey also collected information on the location of end markets in the UK, or export, for the latter the extent to which end destinations are in the OECD or the non-OECD, and the value per tonne of products. In addition, the survey provided a source of information on the export codes (Basel codes and OECD codes) the business used on its shipments for each category of product output.

The key information provided by the surveys includes:

- Estimates of the tonnage and value of UEEE/WEEE exported from the UK, the amount of non-hazardous WEEE, that may not already fall under PIC controls.
- The export codes (Basel codes and OECD codes) the business uses on its overseas shipments to gain an understanding of shipments under control.
- A breakdown of tonnages by different input/output category types of WEEE and UEEE exported.
- A split of the quantity and value of exported outputs by destination to EU/OECD countries and non-EU/non-OECD countries.

This dataset is supplemented with the project team's market knowledge, aggregated (to ensure confidentiality) and cross-checked with businesses. This understanding of the composition and breakdown of outputs produced by the activities in our sample of businesses is then used to obtain estimates of whole market export flows by category type.

6.1 Recycling Survey Response

Of the 28 businesses across the UK that were contacted for the recycling survey, 10 responded with a completed or partial questionnaire. These respondents included some of the UK's largest WEEE recyclers. Based on information provided by the survey on input tonnage, these businesses processed a combined 216,919 tonnes of the total WEEE market by volume in in 2019.

The total combined tonnage of collected WEEE handled by respondents to the survey accounts for ~56% of all collected WEEE that went to AATFs in the UK to be recycled.

6.2 Input Categories, Export Codes and Marketable Outputs

Table 8 details the recycling survey response. The input tonnages are the tonnages of the input category processed by the business, and the output tonnage is the tonnage of each output of the input category. The output tonnage sum does not necessarily match the input tonnage as some businesses did not list the outputs of the recycling process that were not relevant to the survey. Exported tonnage is generated from a percentage provided by the AATF in the survey on their estimated proportion exported, applied to output category tonnage.

The 32% not specified as exported in the "% Exported Out of Output Category Total" column is treated in the UK. While this figure is low, it does not indicate that there is very little reprocessing in the UK, as many respondents included only exported material in their response, as the survey requested information on materials likely to be impacted by the proposed amendments.

In the export codes section of Table 8, the Basel codes and OECD codes mentioned to export each output category are listed. Multiple codes are listed when different businesses provided different codes. 'Not Exported' is only specified if the business specifically stated that this material is not exported. Spaces are left blank when it has not been specified by the business responding to the survey whether the material is exported or not.

It should be noted that input category tonnage in Table 8 sums to 216,151 tonnes while the overall tonnage specified in the survey was 216,919. This is a result of AATFs providing input tonnage figures for 768 tonnes of cooling for which output category and export code information was not provided. Since these did not add any insight to Table 8 they were excluded.

Table 8: Summary of WEEE Input Categories, Export Codes Output Categories and Exports

Input Category			Marketable Outputs			
Description	Tonnes	Export Codes Used	Description	Total Produced	Total Exported	% Exported
				Tonnes	Tonnes	%
Cooling	57,512	B1110†, B1010	Metal	12,431	12,431	100%
		B1110, B1010†, GC010	Compressors	9,758	9,758	100%
		Y48, B3011	Plastic	6,588	1,222	19%
		No code	Foam	3,780	1,890	50%
		B3011	PUR	2,858	2,801	98%
		Not Exported	CFC	210	-	-
		Not Exported	Oil	210	-	-
		B1110, GC020	Circuit boards	197	197	100%
Display Screens: FPD	8,068	B1010, GC010	Metal	1,049	1,049	100%
		B1110, GC020	Circuit boards	645	645	100%
Display Screens: CRT	7,712	B1110, GC020	Circuit boards	463	463	100%
		B1010, GC1010	Metal	308	308	100%
LDA	74,093	B1010	Metal	27,817	25,225	91%
		Not Exported	Aggregate	6,560	-	-
		Not Exported	Plastic	3,360	-	-
		Not Exported	Other (Unspecified)	3,000	-	-
		GC010	Motors	2,936	2,716	93%
		Not Exported	Glass	1,160	-	-
		GC020	Circuit boards	282	272	96%
		Not Exported	Plugs	-	-	-
SDA	53,766	B1110†, B1010	Metal	21,692	20,279	93%
		Not Exported	Plastic	15,852	5,196	33%
		Not Exported	Fines	3,922	-	-
		No code	Wire	2,627	2,627	100%
		Not Exported	Waste	2,553	-	-
		B1110, GC010	Motors	1,087	945	87%
		-	Batteries	118	118	100%
		-	Circuit boards	209	27	13%
		-	DVD/High Value	-	-	-
		-	Ink Cartridges	-	-	-
WEEE Residues	15,000	-	Plastic	3,000	3,000	100%
		B1010	Metal	1,800	1,785	99%
		- (1xY48)	Circuit boards	150	150	100%
Total	216,151			136,619	93,102	68%

†These were incorrectly listed; metal scrap should be categorised under Basel code B1010 (metal and metal-alloy wastes), and compressors should be categorised under Basel code B1110 (electrical and electronic assemblies) to non-OECD countries.

2019 tonnage was queried as opposed to 2020 tonnage due to the impact of Covid-19 on operations. However, businesses were asked whether input tonnages for 2021 were significantly different compared to 2019. Some reported increases which varied across processes (for example, one business reported a 40% increase in input tonnage for LDAs and SDAs, and a 200% increase in input tonnage from cooling). Five businesses reported increased tonnage (compared to 2019) for at least one process, while two reported at least one decrease. Reasons for decreases in input tonnages included loss of contracts and site closures, reasons for increased input tonnage included expansion in the number of council contracts.

Of the 216,919 tonnes of input material detailed in the survey, 136,619 tonnes of output material was listed in material categories that were identified as potentially impacted by the proposed amendments to the Basel Convention, this is what respondents believed to be in their opinion the categories that were potentially impacted. 93,102 (68%) of the 136,919 tonnes was found to be exported, according to survey respondents' estimates of the percentage of their marketable outputs that were exported.

It is worth noting that this table is, however, skewed by the fact that some percentages of output categories (including some motors, PVC, metals, batteries, circuit boards, (Digital Video Disc) DVD/high value items, ink cartridges and plugs) have not been provided and therefore, we were unable to calculate tonnage data for these.

Of the known output tonnages that businesses believed to be potentially impacted materials, metal was the largest contributor at 65,097 tonnes and 48% of the total, followed by plastic at 28,800 tonnes and 21% of the total, then compressors at 9,758 tonnes and 7% of the total.

In terms of anticipated changes to input tonnages in the future, three businesses expected increases in at least one category, citing reasons such as relaxing of Covid-19 restrictions on (Household Waste and Recycling Centre) HWRC inputs. Two businesses expected decreases, citing reasons such as continuing impacts of restrictions relating to Covid-19 and lost contracts. Two businesses expected no changes in any process.

6.3 Export Codes

Table 9 shows the Basel codes and/or OECD codes mentioned by businesses responding to the survey for each of the main output categories 'marketable products' that are exported. What is clear is that there are some inconsistencies in the allocation of exported products to export codes with respect to the guidance by the regulator and the descriptions of the categories that these codes refer to. For example, there is clear guidance from the regulator that circuit boards are deemed hazardous and should not be exported under OECD code GC020.

Table 9: Basel / OECD Codes Attributed to Export Categories by Survey Respondents

Code	Circuit Boards	Compressors	Metals	Motors	Plastic
Basel	B1110	B1110, B1010	B1010 / B1110	B1110	B3011 / Y48
OECD	GC020	GC010	GC010	GC010	-

In addition to the categories shown above, batteries, ink cartridges and 'DVD / High Value' were also given for products exported for which no Basel code or OECD code was listed in the survey. Basel code B1110 for metals was given for two categories (cooling and SDAs) by one business, which is the incorrect category for metals. Normally, export of metals would be expected to be placed under Basel code B1010. There were also instances of export of compressors being listed under B1010 (the code for metal and metal-alloy wastes), these would be expected to be under B1110.

In addition to the information from the survey, supplementary information was provided by the EA from the application forms for 'Approval as an Approved Exporter (of WEEE)'. This data, summarised in Table 10 provided information on the export destination to be used by the approved exporter, and the codes used to export it, for successful applications made by 488 sites to export WEEE. Destinations mentioned are the final destination for recycling.

The European Waste Catalogue (EWC) codes with a '*' and the Basel codes that are prefixed by A are for export of hazardous materials which would already be under PIC. The Basel codes that are prefixed by B and the OECD codes prefixed by GC are for export of materials that, in principle, don't require PIC notification, the OECD codes GC010 and GC020 would move to PIC control notification were the S-G amendments to the Basel Convention implanted as proposed (see discussion in section 8.1). The highlighted countries are in the non-OECD area.

No tonnage data is available, but the summary is indicative of the export destinations used for WEEE exports by UK businesses.

Table 10: Basel / OECD Codes Attributed to Export Categories

EEA or non-EEA	EWC Codes			Basel Codes								OECD Codes	
	16 02 15*	19 02 04*	20 01 23*	A1190	A2010	AC300	B1010	B1020	B1050	B1115	B2020	GC010	GC020
EEA	Germany Netherlands Spain Sweden	Austria Belgium Germany Sweden	Germany	Belgium Spain	Belgium Germany	Denmark Germany	Belgium Finland France Germany Greece Italy Netherlands Poland Portugal Spain Sweden	Ireland	Belgium Finland France Germany Greece Italy Netherlands Poland Portugal Spain Sweden	Belgium Germany Greece Italy Netherlands Poland Spain	Belgium Germany Spain	Belgium Finland France Germany Italy Netherlands Poland Portugal Spain Sweden	Belgium Finland France Germany Italy Netherlands Poland Spain Sweden
Non-EEA	Canada	Canada Japan					Canada China India Indonesia Japan Mexico Pakistan South Korea Turkey		Canada India Japan South Korea Turkey	Canada		Canada India Indonesia Pakistan Turkey	Canada Japan

Table 11: Approved Exporters Destinations, Export Codes by Output Category

Circuit boards		Compressors		Electronic Scrap		Metal and Alloy Scrap	
Belgium Canada France Germany Italy Japan Netherlands Poland Spain Sweden	B1010 B1050 GC010 GC020 16 02 15* Other	Pakistan	GC010 B1010	Poland Spain Germany Sweden France Netherlands Belgium Italy Canada	GC010 GC020	Ireland Netherlands India China Pakistan	B1020 B1010 B1050 GC010

Table 11 shows a summary of the destination countries and export codes used for a sample of the information on exporters approvals. The output categories included (circuit boards, compressors, electronic scrap and metal alloys) are based on the descriptions provided i.e., specific mentions of these output categories.

The OECD codes prefixed by GC and the Basel codes prefixed by B are for non-hazardous materials that don't currently require PIC notification, the OECD codes GC010 and GC020 would move to PIC control notification were the S-G amendments to the Basel Convention implanted as proposed (see discussion in section 8.1). In theory, the circuit boards under the Basel codes and OECD codes should not be used as circuit boards are likely to contain hazardous substances or components with hazardous substances. The EA has a clear position that circuit boards are deemed hazardous and clear guidance that the GC codes should not be used. However, in the descriptions supplied with the applications, several, but not all, of the approvals for circuit boards that

listed OECD code GC020, explicitly indicated that for circuit boards the intention is for them to be shipped under notification (PIC)[71].

Compressors removed from cooling appliances require appropriate treatment to remove coolants and oil but once that process has been done compressors can be shipped as non-hazardous without PIC controls. Pakistan was listed as an export destination for fridge compressors but using OECD code GC010. Destinations mentioned are the final destination for recycling.

6.4 Destination and Value of Exports

The survey results provided indicative splits by export destinations (EU or OECD and non-EU or non-OECD) for marketable output categories listed by businesses responding to the survey are shown in Table 12 together with typical values per tonne. Categories are listed multiple times where businesses provided different destination percentages and export values across marketable output categories.

Table 12: Export Destination and Value of Output Categories

Input Category	Output Category	% Recycled in EU or OECD	% Recycled Outside EU or OECD	Typical Value of Output £/t
Cooling	Compressors	0.5%	99.5%	£600
	Compressors	0%	100%	£430
	Circuit Boards	100%	0%	£300
LDA/SDA	Motors	0%	99.50%	£700
	Circuit Boards	100%	0%	£300
WEEE[72] Residues	Metal	20%	75%	£900
	Metal	100%	0%	£1,800
	Circuit Boards	100%	0%	£2,500
	Metal	0%	100%	£1,100
	Plastic	100%	0%	£300

The output categories highlighted by our analysis as being most likely to be impacted by the proposed changes to the Basel Convention are discussed below in sections 6.4.1 to 6.4.3. Details on other marketable outputs which businesses believed could be impacted by the amends to the Basel Convention are reported in Appendix 1: Further Details on Survey Responses.

6.4.1 Compressors

In the survey responses, compressors from cooling equipment were listed as being exported outputs by five businesses. Of these, one currently exports compressors under Basel code B1110, one under Basel code B1010 (the code for scrap metal), and the others mentioned that they exported compressors under OECD code GC010[73].

A key finding is that none of the respondents indicated that compressors removed from cooling equipment were sent to facilities in the UK for recycling. This finding is also in-line with our knowledge of the markets for these items. There was general agreement that the vast majority (99.5%+) of compressors that are exported are shipped to non-EU or non-OECD destinations for recycling. However, one business mentioned that there was some tonnage of compressors going to EU or OECD countries.

[71] *It is uncertain where PIC is not explicitly mentioned whether or not circuit boards are shipped under notification.*
[72] *The information was supplied by a business downstream from AATFs, while the data is included here for completeness it is not a typical WEEE recycling operation in the same sense as an AATF, the operation is more like a metal refinery process. The tonnage data is not used to inform the modelling. However, it is indicative of the value of electronic scrap that is destined for base/precious metal recovery.*
[73] *OECD GC010: Electrical assemblies consisting only of metals or alloys.*

The survey indicated that the market value of compressors removed from cooling equipment ranged from £430 per tonne to £600 per tonne.

One business commented that they believed that "a PIC process for [exported compressors from fridges] would be no bad thing for the system" (further explanation was not provided).

6.4.2 Circuit Boards

In the survey responses, circuit boards were listed by six businesses as outputs generated across six input categories – cooling, LDA, SDA, WEEE residues, and display screens, cathode ray tubes (CRT) and flat panel display (FPD). Two currently report shipments under Basel code B1110[74], and OECD code GC020[75], the others didn't provide an export code. However, for exporters not providing a code, one did say they shipped 100% of circuit boards to EU/OECD countries under notification. The other, extracting circuit boards from cooling equipment and LDA, said they shipped circuit boards 100% to EU/OECD countries (at an output value of £300 per tonne) under Article 18 Annex VII (which is not in line with the EA's position that circuit boards are hazardous). One business recycled 77% of their circuit boards from SDA in the UK and didn't export any of this output stream category, and another business confirmed that no circuit boards they process are exported.

Circuit boards have been shown to make up 6-8% of the weight of display screens, and <1-3% of SDA, LDA, and cooling appliances.

6.4.3 Motors

In the survey responses, motors were listed by six businesses across two input categories (LDA and SDA). Of these, one currently reports shipments under Basel code B1110 and OECD code GC010, one reports shipments under B1110 (with no OECD code provided), two report shipments under OECD code GC010 (with no Basel code provided), one did not provide a Basel code or an OECD code, and one has confirmed to not export motors.

One business stated that 99.5% of the motors were shipped to non-EU or non-OECD countries for recycling (exported under Article 18 using an Annex VII) at £700/tonne. Another stated that 20% of motors were recycled in the UK, with 40% exported to EU/OECD Countries under Article 18 using an Annex VII, and 40% to non-EU/non-OECD countries. Another stated that 100% of motors were exported under OECD code GC010 to non-OECD destinations, which is likely a misinterpretation because it suggests the use of an OECD code to ship to a non-OECD country.

6.5 Summary

Table 13 details the input tonnages (i.e., from collected cooling, LDA, SDA and display) from the businesses responding to the recycling survey and the marketable output quantities generated (circuit boards, compressors, electronic scrap (high value) and motors). One business was unable to provide input tonnages in categories for cooling and SDA, estimates based on our knowledge of the throughput in this operation are included in Table 13.

Reading across from left to right, Table 13 details:

- The input tonnage received by the businesses (i.e., WEEE collected and sent to AATFs) by input category type.
- The tonnage of marketable products 'outputs' that are generated.
- The tonnage of those marketable products that are exported.

The table represents a partial mass flow[76], the survey focussed on the exported products that are potentially impacted by the proposed amendments to the Basel Convention. Other marketable outputs e.g., plastic, metals, glass, cables are generated by these businesses and may be sold in the UK or exported.

[74] *Basel B1110: Electrical and electronic assemblies not under PIC control.*
[75] *OECD GC020: Electronic scrap (e.g., printed circuit boards, electronic components) and reclaimed electronic components suitable for base and precious metal recovery not under PIC control.*
[76] *Therefore, the output tonnages do not sum to the input tonnages.*

Based on the evidence from the survey of UK WEEE recyclers:

- The vast majority (~99.9%) of circuit boards recovered from (cooling, LDA, SDA and display) are exported.
- 100% of compressors dismantled from cooling appliances are exported.
- The vast majority (99.9%) of electronic scrap (high value, destined for base precious metal refining) is exported.

Table 13: Export Destination and Value of Output Categories

Input Category		Output Category		Output Exported	
Description	**Tonnes**	**Description**	**Tonnes**	**Tonnes**	**%**
Cooling	99,312	Circuit boards	197	197	100%
		Compressors	18,118	18,118	100%
LDA	89,093	Circuit boards	282	282[77]	99.9%
		Motors	2936	2716	93%
SDA	53,766	Circuit boards	209	209[78]	99.9%[52]
		Electronic scrap (high value)	502	502	99.9%
		Motors	1087	945	87%
Display	15,780	Circuit boards	1108	1108	100%
Total	257,951		24,475	23,084	100%

[77] *According to the survey the vast majority of circuit boards from LDA are exported (and that aligns with our market knowledge). But the survey did indicate some circuit boards from SDA and LDA being further processed in the UK. To our knowledge there are not any businesses downstream of AATFs in the UK further treating circuit boards. It is possible that the survey responses meant 'sold/sent to an intermediary who then exported it'.*

[78] *According to the survey the vast majority of circuit boards from LDA are exported (and that aligns with our market knowledge). But the survey did indicate some circuit boards from SDA being further processed in the UK. To our knowledge there are not any businesses downstream of AATFs in the UK further treating circuit boards. It is possible that the survey responses meant 'sold/sent to an intermediary who then exported it'.*

7. Repair/Reuse Survey

The reuse survey explored the prevalence of activities such as 'export for repair and reuse', 'refurb/repair in the UK and export', the location of associated markets, and the nature and practice of functionality testing of appliances prior to these activities. In general, repair/reuse businesses may handle items returned direct to the manufacturers or retailers for repair or replacement under warranty. These are resold (and could be exported) once repairs have been undertaken and the appliance or device is fully functional. If they are deemed not repairable the devices are recycled. Before this, valuable components are removed (working components are retained for other repairs, non-functional or untested components are sold to recoup the scrap value).

7.1 Survey Response

Of the 25 businesses contacted for the repair/reuse survey, five responded with some information on this market in the UK and their perspectives on the Basel amendments.

7.2 Input Categories

For the responding reuse businesses input categories mentioned included large and small domestic appliances (LDA and SDA), flat panel display (FPD) screens, cooling equipment, IT equipment, consumer equipment, lighting, electrical tools, and toys.

7.3 Inputs

The five businesses for which tonnage data was provided processed in 2019 a total of 4,991.81 tonnes (Table 14). The largest categories are cooling, LDA, and flat panel display screens (FPD). Detail was not provided regarding export, except for the business processing cooling equipment outlined above, of which 100% is recycled in non-EU / non-OECD countries. This is not to say that the rest of the material listed is treated in the UK, just that the treatment destination is not listed.

Table 14: Input Categories and Tonnage Reported by Reuse Businesses

Input Category	2019 Tonnage
Consumer Equipment	0.90
Cooling	2,685.10
Display Screens FPD	258.60
Electric Tools	7.10
IT Equipment	2.70
LDA	1,959.21
Lighting	0.50
SDA	76.10
Toys	1.60

7.4 Outputs

For cooling appliances one business provided export information indicating shipments of compressors under OECD code GC010 (Basel code not provided) and shipped under Article 18 with an Annex VII – 'Green list' which does not require notification controls. All marketable outputs exported are to non-EU or non-OECD countries at a typical value of £430/tonne.

7.5 U/WEEE Exported for Repair for Reuse

Under the UK WEEE regulations export of UEEE for direct reuse is only possible for fully functioning items, functionality testing, and certification of function is required, as well as assessment for POPs and/or any other hazardous components or substances. Such items are a non-waste and are out-of-scope of the Basel Convention. Compliant businesses in the UK who export fully functioning UEEE for direct reuse can do so without controls, the proposed amendments to the Basel Convention do not alter this position.

Two repair/reuse businesses explicitly stated that even though they do not export for repair for reuse (or export WEEE derived from undertaking repair activities in their business), they believed that in their opinion the proposed Basel amendments were 'a good thing', adding that in their opinion 'all WEEE should be dealt with where it originates', and that the amendments 'are welcome if policed properly with targeting on recyclers who continue to export with impunity'.

In the UK WEEE regulations, export for repair for reuse (even for minor repair, and even if that repair is certain in the receiving country) is, in practice for compliant businesses, closed off for the regulated sector. Discussion within the EA on whether this also captures WEEE outside of accredited businesses from a regulatory perspective indicated that it does.

Therefore, the UK WEEE regulations already go further than the proposed BAN amendment to the Basel Convention. Under the UK's WEEE Regulations, UEEE must be fully functional and for direct re-use in order to be exported, except for the Schedule 9 derogation in those Regulations which allows for export for repair for reuse under certain circumstances. For the latter, feedback from industry indicated UK export for repair for reuse is extremely unlikely or non-existent. It is also the case that the usage of the Schedule 9 derogation for export for repair for reuse for professional[79] use is thought to be at extremely low tonnages.

Compliance with the UK WEEE regulations, as discussed in section 3 and in section 8, effectively means that there will be no significant impact on UK exporting businesses if the BAN amendments to the Basel Convention are implemented, as proposed.

[79] *Professional is not defined but Schedule 9 refers to medical equipment.*

8. Scenarios

This section of the report discusses the key economic, environmental, and social impacts in the scenarios for the implementation of the proposed amendments to the Basel Convention.

The main economic impacts are from the additional costs on exporters from moving items to PIC control. The main environmental impact considered is the (Green House Gas) GHG emissions from export. And the main social impact considered is any potential impact on jobs following the implementation of the proposed amendments to the Basel Convention.

The approach to quantifying the impacts on UK exporters is to develop scenarios to 2035 for each of the proposals that are expected to have impacts from the perspective of the UK taking full account of existing UK regulations. Analysis of the latter (see the discussion in section 3.5 and section 3.6) indicates that the amendments proposed under the S-G proposal, is the only scenario that is considered to have significant impacts from the perspective of the UK.

The impacts modelled in the S-G scenario establish trajectories for the likely quantities and values of output streams generated by the UK industry that are exported following the implementation of the amends proposed. The scenario provides a quantification of the monetised costs and benefits, with the impacts on UK exporters presented as relative to the baseline scenario.

It is assumed under the implementation of the S-G amendments to the Basel Convention that all businesses exporting continue to export and pay notification fees, the rationale for assuming this is discussed in detail in section 10.4.

It is assumed that all exporting businesses potentially impacted by the proposed amendments to the Basel Convention are fully compliant. While there may be export businesses that currently carry out export activities circumventing the Basel amendments and/or the UK regulations it is assumed that this behaviour is unchanged by the proposed amendments. It is also assumed that monitoring and enforcement by regulators in the UK is sufficient to deter exporters from misreporting declarations to avoid paying notification costs.

Monetised benefits not included are any other beneficial impacts from avoided UK export of WEEE on the environment, health, toxicity etc. from recycling, burning, littering or dumping of such wastes in countries receiving these wastes that are unable to manage these wastes through environmentally sound methods, and the avoided damage to their land or marine wildlife, and their natural environment in general. These costs may be very significant but are very difficult to monetise.

There is a potential cost to exporters if notified waste is rejected by the competent authorities in receiving countries, or if receiving countries do not have capacity to process forms which results in delays for exports. It is assumed that all countries are able to meet the notification requirements of the Basel Convention.

There is a potential saving from reduced repatriation costs as exporters becomes more aware of their responsibilities and fewer shipments are made to countries with inadequate infrastructure to process imports received in an environmentally sound manner. This is not included in the monetised benefits.

8.1 The OECD Decision

Historically, the Basel Convention and the OECD Decision[80] have tended to evolve in alignment with each other as changes to either have been made. That being said, the impacts in scenarios modelling the proposed changes to the Basel Convention are potentially different depending on whether or not changes are subsequently made to the OECD Decision. In essence, regarding the introduction of PIC controls the potential impacts (of changes to the Basel Convention) is governed by the extent to which OECD countries choose to adopt the Basel Convention changes. In a scenario where the Basel Convention were to be amended, and these were the only changes (i.e. the Basel Convention changes didn't flow through to changes to the OECD Decision) then potentially the only impacts requiring consideration would be on shipments to non-OECD countries.
Since the OECD Decision covers shipments between OECD countries, UK exporters could continue to use OECD codes for shipments *unless* UK agencies stated otherwise (exporters and UK authorities would of course

[80] *The OECD Decision is the legal framework governing the movement of wastes in the OECD area.*

have to recognise the stated preferences of the receiving countries in the OECD area, and transit countries, regarding notification or prohibited status etc of shipped materials). So, a key question becomes how likely is it that potential changes to the Basel Convention considered here flow through to changes to the OECD Decision?

A possible relevant example to cite here is the recent changes implemented to the Basel Convention regarding the export of plastic wastes (amendments included the introduction of the Y48, B3011 codes). European countries supported the move to Y48 and PIC control notification for plastic wastes, but some countries e.g., the USA didn't accept Y48. The USA would likely resist adopting any further changes to the OECD Decision (but note the USA is not signed up to the Basel Convention anyway).

Since the UK and Europe supported the tougher controls for export of plastic wastes, there is an argument that it may seem counterintuitive for either of them to then decide to go with lighter touch controls for shipments of U/WEEE. Following this example to opt for a tougher stance on controls on export of plastic wastes it is assumed here that the Basel Convention changes for export of U/WEEE would largely carry through fully into the OECD Decision on a country-by-country basis (including with agreement by GB and NI). With agreement from GB and NI, this means, for example, that following the Basel Convention changes the OECD Decision would be modified to incorporate Y49 (and the deletion of the GC010 and GC020 codes etc) with UK export of U/WEEE moving to PIC control regardless of any position taken by other OECD and non-OECD countries.

Any scenario is further complicated by the fact that we don't actually know whether or not the OECD Decision will fully align country-by-country to any Basel Convention changes or not, and some OECD countries will likely resist (as is their right under the OECD Decision) changes to notification status (this is discussed further below).

From the survey responses and the EA data on exporter approvals it is clear that Basel Codes B1110, and OECD codes GC010 and GC020 codes are mentioned by exporting businesses. There is no PIC control for B1110, GC010 and GC020 and export under these codes is shipped as non-hazardous (however, there is some evidence to suggest some hazardous materials may unintentionally be moving under these codes).

GC010 would cover compressors and motors. From the EA exporter approval data of 30 approvals mentioning GC010, 28 are to EU countries, and 2 are to non-EU countries (Canada and Pakistan). This tonnage would be impacted if the B1110 code is deleted and replaced by Y49 AND the OECD Decision is aligned to the Basel Convention changes under the S-G proposal (GC010 would be deleted and replaced by the Basel code Y49).

GC020 covers circuit boards, high value items like DVD and hard drives (typically from which base and precious metals are recovered) which are likely to be exported to countries within the OECD. From the EA approvals data of 53 approvals, 51 are to EU destinations and 2 are to non-EU destinations (Canada and Japan). This tonnage would be impacted if the B1110 code is replaced by Y49 AND the OECD aligned to the Basel Convention changes under the S-G proposal (GC020 would be deleted and replaced by Y49).

Three possible approaches to scenarios for impact modelling of the proposed amendments to the Basel Convention factoring the context of the UK regulations and the OECD Decision are as follows.

8.2 A possible 'Hard-Line' Interpretation of the UK Legal Position

This scenario envisages a baseline projection that assumes full compliance with existing UK regulations in which the baseline projection assumes 100% of circuit boards are shipped under PIC controls. A proportion of electronic scrap destined for base / precious metal refining shipped under PIC controls, and no compressors or motors shipped under PIC controls. This scenario would then model impacts on UK businesses as follows.

Circuit Boards

In the existing UK regulations, circuit boards are hazardous, and should be being shipped under PIC control notification already. Therefore, in a scenario considering the impacts of the implementation of the changes to the Basel Convention that moves circuit boards to notification there would be no impact from the perspective of the UK. By extension of this logic, hard drives, and other high value WEEE etc that contains circuit boards should (arguably) also be already shipped under notification.

Motors and Compressors

Motors and compressors are shipped from the UK as non-hazardous e.g., using codes B1110, GC010 without PIC control notification. In a scenario modelling these flows, they would be impacted by the implementation of the S-G changes to the Basel Convention, if implemented as proposed.

8.3 Industry Scenario

This scenario envisages a baseline projection that reflects current behaviour in the UK WEEE recycling industry. However, the baseline projection would assume 100% of circuit boards are shipped under PIC controls. A proportion of electronic scrap destined for base / precious metal refining shipped under PIC controls, and no compressors or motors shipped under PIC controls. This scenario would then model impacts on UK businesses as follows.

Circuit boards are part of what falls under GC020 in the OECD Decision. But GC020 can also include other electronic scrap such as hard drives etc that are destined for base/precious metal refining.

Modelling this scenario approach would artificially split GC020 into two categories for the purposes of modelling the impact of the scenario:

1. Circuit Boards.
2. Other electronic scrap destined for base / precious metal refining.

This split is for modelling purposes and has nothing to do with the OECD Decision. But it does reflect a difference between the two categories from a UK perspective. For category 1, the Environment Agency has specifically and clearly stated that circuit boards are hazardous and should be shipped under PIC control notification (and that the OECD code GC020 should not be used). It is assumed there would no change to the PIC control status of circuit boards in 2025 when the scenario is implemented.

For category 2 the Environment Agency have not made the same type of determination and our analysis and feedback from the industry suggests this category of outputs is sometimes shipped without notification using GC020. It is assumed there would be changes to the PIC control status of electronic scrap in 2025 when the scenario is implemented.

Motors and compressors are shipped from the UK as non-hazardous e.g., using codes B1110, GC010 without PIC control notification. In this approach, a scenario modelling these flows, motors and compressors would be impacted by the implementation of the S-G changes to the Basel Convention, if implemented as proposed.

8.4 Mid-point Scenario

As discussed above, circuit boards should not currently be shipped as non-hazardous from the UK, there is a clear Environment Agency position on this. In the baseline projection and the scenario modelled the impacts of implementing the proposed S-G changes to the Basel Convention circuit boards would not be impacted in terms of a change to the PIC control status for UK export.

For GC010 (and similar under B1110) exports of 100% of motors and compressors are impacted and PIC control notification is required from 2025 onwards – the point at which the scenario is assumed to be implemented.

For GC020 (and similar under B1110) the scenario assumes that no circuit boards are impacted as enforcement is assumed to ensure guidance is followed by 2025, and all circuit boards are shipped under PIC control notification. But 100% of other electronic scrap destined for base or precious metals recovery is impacted as export of these marketable outputs without PIC control notification appears to be the standard behaviour currently.

This is the S-G scenario for which the impacts relative to baseline are reported in Section 10.

9. Baseline Projection

The impacts of the proposed amendments to the Basel Convention by S-G are assessed relative to the baseline scenario discussed in this section. The baseline scenario horizon extends to from 2019 to 2035 and is a projection that assumes there are no changes to the Basel Convention implemented.

The input streams/categories processed by the UK industry that produce marketable outputs that may be exported and potentially impacted by the amendments to the Basel Convention are:

- Cooling appliances.
- Large domestic appliances (LDA).
- Small domestic appliances (SDA).
- Flat panel display (FPD) screens.

The main exported outputs identified through analysis of the survey responses and from discussions with the industry that are potentially impacted by the amendments to the Basel Convention are:

- Circuit boards (although these should all currently be shipped with PIC).
- Compressors.
- Electronic scrap that is high value and destined for base/precious metal recovery.
- Motors.

The baseline includes (for the WEEE input categories and each of the marketable output streams) projections for WEEE collection, UK recycling, and export for recycling by destination (EU or OECD countries and non-EU or non-OECD countries). The baseline projection also includes estimates of; the costs and values generated by export activities; the jobs associated with exporting marketable outputs recovered by the WEEE industry in the UK; and the approximate GHG emissions caused by the export of these outputs (tCO2eq and with monetised values at traded carbon prices (£ per tCO2eq)).

9.1 Key Assumptions

This section of the report discusses the key modelling assumptions made in establishing the baseline projection. These assumptions/parameters are informed by the data collected from the survey engagement with the WEEE recycling and reuse industry, for which the results are discussed in section 10. These parameters are applied to full market input tonnages on collected WEEE input to AATFs to model the baseline and the scenario to estimate the impacts on UK businesses of the proposed amendments to the Basel Convention.

9.1.1 Marketable Outputs Generated

There is a relationship between the collected tonnage of WEEE input to WEEE recyclers and reuse businesses and the tonnage of marketable outputs 'products' generated that are supplied to market. For example, suppose 100 tonnes of cooling equipment is collected and input to a WEEE recycler yields 20 tonnes of compressors (after dismantling and depollution), then the process yield for the cooling category input is 20% (of compressors). Each type of WEEE input to recyclers[81] generates different proportions of these marketable outputs that are either sold in the UK for further refining or exported.

Table 15 shows the fractions of outputs generated from the input streams handled by WEEE recyclers[82]. The information shown is taken from the survey. Circuit boards are recovered from all of the input streams at around 1% (by weight) for cooling, LDA and SDA, 6% for CRT display, and 8% for flat screen display. For example, 100 tonnes of LDA processed generates 1 tonne of circuit boards. Compressors removed from cooling appliances represent around 20% (by weight) of cooling appliances. Electronic scrap that is high value and destined for base/precious metal recovery is 1% (by weight) of SDA. Motors are recovered from LDA, and SDA are 6% and 8% of these input streams respectively.

[81] *WEEE recyclers may have multiple processes and receive several types of input categories and produce several types of marketable outputs.*
[82] *The blank cells in the tables in this section are zeroes.*

Table 15: Fraction of Marketable Outputs Generated from Input Streams (%)

	Category of WEEE Input				
Marketable Output Category	**Cooling**	**LDA**	**SDA**	**Display: CRT[83]**	**Display: FPD[84]**
Circuit boards	1%	1%	1%	6%	8%
Compressors	20%				
Electronic Scrap (High Value)			1%		
Motors		6%	8%		

There is reasonably high level of confidence on the figures for circuit boards. For SDA one business mentioned a figure slightly above 1%, the figure shown in Table 15 is an average. There is high confidence on the 20% figure for compressors from cooling, one business mentioned a lower figure, the figure shown is the mode. There is a high level of confidence on the figures for motors. There is uncertainty on the 1% for high value electronic scrap, it could be lower than this as some SDA is just shredded without the removal of the high value components.

9.1.2 Outputs Sold in the UK

Table 16 shows that very few of the marketable outputs that are generated by the UK industry are sent to other facilities in the UK for further processing. Most circuit boards, and all compressors and electronic scrap rich in high value materials recovered from all streams are exported. Approximately 10% of motors recovered from SDA and 6% of motors from LDA are sold to other facilities in the UK for further processing, the vast majority (90%+) being exported.

Table 16: Marketable Outputs Sold in the UK (%)

	Category of WEEE Output				
Marketable Output Category	**Cooling**	**LDA**	**SDA**	**Display: CRT**	**Display: FPD**
Circuit boards			0.5%		
Compressors					
Electronic Scrap (High Value)					
Motors		6%	10%		

There is a reasonably high level of confidence on these figures apart from circuit boards from SDA where two businesses responding to the survey mentioned that they didn't export. These are regarded as outliers and ignored as feedback from others in the sector suggests there is currently very little or no dedicated capacity in the UK to process circuit boards. (N.B. this feedback was collected before the additional UK capacity for processing circuit boards discussed in section 10.4.2 came online). They could go be going to niche UK metal refiners but in small quantities (hence the assumed 0.5%). An alternative interpretation is that they may be exported but by third parties downstream of these businesses.

9.1.3 Notification Costs

The costs associated with PIC controls for exported outputs from the WEEE processing industry include the cost of paying notification fees to the regulators (in the UK and the destination country), the cost of obtaining financial guarantees, and other administration costs associated with managing the requirements of the amended regime for exporting.

[83] *Cathode ray tube.*
[84] *Flat panel display.*

Export businesses may operate multiple sites in the UK and will very likely have multiple trading partners at overseas facilities. Therefore, exactly how many shipments and how many notifications exporting business will need when these items move to PIC controls is very difficult to estimate. The uncertainty is related to what the actual number of individual sites exporting within businesses in the UK and the number of overseas locations that the exported items are shipped to.

The quantity (by weight) for export of compressors and motors is large relative to high value electronic scrap. In 2025, the scenario projects export of 29,799 tonnes of compressors, 19,604 tonnes of motors, and 1475 tonnes of electronic scrap (high value). It is expected that there will be a higher number of shipments per notification for motors and compressors (currently moved under Basel code B1110 and OECD code GC010 compared to electronic scrap (currently moved under Basel code B1110 and OECD code GC020). This is due to the higher tonnages of motors and compressors being exported and the likelihood that exporters would want to have notifications in place to multiple overseas recyclers so as to negotiate the best sales price (prices vary over time based on changes in the metals value, in particular copper). Metal refining of electronic scrap is relatively specialist and there are fewer overseas reprocessors. In addition, they are often sold based on a pricing formula linked to metals prices which reduces the need for frequent renegotiation of prices. This reduces the advantage of having multiple notifications in place with overseas recyclers, although having more than one notification in place will reduce risks in terms of overseas recyclers not being able to take deliveries for whatever reason.

Table 17 shows the Environment Agencies' charges[85] for obtaining export under notification. The charges vary on a sliding scale depending on the number of shipments per year covered by the notification. This means that there are likely to be cost efficiencies for larger businesses who are likely to be undertaking a larger number of shipments per year. The modelling assumes that these charges are constant at these values from 2019 to 2035.

Table 17: Environment Agencies' Charges for Export Under Notification, (£ Per Number of Shipments)

Number of shipments	EA*
1 to 5	£3,227
6 to 20	£3,636
21 to 100	£4,560
101 to 300	£6,597
301 to 500	£9,557
501 to 1000	£11,962
>1000**	£11,962

* Export for recovery
**£11,962 plus £1,196 for each additional 100 or part of 100 shipments

Number of shipments	SEPA*	NRW	NIEA
1	£3,103	£1,450	£1,090
2 to 5	£3,320	£1,450	£1,090
6 to 20	£4,572	£2,700	£2,025

[85] Charges correct in September 2024 https://www.gov.uk/guidance/importing-and-exporting-waste. SEPA https://www.sepa.org.uk/regulations/authorisations-and-permits/charging-schemes/charging-schemes-and-summary-charging-booklets/ NRW https://cdn.cyfoethnaturiol.cymru/permits-and-permissions/waste-permitting/guidance-on-importing-and-exporting-waste/?lang=en NIEA https://www.daera-ni.gov.uk/publications/trans-frontier-shipment-waste-fees-refund-policy-2014

21 to 100	£6,064	£4,070	£3,050
101 to 500	£10,255	£7,920	£5,940
>500**	£17,287	£14,380	£10,785

* Fee shown is average of interim and non-interim recovery. SEPA charges separate fees for interim and non-interim shipments. Interim fees are an additional £544.30 per shipment for 5 or less shipments and an additional £1,088.60 per shipment for >6 shipments

9.1.3.1 Compressors

A typical plant processing cooling appliances in the UK has a ~20ktpa capacity and throughput of 15ktpa of appliances from WEEE collections. So, this would generate 3,000 tonnes of compressors (i.e., 20% of the weight of fridges) input to the plant each year.

At 20 tonnes per full container load, 150 full container loads (shipments[86]) per year are needed export 3,000 tonnes. It is assumed that UK sites have notifications in place with multiple overseas recyclers to maximise the ability to negotiate the best prices. Under the central cost scenario assumptions, the UK business requires 10 notifications each with 15 shipments per notification for compressors, on average, in a year.

10 notifications x 15 shipments per notification x 20 tonnes per shipment = 3,000 tonnes exported.

Using these assumptions and the total projected export of 29,799 tonnes of compressors in 2025 requires 100 notifications to be in place.

The EA's charge for 15 shipments a year is £3,636 per notification, it is assumed[87] that the overseas authority charges a fee equivalent to £2,025 in £ sterling, although there is uncertainty, the actual charge varies by overseas authority and it is known some authorities do not charge. So, the total charge for EA and destination country PIC control notification is £5,661 per notification. For the estimated 100 notifications required this amounts to £566,100 which equates to £19 per tonne of compressors exported in 2025.

Financial Guarantee

The financial guarantee is based on estimates of the full repatriation costs to the UK and treatment of the shipment (or preparation for re-export). It is also dependent on the number of 'active shipments' in transit at a point in time, and the distance to the destination. It is assumed that the compressors are exported to non-OECD countries.

Assuming[88] 3 'active shipments', then per shipment, there would be:

- £2,500 for storage (a high figure as there is a risk of detention/demurrage if stranded at a foreign port – it may actually be more than this, but an exporter business would be unlikely to put forward an extreme storage cost scenario as it would increase their costs).
- $20,000 (or ~£15,000) to return a container to the UK. It is assumed the recycler is in Asia. Note that at the time of writing this report East-West container shipping costs were particularly high historically.

It is assumed that a contaminated (or otherwise in distress) container load of compressors would likely be accepted 'free of charge' when returned to a UK site (a worst-case scenario to the exporter arranging the financial guarantee). Given the intrinsic value of compressors, a UK exporter arranging a financial guarantee could reasonably argue a positive value, so this is a cautious assumption.

[86] *Here one container per shipment is assumed so the associated costs per container will be lower where there are multiple containers per shipment.*
[87] *The charges made by overseas authorities is uncertain. Here it is approximated based on the fee scale of the UK agency with the lowest fees per number of shipments, namely the NIEA.*
[88] *The figures in this section are reasoned (and cautious) assumptions based on the project team's market knowledge.*

The overall cost is £17,500, and for the 3 active loads is £52,500. The fees for the financial guarantee are assumed to be of the order of 1% to 2% of the level of the required guarantee. At 2% (the higher end) the arrangement fee that applies would be just over £1,000. Apportioned to the 60 tonnes in the active shipments gives a contribution to the overall notification cost of £17.50 per tonne. Note that the larger UK exporters are typically lower risk and would be very likely to get better deals than this given the volume of their business. They may also be able to access special insurance arrangements which would also minimise their costs.

Given the number of assumptions and uncertainties a sensitivity analysis on the full notification costs likely under PIC control notification is undertaken. It looks at a range of factors that cause the notification costs to vary for compressors. Table 18 below shows how the cost varies by the number of notifications per business and the number of shipments per notification per business (which determines which fee bracket the notification is regarding the EA charges). As above the average business is assumed to export 3,000 tonnes of compressors per year under notification, so with just 1 notification it requires 150 shipments per notification, at 20 notifications it would require 7 shipments per notification.

To export the estimated 29,799 tonnes of compressors under PIC (assuming 1 notification per business) requires 10 notifications (in total) and 149 shipments per notification at a cost of £21.71 per tonne. For 20 notifications per business (and 7 shipments per notification) the notification cost per tonnes would increase to £55.49 per tonne. The aim here is to illustrate the sensitivity of costs to alternative scenario assumptions. It is noted that some of these combinations are not realistic in terms of what arrangements actual businesses might actually put in place in a PIC control scenario for compressors.

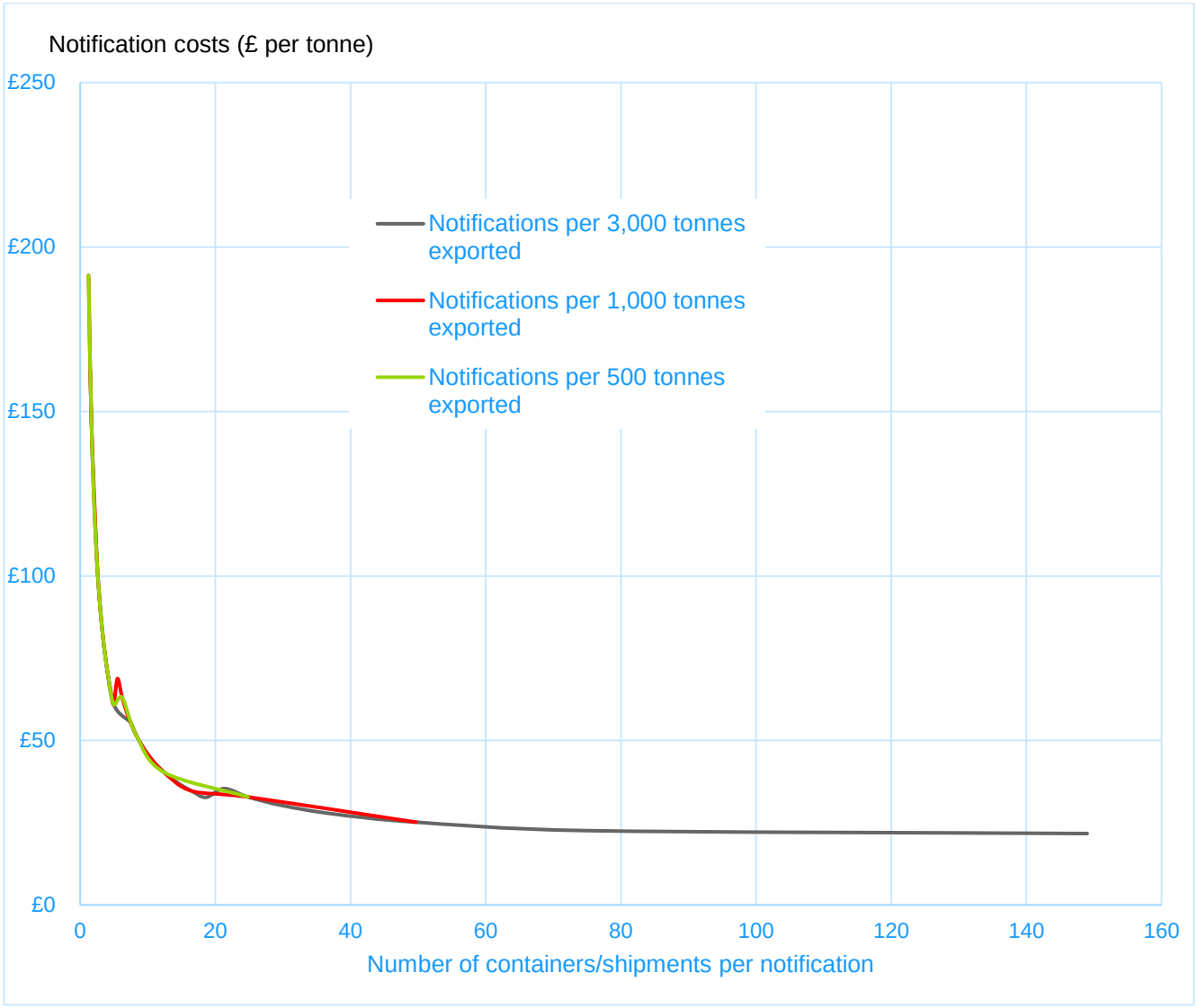
Table 18: Notification Cost Scenarios for Compressors

Number of notifications per business	1	3	5	10	20
Number of shipments per notification	149	50	30	15	7
Total number of notifications	10	30	50	100	200
Notification cost (£ per tonne)	£21.71	£25.16	£30.27	£36.50	£55.49

Table 18 also assesses the sensitivity, it shows the notification costs (£ per tonne) for a range of possible combinations that businesses exporting compressors might put in place[89]. The notification costs include the fee for the financial guarantee. It also varies the assumption on the size of business which as Figure 1 indicates has little impact on the estimated notification cost per tonne. As discussed above there is uncertainty around the arrangements businesses will need to put in place, however it is assumed here that a realistic potential range for the number of notifications for businesses exporting compressors is somewhere between 5 and 20 (the central case scenario assumes 10 notifications per business).

[89] *Assuming the business has sufficient notifications at a given number of shipments per notification to export the annual tonnages illustrated (3k tonnes, 1 k tonnes, and 0.5 k tonnes).*

Figure 1: Notification Costs by Size of Business and Number of Shipments: Compressors



9.1.3.2 Motors

On average motors generated from processing of LDA and SDA are 8% of the input weight of collected WEEE received by the plants. With a typical plant at annual capacity of ~14,000 to ~16,000 tonnes, and throughput of 12,500 tonnes per year, it would generate around 1,000 tonnes motors for export in a year.

Assuming shipments[90] of 20 tonnes in full container loads and 5 buyers in overseas locations, 5 notifications per year are required, each with 5 shipments in full container loads.

10 notifications x 5 shipments per notification x 20 tonnes per shipment = 1,000 tonnes exported

Under the central costs scenario assumptions, there are 10 PIC control notifications per 1,000 tonnes of motors exported from the UK, and 5 shipments per notification. To ship the 19,604 tonnes of motors projected to be exported in 2025, the total number of notifications required to be in place would be 200.

EA and Destination Country Charges

[90] *Here we assume one container per shipment so the associated costs will be lower where there are multiple containers per shipment.*

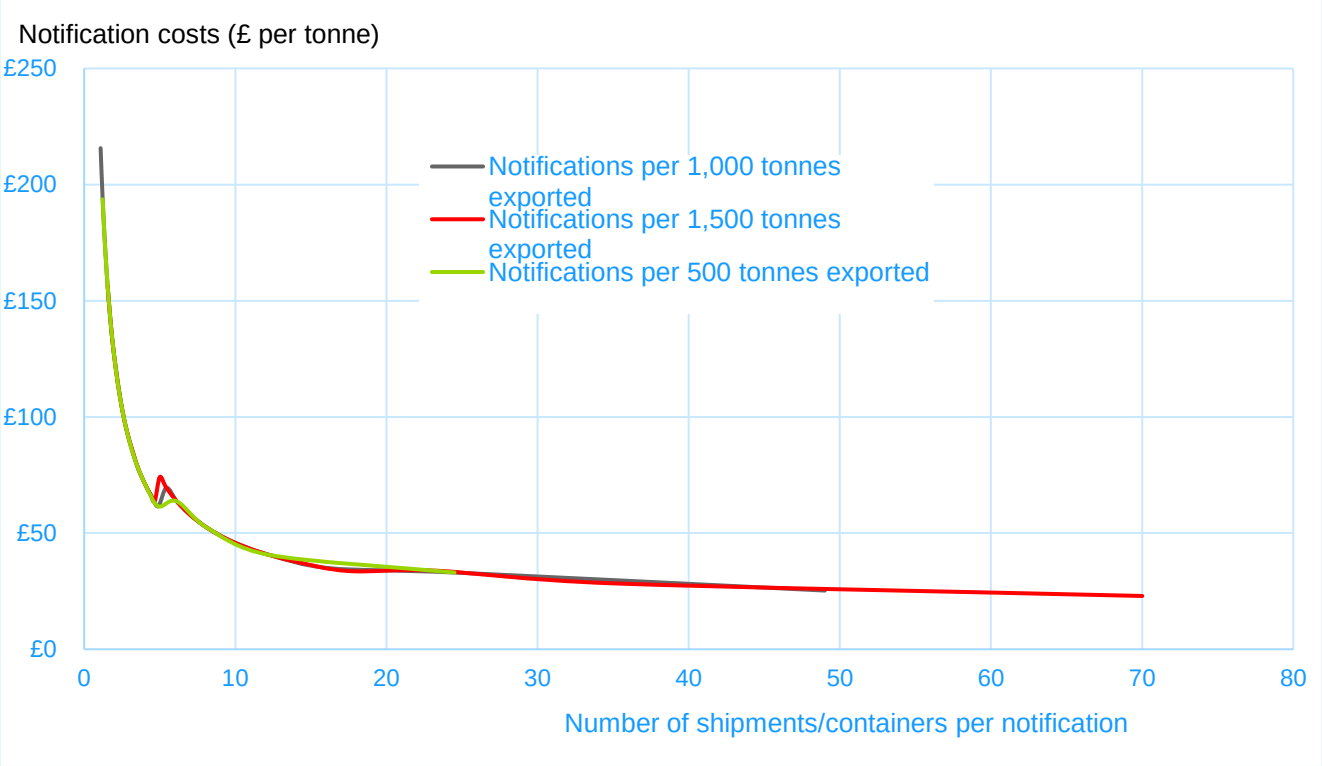
The EA charge for up to 5 shipments a year is £3,227 per notification, combined with the assumed overseas authority charge, the total charge is £4,317 per notification. As noted above, the latter is uncertain and will vary. For the whole export market, for the 200 notifications the combined EA and destination country charges amount to £863,400 which equates to £44.04 per tonne, on average, for motors exported under PIC. Assuming the same arrangements for financial guarantees as for compressors (a reasonable assumption given the similarities) the total notification costs per tonne for motors is £61.54 per tonne.

Given the number of assumptions and uncertainties, a sensitivity analysis on the full notification costs likely under PIC control for motors was undertaken, looking at a range of factors that cause the notification costs to vary for business exporting motors.

Figure 2 shows the notification cost (£ per tonne) for the full range of possible options that businesses exporting motors might choose to put in place. It also varies the assumption on the size of business (i.e. the annual export tonnage) which as Figure 2 indicates has little impact on the estimated notification costs per tonne.

The arrangements for notifications that an exporting business will need to put in place depends on the number of sites they have in the UK and the number of overseas sites it trades with. So, there is uncertainty. However, it is assumed here that a realistic range for the number of notifications for motors might be somewhere between 5 and 20 (the central case scenario assumes 10 per business).

Figure 2: Notification Costs by Size of Business and Number of Shipments: Motors



9.1.3.3 Electronic Scrap (High Value)

Electronic scrap (high value) e.g., DVD drives etc are the items typically moved under OECD codes GC020, *excluding* circuit boards. For this category of export there is a lower tonnage exported compared to motors and compressors. It is also assumed that the weight in containers or trucks shipping this material is less than that for motors and compressors. In reality this will vary on a load-by-load basis and depend on what the mix of materials in the load, and whether it is shredded or not.

EA and Destination Country Charges

It is assumed that the typical weight per shipment shipped is 10 tonnes per container/truck and that there are 5 exporting sites and 5 sites overseas, so 10 notifications per year. A business generating electronic scrap and exporting 500 tonnes per year requires 5 shipments per notification, on average.

10 notifications x 5 shipments per notification x 10 tonnes per shipment = 500 tonnes exported

The EA charge for up to 5 shipments a year is £3,227 per notification, it is assumed that the overseas authority charges £1,090 – a total charge of £4,317 per notification.

Financial Guarantee

It is assumed that there are 3 active shipment per business at any point in time. The export markets for this material are 'closer to home', predominantly in the EU with the majority of tonnage going to Belgium and Germany. The assumptions[91] on the level of financial guarantee required to repatriate the shipment (should there be a need to) are per active shipment:

- £625 storage overseas.
- £2,000 for shipping the items back to the UK.
- A charge of £3,000 for an AATF to sort through the load and re-prepare for recycling (i.e., £300 per tonne on a ten-tonne load).

The total financial guarantee is £5,625, assuming arrangement fees at 2% then the costs of financial guarantees for 3 active shipments is £338, which equates to approximately £11.25 per tonne.

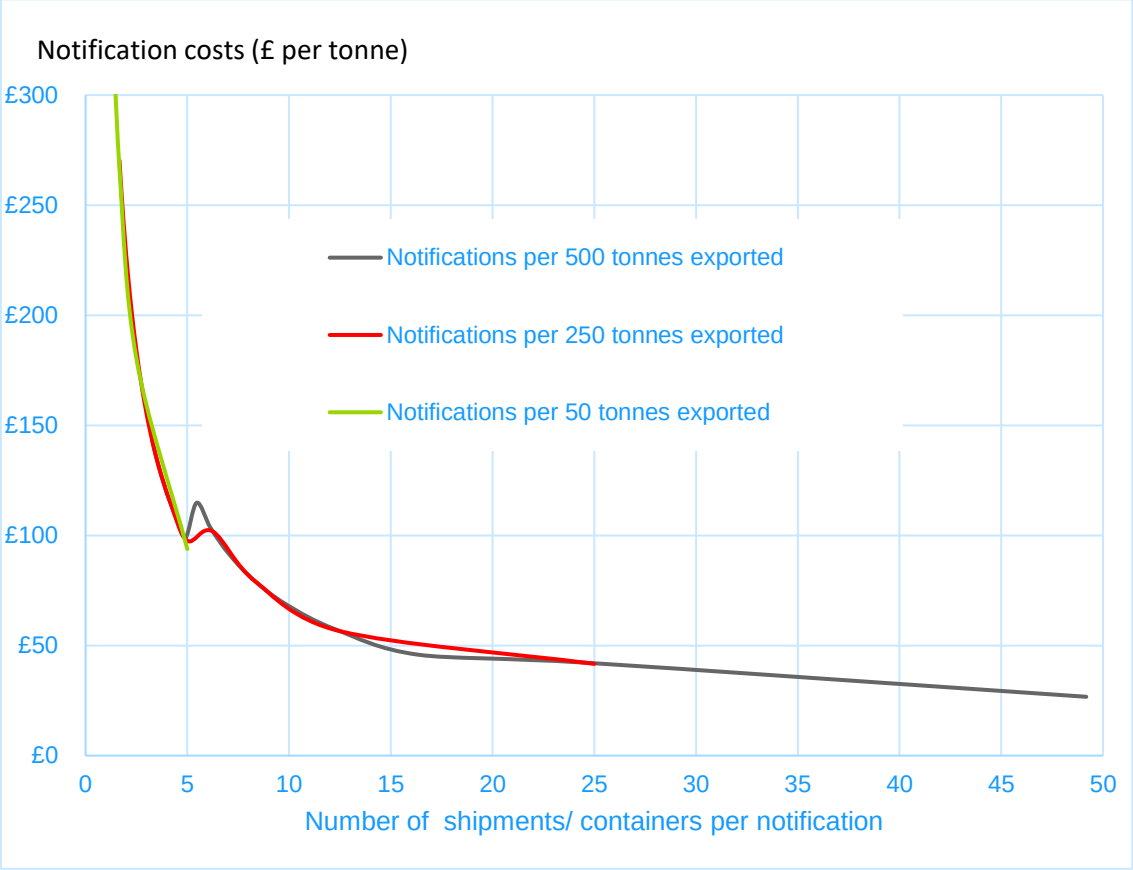
In the scenario 1,475 tonnes of electronic scrap (high value) is exported under PIC control notifications in 2025. Under these assumptions there would be 30 notifications required, and the total EA and destination country charges amount to £129,510 which equates to £87.78 per tonne for export under PIC control notification. Assuming the fees for financial guarantees are levied as above the total notification costs per tonne for motors is £99.03 per tonne, on average.

Given the number of assumptions and uncertainties, a sensitivity analysis on the full notification costs likely under PIC control for electronic scrap (high value) is undertaken, looking at a range of factors that cause the notification costs to vary.

Figure 3 shows the notification cost £ per tonne for the full range of possible options that businesses exporting electronic scrap (high value) might choose to put in place. It also varies the assumption on the size of business which as Figure 3 indicates has little impact on the estimated notification costs per tonne. The arrangements business will need to put in place depends on the number of sites and the number of overseas sites it trades with. So, there are uncertainties. However, it is assumed here that a realistic potential range for the number of notifications for electronic scrap (high value) is somewhere between 5 and 20. The central scenario assumes 10 notifications per business.

[91] *The figure is reasoned (and cautious) assumptions based on the project team's market knowledge.*

Figure 3: Notification Costs by Size of Business and Number of Shipments: Electronic Scrap (High Value)



9.1.4 Destination of Outputs Exported

Table 19 and Table 20 show a summary of the assumptions on export destinations for the outputs recovered from the UK's WEEE recycling industry. All circuit boards removed from cooling appliances, LDA, SDA and display that are exported, are exported to EU or OECD countries for further processing.

Table 19: Marketable Outputs Exported to EU or OECD Countries (%)

	Category of WEEE Output				
Marketable Output Category	**Cooling**	**LDA**	**SDA**	**Display: CRT**	**Display: FPD**
Circuit boards	100%	100%	99.5%	100%	100%
Compressors	0.5%				
Electronic Scrap (High Value)			90%		
Motors		9.4%	45%		

Compressors removed from cooling appliances that are exported, are mainly exported to non-EU or non-OECD countries for recycling. The vast majority (90%) of SDA derived electronic scrap that is high value and destined for base/precious metal recovery is exported to EU or OECD countries.

Table 20: Marketable Outputs Exported to Non-EU or Non-OECD Countries (%)

	Category of WEEE Output				
Marketable Output Category	Cooling	LDA	SDA	Display: CRT	Display: FPD
Circuit boards					
Compressors	99.5%				
Electronic Scrap (High Value)			10%		
Motors		84.6%	45%		

It is estimated that the majority of motors removed from LDA are exported to non-EU or non-OECD countries, and 45% of motors removed from SDA are exported to non-EU or non-OECD countries, with the remainder 55% of motors removed from SDA exported to EU or OECD countries. Approximately, 90% of SDA derived electronic scrap that is high value and destined for base/precious metal recovery is exported to EU or OECD countries. There is a reasonably high level of confidence on the figures in Table 19 and Table 20.

9.1.5 Value of Exports

Table 21 shows indicative typical values (£ per tonne) for the outputs recovered by the UK industry that are exported. Note that circuit boards from LDA e.g., from items such as hairdryers, washing machines and dish washers, are low grade/value compared to circuit boards from SDA e.g., from laptops, set top boxes). The value per tonne for electronic scrap that is destined for base/precious metal refining very much depends on the type of electronic scrap and the composition of shipments. The figure shown is an assumed average figure.

Table 21: Value Exported Outputs (Ex-works) (£ Per Tonne)

	Category of WEEE Output				
Marketable Output Category	Cooling	LDA	SDA	Display: CRT	Display: FPD
Circuit boards	£300	£300	£5,000	£300	£300
Compressors	£515				
Electronic scrap (high value)			£400		
Motors		£700	£700		

The export value per tonne figures for the output categories are taken from the survey responses apart from the figure for electronic scrap where the figure is a reasoned (and cautious) assumption based on the project team's market knowledge. As noted above, the value per tonne for electronic scrap very much depends on the type of electronic scrap and the composition of shipments.

9.1.6 GHG Emissions from Export of Outputs

Average journey distances for land and sea journeys for shipments of outputs to EU/OECD and non-EU/non-OECD destinations are used to provide estimates of tCO2eq per tonne caused by exporting to these two regions. The exported tonnages in the baseline are estimated to be 16,195 tonnes to EU/OECD and 45,499 to non-EU/non-OECD in 2019. For export of outputs to the EU or OECD countries a figure of 0.128t CO2eq per tonne is applied to the tonnage exported to EU or OECD countries. For export of outputs to the non-EU or non-OECD countries a figure of 0.283t CO2eq per tonne is applied to the tonnage exported to non-EU or non-OECD countries.

9.1.7 Jobs Created by Export of Outputs

Estimates of the jobs intensity for different types of WEEE recycling are based on McMahon et al (2021) 'Estimating job creation potential of compliant WEEE pre-treatment in Ireland', Journal of resources conservation & recycling, 66 (2021). It is assumed that the technology and processes in the UK WEEE industry

are similar. Table 22 reports the estimated number of jobs per tonne of WEEE outputs for cooling, LDA, SDA and Display (CRT and FPD). These estimates are applied to the EA tonnages of collected WEEE input to WEEE recycling businesses.

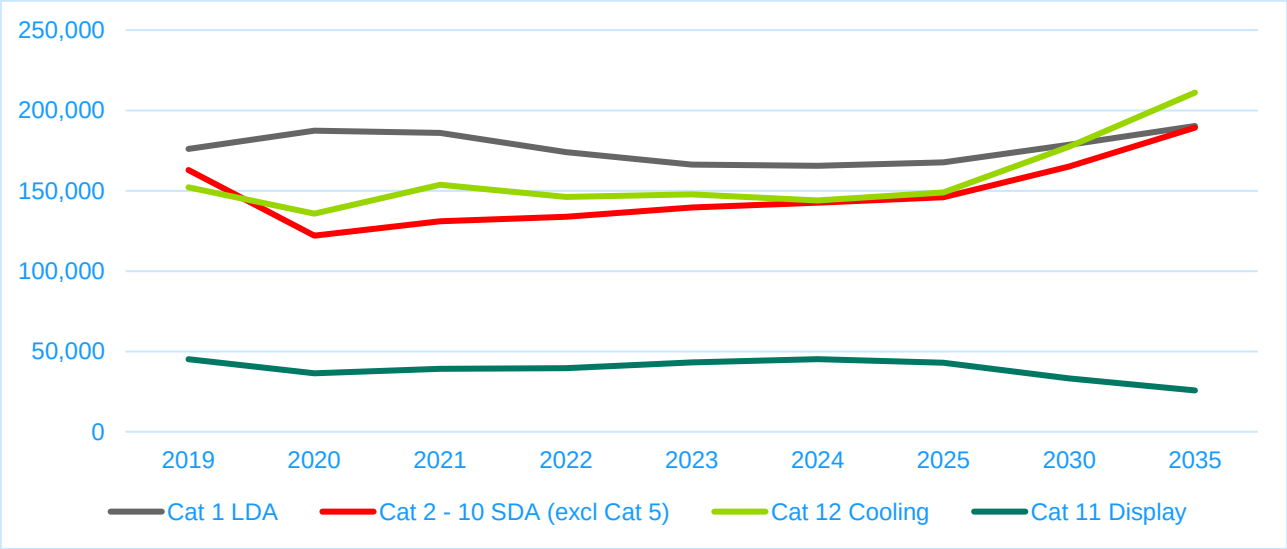
Table 22: Jobs Created Per Tonne of WEEE Input to Recyclers

Cooling	LDA	SDA	Display: CRT	Display: FPD
0.001	0.015	0.004	0.003	0.002

9.2 Input Streams

Figure 4 shows the baseline projection for input category streams processed by the WEEE recycling industry in the UK. Actual data is used for 2019 to 2023, projections are from 2024 to 2035. The input categories shown are aggregated tonnages from EA data on obligated WEEE from households and businesses and non-obligated WEEE received by AATFs. The baseline projection for the tonnages of the four categories of input streams is formed by extrapolating historic growth rates for each of the underlying 14 categories of WEEE included in the EA reported datasets, these are then aggregated to the four categories of interest.

Figure 4: WEEE[92] Received by AATFs, 2019 to 2035, Baseline (Tonnes)



The largest input category (by weight) is LDA, estimated at 166k tonnes in 2023 and projected to increase to 190k tonnes by 2035. Input of SDA is estimated to be around 140k tonnes in 2023 and projected to increase to 189k tonnes by 2035. Just under 148k tonnes of cooling appliances are input to the WEEE processing industry in 2023 with the projection showing an increase to just over 211k tonnes by 2035. Input of display equipment (both flat screen display and CRT) is estimated at 43k tonnes in 2023 and is projected to decline to just under 26k tonnes by 2035.

9.3 Outputs Exported

Figure 5 illustrates the baseline trajectories for the export of outputs recovered by the WEEE processing industry that are most likely to be impacted by the implementation of the proposed amendments to the Basel Convention.

The largest category (by weight) is compressors from cooling appliances, estimated to be just under 30k tonnes in 2023 and projected to increase to around 42k tonnes in 2035.

[92] *In the scenarios modelled in this report, the WEEE categories used are category 1 Large domestic appliances (LDA), categories 2 – 4, 6 – 10 are aggregated and referred to as small domestic appliances (SDA), category 11 is displaying equipment and category 12 is cooling appliances.*

Industry output of motors from LDA and SDA is estimated to be around 21k tonnes in 2023 and is projected to increase to over 26k tonnes by 2035. Approximately 8k tonnes of circuit boards and 2k tonnes of electronic scrap (destined for recovery of base/precious metals) are recovered as outputs with the projected quantities of these broadly stable to 2035.

Figure 5: All Outputs from WEEE Exported, 2019 to 2035 (Tonnes)

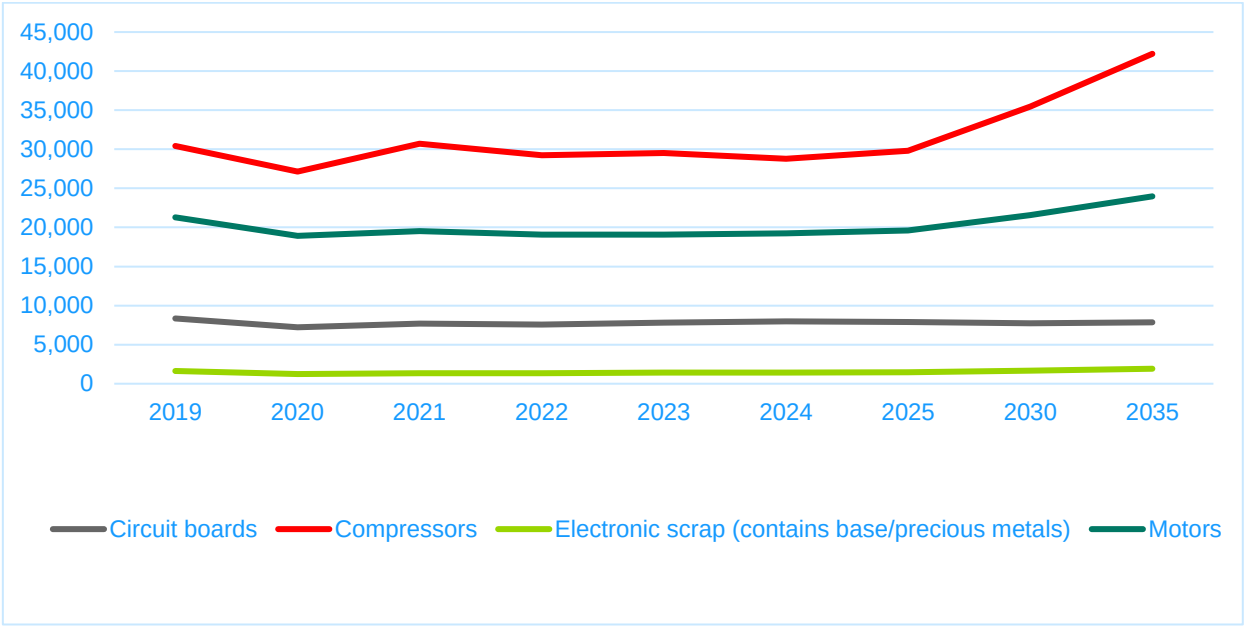


Table 23 and Table 24 show the split of exports to EU or OECD countries and non-EU and non-OECD countries in the baseline projection. In terms of total export tonnages, outputs exported to non-EU or non-OECD countries are approximately three times that of outputs exported to EU or OECD countries. The major categories of outputs exported to non-EU or non-OECD destinations being compressors removed from cooling appliances and motors from LDA and SDA. By comparison, non-EU or non-OECD destinations are relatively less important destinations for export of circuit boards and electronic scrap (destined for base/precious metals recovery).

Table 23 Baseline: Outputs from WEEE Exported to EU or OECD Countries, 2019 to 2035 (Tonnes)

Description	2019	2020	2021	2022	2023	2024	2025	2030	2035
Total	16,195	13,402	14,257	14,173	14,646	14,898	14,988	15,721	16,955
Circuit boards	8,341	7,213	7,680	7,544	7,818	7,953	7,887	7,735	7,861
Compressors	152	136	154	146	148	144	149	177	211
Electronic scrap (Contains base/precious metals)	1,482	1,111	1,193	1,219	1,270	1,297	1,328	1,502	1,723
Motors	6,221	4,942	5,230	5,264	5,410	5,504	5,624	6,307	7,160

The majority of circuit boards and electronic scrap (destined for base/precious metals recovery) is exported to EU or OECD destinations. There is also a significant tonnage of motors going to EU or OECD countries for recycling and it is also estimated that there is some tonnage of compressors exported to EU or OECD countries

Table 24 Baseline: Outputs from WEEE Exported to Non-EU or Non-OECD Countries, 2019 to 2035 (Tonnes)

Description	2019	2020	2021	2022	2023	2024	2025	2030	2035
Total	45,499	41,120	44,994	43,048	43,198	42,529	43,785	50,746	59,025
Circuit boards	8	6	7	7	7	7	7	8	10
Compressors	30,265	27,011	30,575	29,096	29,387	28,635	29,650	35,292	42,007
Electronic scrap (Contains base/precious metals)	165	123	133	135	141	144	148	167	191
Motors	15,062	13,980	14,280	13,809	13,662	13,743	13,980	15,279	16,817

Table 25 shows a summary of the baseline projection for export of outputs recovered by the WEEE processing industry under PIC control notification. It is assumed that 100% of circuit boards and 50% of electronic scrap (containing base/precious metals) are shipped under PIC controls in the baseline scenario.

Table 25 Baseline: Outputs from WEEE Exported Under PIC Control Notification, 2019 to 2035 (Tonnes)

Description	2019	2020	2021	2022	2023	2024	2025	2030	2035
Total	9,172	7,836	8,349	8,228	8,530	8,681	8,632	8,577	8,827
Circuit boards	8,349	7,219	7,687	7,551	7,825	7,960	7,895	7,743	7,870
Compressors	-	-	-	-	-	-	-	-	-
Electronic scrap (Contains base/precious metals)	823	617	663	677	706	721	738	834	957
Motors	-	-	-	-	-	-	-	-	-

In 2023, it is estimated that just over 7.8k tonnes of circuit boards are exported under PIC control notifications with export of these items projected stable at around 7.8k tonnes in 2035. An estimated 706 tonnes of electronic scrap (containing base/precious metals) are shipped under PIC controls in the baseline scenario in 2023, export of these items is projected to increase to ~7.7k tonnes by 2035.

9.4 Value of Exports

Table 26 shows a summary of the baseline projection for the export revenues generated by export of the outputs produced from the WEEE recycling industry. Total export revenue is projected to increase from £38.1m in 2023 to £40.9m by 2035. For compressors represent the largest source of export revenue followed by motors and then circuit boards. Export revenue generated by compressors is projected to increase from £15.2m in 2023 to £16.5m by 2035. The projection of export revenue from motors is broadly comparable increasing from £13.4m in 2023 to 14.2m in 2035.

Table 26 Baseline: Total Value of Outputs from WEEE Exported, 2019 to 2035 (£m)

Description	2019	2020	2021	2022	2023	2024	2025	2030	2035
Total	£41.4	£35.7	£38.5	£37.6	£38.1	£38.0	£38.9	£44.2	£50.6
Circuit boards	£10.2	£7.9	£8.5	£8.6	£8.9	£9.1	£9.3	£10.1	£11.3
Compressors	£15.7	£14.0	£15.8	£15.1	£15.2	£14.8	£15.3	£18.3	£21.7
Electronic scrap (Contains base/precious metals)	£0.7	£0.5	£0.5	£0.5	£0.6	£0.6	£0.6	£0.7	£0.8
Motors	£14.9	£13.2	£13.7	£13.4	£13.4	£13.5	£13.7	£15.1	£16.8

Table 27 and Table 28 show the split of the value of outputs exported to EU or OECD countries and non-EU and non-OECD countries in the baseline projection. In terms of total export value, outputs exported to non-EU or non-OECD countries are approximately three times greater compared to the value of outputs exported to EU or OECD countries. The major categories by value exported to non-EU or non-OECD destinations being compressors removed from cooling appliances (~£15m in 2023) and motors from LDA and SDA (~£9.5m in

2023). By comparison, non-EU or non-OECD destinations are relatively less important in terms of export value for export of circuit boards and electronic scrap (destined for base/precious metals recovery).

Table 27 Baseline: Value of Outputs from WEEE Exported to EU or OECD, 2019 to 2035 (£m)

Description	2019	2020	2021	2022	2023	2024	2025	2030	2035
Total	£15.2	£11.9	£12.7	£12.8	£13.3	£13.5	£13.8	£15.2	£17.1
Circuit boards	£10.2	£7.9	£8.5	£8.6	£8.9	£9.1	£9.2	£10.1	£11.3
Compressors	£0.1	£0.1	£0.1	£0.1	£0.1	£0.1	£0.1	£0.1	£0.1
Electronic scrap (Contains base/precious metals)	£0.6	£0.4	£0.5	£0.5	£0.5	£0.5	£0.5	£0.6	£0.7
Motors	£4.4	£3.5	£3.7	£3.7	£3.8	£3.9	£3.9	£4.4	£5.0

Table 28 Baseline: Value of Outputs from WEEE Exported to Non-EU or Non-OECD, 2019 to 2035 (£m)

Description	2019	2020	2021	2022	2023	2024	2025	2030	2035
Total	£26.2	£23.8	£25.8	£24.7	£24.8	£24.5	£25.2	£29.0	£33.5
Circuit boards	£0.0	£0.0	£0.0	£0.0	£0.0	£0.0	£0.0	£0.0	£0.0
Compressors	£15.6	£13.9	£15.7	£15.0	£15.1	£14.7	£15.3	£18.2	£21.6
Electronic scrap (Contains base/precious metals)	£0.1	£0.0	£0.1	£0.1	£0.1	£0.1	£0.1	£0.1	£0.1
Motors	£10.5	£9.8	£10.0	£9.7	£9.6	£9.6	£9.8	£10.7	£11.8

Table 29 reports a summary of the baseline projection for the value of export of outputs recovered by the WEEE processing industry under PIC control notification. In 2023, it is estimated that £8.9m worth of circuit boards are exported under PIC control notifications with the value of export of these items increasing to £11.3m in the baseline scenario in 2035. The value of electronic scrap (containing base/precious metals) shipped under PIC controls in the baseline scenario in 2023 is estimated to be ~£280k, the value of export of these items is projected to increase to ~£383k by 2035.

Table 29 Baseline: Value of Outputs Exported under PIC controls, 2019 to 2035 (£m)

Description	2019	2020	2021	2022	2023	2024	2025	2030	2035
Total	£10.5	£8.2	£8.8	£8.9	£9.2	£9.4	£9.6	£10.5	£11.7
Circuit boards	£10.2	£7.9	£8.5	£8.6	£8.9	£9.1	£9.3	£10.1	£11.3
Compressors	-	-	-	-	-	-	-	-	-
Electronic scrap (Contains base/precious metals)	£0.3	£0.2	£0.3	£0.3	£0.3	£0.3	£0.3	£0.3	£0.4
Motors	-	-	-	-	-	-	-	-	-

9.5 Notifications

The costs associated with PIC controls for exported outputs from the WEEE processing industry include the cost of paying notification fees to the regulators (in the UK and the destination country), the cost of obtaining financial guarantees, and other administration costs associated with managing the requirements of the amended regime for exporting.

Table 30 shows the baseline projection for the number of notifications required based on the tonnage of these output categories that is moved under PIC control notifications. It is assumed in the baseline projection (central scenario) that shipments are 20 tonne loads for circuit boards, compressors and motors (10 tonnes for electronic scrap) and that, on average, there are 10 shipments per notification for circuit boards, 15 for compressors and 5 for motors and electronic scrap).

It is estimated that in 2023 in the baseline projection there are a total of 60 notifications required to ship the tonnages of circuit boards and electronic scrap, with the projected numbers unchanged by 2035.

Table 30 Baseline: Number of PIC Control Notifications, 2019 to 2035

Description	2019	2020	2021	2022	2023	2024	2025	2030	2035
Total	70	60	60	60	60	60	60	60	60
Circuit boards	50	40	40	40	40	40	40	40	40
Compressors	-	-	-	-	-	-	-	-	-
Electronic Scrap (contains base/precious metals)	20	20	20	20	20	20	20	20	20
Motors	-	-	-	-	-	-	-	-	-

Table 31 shows the baseline projection for the EA/destination country cost of notifications to exporters based on the estimated number of PIC control notifications required and the schedule of EA charges per number of shipments. In the baseline projection between 2023 and 2035, it estimated that the EA/destination country charges for notification of shipments of circuit boards and electronic scrap (containing base/precious metals) is a cost to exporters of ~£313k.

Table 31 Baseline: Cost of EA/Destination Country Notification for Export Under PIC Controls, 2019 to 2035 (£000s)

Description	2019	2020	2021	2022	2023	2024	2025	2030	2035
Total	£369	£313	£313	£313	£313	£313	£313	£313	£313
Circuit boards	£283	£226	£226	£226	£226	£226	£226	£226	£226
Compressors	-	-	-	-	-	-	-	-	-
Electronic Scrap (contains base/precious metals)	£86	£86	£86	£86	£86	£86	£86	£86	£86
Motors	-	-	-	-	-	-	-	-	-

Under PIC control notification exporters will be required to put in place a financial guarantee or equivalent insurance ('financial provision') for all shipments under PIC controls. This provides competent authorities with guaranteed resources to act should there be any problems with a notified shipment, including, for example, arranging and paying for the repatriation of the shipment.

The financial guarantee covers potential repatriation and possibly other clean-up costs, and therefore provides an incentive to exporters to enhance the quality of exports, thereby lowering the risks associated with exporting and the risk premium in the financial guarantee. The amount of the guarantee is required to be set at a level that covers a 'worst case scenario' which covers all potential costs that might be incurred (including repatriation costs and disposal costs) in dealing with shipments under notification from the UK that receiving countries are unable to handle. The risk of the latter is lowered by the notification procedure itself since regulators in the UK and the destination country approve shipments prior to any movement of wastes commences.

The costs of putting in place the financial guarantee are shown in Table 32.

In the baseline projection for 2023, it estimated that the fees for financial guarantees for notification of shipments of circuit boards and electronic scrap (containing base/precious metals) are a cost to exporters of ~£96k, increasing to ~£100k by 2035.

Table 32 Baseline: Cost of Financial Guarantees for Export Under PIC Controls, 2019 to 2035 (£000s)

Description	2019	2020	2021	2022	2023	2024	2025	2030	2035
Total	£103.2	£88.2	£93.9	£92.6	£96.0	£97.7	£97.1	£96.5	£99.3
Circuit boards	£93.9	£81.2	£86.5	£84.9	£88.0	£89.6	£88.8	£87.1	£88.5
Compressors	-	-	-	-	-	-	-	-	-
Electronic Scrap (Contains base/precious metals)	£9.3	£6.9	£7.5	£7.6	£7.9	£8.1	£8.3	£9.4	£10.8
Motors	-	-	-	-	-	-	-	-	-

Table 33 shows the total costs of obtaining notification under PIC controls for export of circuit boards and electronic scrap (containing base/precious metals) recovered as outputs from the WEEE recycling industry in the baseline scenario.

In the baseline projection for 2023, it estimated that the total cost to exporters for notification of shipments of circuit boards and electronic scrap (containing base/precious metals) are ~£410k, increasing slightly to ~£412k by 2035.

Table 33 Baseline: Total Notification Costs for Export Under PIC Controls, 2019 to 2035 (£000s)

Description	2019	2020	2021	2022	2023	2024	2025	2030	2035
Total	£473	£401	£407	£405	£409	£410	£410	£409	£412
Circuit boards	£377	£308	£313	£311	£314	£316	£315	£314	£315
Compressors	-	-	-	-	-	-	-	-	-
Electronic Scrap (Contains base/precious metals)	£96	£93	£94	£94	£94	£94	£95	£96	£97
Motors	-	-	-	-	-	-	-	-	-

9.6 GHG Emissions from Export of Outputs

Table 34 and Table 35 show how estimates of GHG emissions from the export of outputs are split between export to EU or OECD countries and export to non-EU and non-OECD countries in the baseline projection. The weight of shipments and journey distances are the key drivers of the estimated carbon emissions, and this is reflected in the relative magnitudes of the GHG emissions to these regions with GHG emissions from export of outputs to non-EU or non-OECD countries being, overall, much larger in comparison to GHG emissions from export of outputs to EU or OECD countries.

Table 34 Baseline: GHG Emissions from Export of WEEE to EU or OECD, 2019 to 2035 (tCO2eq)

Description	2019	2020	2021	2022	2023	2024	2025	2030	2035
Total	2,073	1,715	1,825	1,814	1,875	1,907	1,919	2,012	2,170
Circuit boards	1,068	923	983	966	1,001	1,018	1,010	990	1,006
Compressors	19	17	20	19	19	18	19	23	27
Electronic Scrap (Contains base/precious metals)	190	142	153	156	163	166	170	192	220
Motors	796	633	669	674	693	704	720	807	916

Table 35 Baseline: GHG Emissions from Export of WEEE to non-EU or non-OECD, 2019 to 2035 (tCO2eq)

Description	2019	2020	2021	2022	2023	2024	2025	2030	2035
Total	12,876	11,637	12,733	12,182	12,225	12,036	12,391	14,361	16,704
Circuit boards	2	2	2	2	2	2	2	2	3
Compressors	8,565	7,644	8,653	8,234	8,317	8,104	8,391	9,988	11,888
Electronic Scrap (Contains base/precious metals)	47	35	37	38	40	41	42	47	54
Motors	4,263	3,956	4,041	3,908	3,866	3,889	3,956	4,324	4,759

The total GHG emissions caused by the export of outputs recovered by the WEEE industry in the UK are shown in Table 36. In the baseline projection, in 2023, it is estimated that GHG emissions from all export of outputs is ~14.1k tCO2eq, this increases to ~18.9k tCO2eq by 2035. The main category generating the GHG emissions is export of compressors from cooling appliances (estimated at ~8.3k tCO2eq in 2023, increasing to ~11.9k tCO2eq by 2035 in the baseline projection), followed by export of motors from LDA and SDA (estimated at ~4.6k tCO2eq in 2023, increasing to ~5.7k tCO2eq by 2035 in the baseline projection).

Table 36 Baseline: Total GHG Emissions from Export of WEEE, 2019 to 2035 (tCO2eq)

Description	2019	2020	2021	2022	2023	2024	2025	2030	2035
Total	14,949	13,352	14,558	13,997	14,100	13,943	14,310	16,373	18,874
Circuit boards	1,070	925	985	968	1,003	1,020	1,012	992	1,009
Compressors	8,584	7,662	8,672	8,253	8,336	8,122	8,410	10,010	11,915
Electronic Scrap (Contains base/precious metals)	236	177	190	194	203	207	212	239	275
Motors	5,059	4,589	4,711	4,582	4,559	4,594	4,676	5,131	5,676

Table 37 reports the overall monetised GHG emissions caused by the export of outputs recovered by the WEEE industry in the UK in the baseline projection. The carbon prices (£ per tCO2eq) used to monetise the GHG emissions tonnage figures in Table 36 are Defra's central estimates for traded emissions.

In 2023, the total monetised GHG emissions from export of outputs is estimated at ~£480k in the baseline projection, increasing to ~£2.2m by 2035.

Table 37 Baseline: Monetised GHG Emissions from Export of WEEE, 2019 to 2035 (£m)

Description	2023	2024	2025	2030	2035
Total	£0.479	£0.572	£0.673	£1.326	£2.227
Circuit Boards	£0.034	£0.042	£0.048	£0.080	£0.119
Compressors	£0.283	£0.333	£0.395	£0.811	£1.406
Electronic Scrap (Contains base/precious metals)	£0.007	£0.008	£0.010	£0.019	£0.032
Motors	£0.155	£0.188	£0.220	£0.416	£0.670

9.7 Jobs Created by WEEE Reprocessing

Table 38 reports estimate of the total jobs created by the export of outputs recovered by the WEEE industry in the UK in the baseline projection.

Table 38 Baseline: Total Jobs Created by WEEE Reprocessing, 2019 to 2035

	2019	2020	2021	2022	2023	2024	2025	2030	2035
Jobs Created by WEEE processing	3,426	3,417	3,454	3,278	3,189	3,185	3,233	3,492	3,789

10.Implementing the Amendments Proposed by S-G

This section of the report discusses the impacts of implementing the amendments to the Basel Convention proposed by Switzerland and Ghana (S-G). The impacts are reported relative to the baseline scenario which extends from 2019 to 2035.

The input streams processed by the UK industry that produce marketable outputs potentially impacted by the amendments to the Basel Convention are:

- Cooling appliances.
- Large domestic appliances (LDA).
- Small domestic appliances (SDA).
- Flat panel display (FPD) screens.

In the scenario it is assumed that the S-G changes to the Basel Convention are implemented in 2025. The main outputs categories identified through our analysis of the survey responses, and from discussions with the industry, that are impacted by the S-G amendments to the Basel Convention are:

- Compressors.
- Electronic scrap that is high value and destined for base/precious metal recovery (refining).
- Motors.

Full details of the scenario modelled to estimate the impacts of the amendments to the Basel Convention proposed by S-G on UK export of outputs from the WEEE industry are reported in Appendix 4: Full Details of the S-G Scenario.

It is assumed that all exporting businesses potentially impacted by the proposed S-G amendments to the Basel Convention are fully compliant. While there may be export businesses that currently carry out export activities circumventing the Basel amendments and/or the UK regulations it is assumed that this behaviour is unchanged by the proposed S-G amendments. It is also assumed that monitoring and enforcement by regulators in the UK is sufficient to deter exporters from misreporting declarations on shipments to avoid paying notification costs.

It is assumed that the amendments to the Basel Convention proposed by S-G are implemented in 2025 and that from then 100% of the output categories identified above that are exported are required to be shipped under PIC control notifications.

It is assumed under the implementation of the S-G amendments to the Basel Convention that all businesses exporting continue to export (destinations and values unchanged), the rationale for this is discussed in detail in section 10.4. They also absorb the full costs of obtaining PIC control notifications, this means the impacts on the costs of exporting (to exporters) reported in this scenario are the highest costs that UK businesses would incur. It is assumed that the higher costs to exporters from exporting outputs under PIC control notifications do not result in any exporters exiting the market.

It is very unlikely because of the high costs of disposal (landfill) in the UK that businesses that would be impacted by the implementation of the S-G amendments would revert to sending this material to disposal (landfill) in the UK, the rationale for this is discussed further in section 10.4. Landfill disposal costs over £130 per tonne[93]. This is the cost per tonne for non-hazardous landfill, the disposal charges at a hazardous landfill sites[94] could easily be double that for landfill of hazardous materials.

All other assumptions remain constant at the value's pre-implementation levels. Therefore, the only impacts (relative to baseline) in this scenario are on PIC control notifications and the associated costs to exporters of obtaining them. In the tables reported below the costs and values assumed are from our central scenario.

[93] *Landfill cost of £27/tonne (excluding tax) https://www.wrap.ngo/sites/default/files/2024-07/WRAP-Gate-Fees-Report-2023-24-V1.1.pdf + Tax of £103.70 https://www.gov.uk/government/publications/landfill-tax-rates-for-2024-to-2025/increases-to-landfill-tax-rates-from-1-april-2024.*

[94] *Hazardous gate fees are not covered in WRAP's Gate Fees Reports*

10.1 Outputs Exported

The impacts (relative to baseline) on the tonnage of industry outputs exported under PIC control notifications from 2025 to 2035 are shown in Table 39. It is assumed that 100% of circuit boards are already shipped under PIC controls in the baseline scenario, therefore there are no impacts on export of circuit boards as the control position is unchanged.

Export of compressors, motors and electronic scrap (destined for base/precious metals recovery) are impacted from 2025 onwards as they are required to be shipped under PIC control notifications once the amendments proposed by S-G are implemented.

Table 39 Central S-G Scenario: Impacts on Outputs from WEEE Exported Under PIC Control Notification, Relative to Baseline, 2025 to 2035 (Tonnes)

Description	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Total	50,141	51,585	53,079	54,627	56,229	57,889	59,610	61,393	63,243	65,161	67,152
Circuit Boards	-	-	-	-	-	-	-	-	-	-	-
Compressors	29,799	30,856	31,950	33,082	34,255	35,469	36,727	38,029	39,377	40,773	42,219
Electronic Scrap (Contains base/precious metals)	738	755	774	793	813	834	857	880	904	930	957
Motors	19,604	19,974	20,356	20,751	21,161	21,586	22,026	22,485	22,962	23,458	23,977

In 2025, it is estimated that in total an additional ~50.1k tonnes of WEEE industry outputs are exported under PIC control notifications, increasing to an additional tonnage of ~67.2k tonnes of outputs exported under notification by 2035. The major export categories impacted in the S-G scenario are compressors (an additional ~29.8k tonnes are shipped under notification in 2025, increasing to ~42.2k tonnes by 2035) and motors (an additional ~19.6k tonnes are shipped under notification in 2025, increasing to ~24k tonnes by 2035). An additional (relative to baseline) 738 tonnes of electronic scrap (destined for base/precious metals recovery) is exported under PIC controls in 2025, increasing to a further 957 tonnes of this output category being exported under notification by 2035.

In 2025, 74% (by weight) of WEEE exported under PIC is estimated to go to non-EU/non-OECD countries and 26% is estimated to go to EU/OECD countries.

10.2 Value of Exports

The impacts on the value of outputs exported by the WEEE industry under PIC controls export are reported in Table 40. In 2025, it is estimated that in total an additional ~£29.4m worth of WEEE industry outputs are exported under PIC control notifications, increasing to an additional ~£38.9m worth of outputs exported under notification by 2035.

The major export categories impacted in the S-G scenario are compressors (an additional ~£15.3m worth of compressors are shipped under notification in 2025, increasing to an additional ~£21.7m worth shipped under notification by 2035) and motors (an additional ~£13.1m worth of motors are shipped under notification in 2025, increasing to ~£16.8m worth shipped under notification by 2035). Relative to baseline, a further ~£0.3m to ~£0.4m worth of electronic scrap (high value, destined for base/precious metals recovery) is exported under PIC controls in 2025 to 2035.

Table 40 Central S-G Scenario: Impacts on the Value of Outputs from WEEE Exported Under PIC Control Notification, Relative to Baseline, 2025 to 2035 (£m)

Description	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Total	£29.4	£30.2	£31.0	£31.9	£32.8	£33.7	£34.7	£35.7	£36.7	£37.8	£38.9
Circuit Boards	-	-	-	-	-	-	-	-	-	-	-
Compressors	£15.3	£15.9	£16.5	£17.0	£17.6	£18.3	£18.9	£19.6	£20.3	£21.0	£21.7
Electronic Scrap (Contains base/precious metals)	£0.3	£0.3	£0.3	£0.3	£0.3	£0.3	£0.3	£0.4	£0.4	£0.4	£0.4
Motors	£13.7	£14.0	£14.2	£14.5	£14.8	£15.1	£15.4	£15.7	£16.1	£16.4	£16.8

10.3 Notifications

The costs associated with PIC controls for exported outputs from the WEEE processing industry include the cost of paying notification charges to the regulators (in the UK and the destination country), the cost of obtaining financial guarantees, and other administration and one-off familiarisation costs associated with managing the requirements of the amended regime for exporting.

Table 41 shows the impacts on the number of PIC control notifications that would be required following the implementation of the amendments proposed by S-G. In this scenario, it is estimated that in 2025, an additional total of ~310 notifications will be required to ship the tonnage of outputs exported by the WEEE industry (excluding circuit boards). For compressors an additional ~100 notifications required in 2025, with the number projected to increase to an additional 150 by 2035. For shipment of motors under notification it is estimated in this scenario that in 2025 an additional 200 notifications would be required, with this number projected to increase to 240 additional notifications in 2035. Relative to the baseline projection very few additional notifications (20) are estimated to be required for shipping electronic scrap under notification following the implementation of the proposed S-G amendments to the Basel Convention.

Table 41 S-G Central Scenario: Impacts on the Number of PIC Control Notifications, Relative to Baseline, 2025 to 2035

Description	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Total	310	330	340	350	360	360	380	380	390	400	410
Circuit Boards	-	-	-	-	-	-	-	-	-	-	-
Compressors	100	110	110	120	120	120	130	130	140	140	150
Electronic Scrap (Contains base/precious metals)	10	20	20	20	20	20	20	20	20	20	20
Motors	200	200	210	210	220	220	230	230	230	240	240

Table 42 shows the impacts on EA/destination country costs to exporters of putting in place notifications to ship outputs under PIC controls. In this scenario, total additional costs (relative to baseline) are estimated to be around ~£1.5m in 2025, with these additional costs to exporters projected to be increased by ~£1.9m (relative to baseline) in 2035.

Businesses exporting motors removed from appliances incur the majority of this uplift in costs (with an additional cost of ~£863k in 2025, projected to increase to an additional cost of ~£1.04m by 2035). For shipment of compressors under notification it is estimated in this scenario that in 2025 that the additional cost would be approximately £566k, with this projected to increase to £849k in 2035. Relative to baseline, the additional costs to businesses exporting electronic scrap (destined for base/precious metal recovery) is comparatively small (~£86k per year[95]) as a consequence of the low export tonnage (and the comparatively small increase in exports) there are very few additional notifications required for shipping this material under notification following the implementation of the proposed S-G amendments to the Basel Convention.

Table 42 Central S-G Scenario: Impacts on the Cost of EA/Destination Country Notifications for Export Under PIC Controls, Relative to Baseline, 2025 to 2035 (£000s)

Description	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Total	£1,473	£1,572	£1,616	£1,672	£1,715	£1,715	£1,815	£1,815	£1,872	£1,915	£1,972
Circuit Boards	-	-	-	-	-	-	-	-	-	-	-
Compressors	£566	£623	£623	£679	£679	£679	£736	£736	£793	£793	£849
Electronic Scrap (Contains base/precious metals)	£43	£86	£86	£86	£86	£86	£86	£86	£86	£86	£86
Motors	£863	£863	£907	£907	£950	£950	£993	£993	£993	£1,036	£1,036

Table 43 shows the impacts on the costs to exporters of obtaining the financial guarantees required for notifications to ship outputs under PIC controls. In this scenario, total additional costs (relative to baseline) of

[95] *After an additional £43k in 2025*

obtaining financial guarantees are estimated to be around ~£873k in 2025, increasing to ~£1.2m by 2035. Business exporting compressors and motors are estimated to incur the vast majority of the additional costs.

Table 43 Central S-G Scenario: Impacts on Costs of Financial Guarantees for Export Under PIC Control Notifications, Relative to Baseline, 2025 to 2035 (£000s)

Description	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Total	£873	£898	£924	£951	£979	£1,008	£1,038	£1,069	£1,101	£1,135	£1,169
Circuit Boards	-	-	-	-	-	-	-	-	-	-	-
Compressors	£521	£540	£559	£579	£599	£621	£643	£666	£689	£714	£739
Electronic Scrap (Contains base/precious metals)	£8	£8	£9	£9	£9	£9	£10	£10	£10	£10	£11
Motors	£343	£350	£356	£363	£370	£378	£385	£393	£402	£411	£420

The impacts on the total costs to exporting businesses of obtaining notification under PIC controls for export of outputs from the WEEE recycling industry are shown in Table 44.

In this scenario modelling the impacts from the implementation of the amendments proposed by S-G, it is estimated that the total additional costs to exporters of obtaining PIC control notification for shipment of outputs (excluding circuit boards) are ~£2.3m in 2025, increasing to ~£3.1m by 2035. The majority of the additional cost burden is on exporters of compressors and motors.

Table 44 Central S-G Scenario: Impacts on Total Notification Costs for Export Under PIC Control Notifications, Relative to Baseline, 2025 to 2035 (£000s)

Description	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Total	£2,346	£2,470	£2,540	£2,623	£2,694	£2,723	£2,853	£2,884	£2,973	£3,049	£3,141
Circuit Boards	-	-	-	-	-	-	-	-	-	-	-
Compressors	£1,088	£1,163	£1,182	£1,258	£1,279	£1,300	£1,379	£1,401	£1,482	£1,506	£1,588
Electronic Scrap (Contains base/precious metals)	£51	£95	£95	£95	£95	£96	£96	£96	£97	£97	£97
Motors	£1,206	£1,213	£1,263	£1,270	£1,320	£1,327	£1,378	£1,386	£1,395	£1,447	£1,456

The cumulative impacts (relative to baseline) on total exporters costs from the implementation of the amendments proposed by S-G are shown in Table 45. In the central scenario, it is estimated that the cumulative total additional costs from 2025 to 2035 that would be incurred by exporting businesses in order to obtain the required notifications for shipment of outputs (excluding circuit boards) is ~£30.3m, or ~£2.75m per year.

In the central scenario, businesses exporting motors removed from appliances are estimated to incur total costs of ~£14.7m, from 2025 to 2035 (cumulative, relative to baseline). This is similar to businesses exporting compressors who are estimated to incur total additional costs of ~£14.6m, 2025 to 2035, cumulative. By comparison, additional costs to electronic scrap exporters are smaller at ~£1m, 2025 to 2035, cumulative.

In the high cost scenario, it is estimated that the cumulative total additional costs from 2025 to 2035 that would be incurred by exporting businesses in order to obtain the required notifications for shipment of outputs (excluding circuit boards) is ~£36.4m, or ~£3.3m per year. Exporters of compressors and motors share the additional costs approximately equally, and with relatively smaller additional costs to electronic scrap exporters).

In the low cost scenario, it is estimated that the cumulative total additional costs from 2025 to 2035 that would be incurred by exporting businesses in order to obtain the required notifications for shipment of outputs (excluding circuit boards) is ~£24.2m, or ~£2.21m per year (again with exporters of compressors and motors sharing the additional costs approximately equally (£11.7m each, cumulative 2025 to 2035), and with relatively smaller additional costs to electronic scrap exporters).

Table 45 Low, Central, and High Costs S-G Scenarios: Cumulative Impacts on Total Notification Costs for Export Under PIC Control Notifications, Relative to Baseline, 2025 to 2035 (£m)

Description of Category	Cumulative Impact of Exporter Costs (£m), 2025 to 2035			Impact of Exporter Costs Per Year (£m)		
	Low	Central	High	Low	Central	High
Total	£24.24	£30.30	£36.36	£2.20	£2.75	£3.31
Circuit Boards	-	-	-	-	-	-
Compressors	£11.70	£14.62	£17.55	£1.06	£1.33	£1.60
Electronic Scrap (contains base/precious metals)	£0.81	£1.01	£1.21	£0.07	£0.09	£0.11
Motors	£11.73	£14.66	£17.59	£1.07	£1.33	£1.60

10.4 Impacts on Business

Many of the businesses in the WEEE recycling and reuse industry are large businesses in terms of the quantity of material throughput. Several of the AATFs (who also are exporters) have multiple site operations in the UK and internationally. The waste management business involved with collecting WEEE are also larger scale business.

While the key players are large (in terms of annual throughput), the industry is fragmented; there will be many smaller businesses collecting WEEE in small quantities and selling it to other intermediaries in the supply chain, and there will be some opportunists collecting off the streets in small quantities. There may also be smaller scale recycling activity, but it is unlikely that businesses at micro scale would be involved directly with export for recycling, being more likely to deal with brokers and other intermediaries in the UK.

It is assumed that exporters that are impacted by the implementation of the S-G amendments to the Basel Convention continue to export and pay the notification costs, the rationale for assuming this is discussed in detail in this section. There would be no uplift in costs to export of circuit boards (compared to the baseline) as the position taken in the S-G scenario is that circuit boards are shipped under notification prior to its implementation.

In terms of cost pass through, the most likely scenario is that WEEE recyclers pass through cost impacts via the gate fees they charge for the WEEE streams impacted. All exporters are impacted equally, and they would be in a reasonable position to pass on these costs. Where cost uplifts are passed on, smaller businesses upstream and downstream of WEEE recycling businesses are the most likely to be impacted following the implementation of the S-G amendments.

There is a potential risk following the implementation of the S-G amends to the Basel Convention that some countries either lack the systems to process notifications or choose not to receive certain outputs exported from the UK, for example where the notification process gives them greater visibility of the wastes and a greater ability to stop shipments. The risk is likely to be higher in non-EU non-OECD countries compared to countries in the EU and OECD area. Such risks could also apply to outputs that should already be exported (but are not) under notification prior to the implementation of the S-G amendments, such as circuit boards. However, most circuit boards are shipped to EU/OECD countries with systems in place and established processes for managing WEEE using environmentally sound methods. Compressors and motors are shipped from the UK to non-EU non-OECD countries, so the risk is arguably greater although these streams are likely to divert to other available export markets, such as those in the EU/OECD. UK export of electronic scrap is at a lower risk because it is exported from the UK to EU/OECD countries already and typically destined for precious and base metal refining in well-established industries that have environmentally sound management methods.

10.4.1 Export Margins Under Notification

This section of the report considers the impacts on UK exporters in scenarios for the costs of moving compressors, motors and electronic scrap (high value) to PIC control notifications. The assessment is on a cost per tonne basis in low, central and high-cost scenarios for each of these export categories under notification.

10.4.1.1 Compressors

In the S-G scenario 100% (a projected 29,799 tonnes) of UK exported compressors would move to PIC notification controls in 2025. Three scenarios with realistic potential options that exporting business might put in place for notifications and shipments across their sites are shown in (Table 46).

Table 46: Notification Cost Scenarios for Compressors[96]

Notification Cost Scenarios	Low	Central	High
Number of notifications per site	5	10	20
Number of shipments per notification	30	15	7
Total number of notifications	50	100	200
Notification cost (£ per tonne)	£24.21	£36.50	£66.59

The total number of notifications required to export 29,799[97] tonnes of compressors in 2025 is 50 in the low-cost scenario, 100 in the central cost scenario and 200 in the high-cost scenario. The central case scenario assumes 10 notifications per site and 15 shipments per notification, with a £36.50 per tonne figure for the full cost of arranging notifications (including EA/destination country charges and fees for the financial guarantees). The low-cost scenario assumes 5 notifications per site and 30 shipments per notification, with a figure of £24.21 per tonne for the overall cost of arranging notifications. The high-cost scenario assumes 20 notifications per site and 7 shipments per notification on average, with a figure £66.59 per tonne for the overall cost of notifications.

[96] *Here we assume one cper shipment so the associated costs will be lower where there are multiple containers per shipment.*
[97] *Using the higher projected 2035 export tonnages for compressors changes the notification cost per tonne by approximately £1 - £2.*

Table 47: Impact on Exporter Margins for Compressors (£ Per Tonne)

Export of Compressors Revenue[100]			Notification Costs			Other Shipping Costs[98]			Export Margin[99]		
Low	Central	High	Low	Central	High	Freight	Inspec-tion	Total other	Low	Central	High
£618	£515	£412	£24	£36	£67	£84	£10	£94	£500	£385	£252

Table 47 shows the estimated revenues per tonne from export, the scenarios for notification costs, other shipping costs, and the margin a business potentially could make from exporting compressors under PIC control notification.

This analysis suggests that under realistic assumptions UK businesses exporting compressors would continue to export under PIC and pay the notification costs. There are substantial exporter margins (£ per tonne) even in the high notification costs scenario. There's no realistic scenario in which compressors with a market value of £515 per tonne (central case) would go to landfill in the UK at a cost of over £130 per tonne. The possibility of compressors being dismantled and further refined in the UK is considered in section 10.4.2.2.

10.4.1.2 Motors

In the S-G scenario 100% of motors exported from the UK (a projected 19,604 tonnes) would move to PIC notification controls in 2025. Three scenarios with realistic options that UK exporting business might put in place for notifications and shipments across their sites are shown in Table 48. The notification costs (£ per tonne) include the fee for arranging the financial guarantee.

Table 48: Notification Cost Scenarios for Motors[101]

Notification Cost Scenarios	Low	Central	High
Number of notifications per site	5	10	20
Number of shipments per notification	10	5	3
Total number of notifications	100	200	400

[98] *The freight costs for compressors are a weighted average cost of a 40ft container to Europe and to selected non-OECD destinations (India, Indonesia and Pakistan) downloaded from https://www.dfsworldwide.com in September 2024. It is assumed the container weighs 20 tonnes. The inspection cost is an assumed figure for the costs of an internal inspection and checking paperwork prior to the shipment leaving the site*

[99] *This is the calculated net revenue from export per tonne of compressors under PIC. For example, in the central case £385 = £515 – £36 - £94.*

[100] *Current value, ex-works. The central case export revenue per tonne figure for compressors is taken from the survey responses, the low/high scenario values are assumed to be +/- 20% of the central figure.*

[101] *Here we assume one container per shipment so the associated costs will be lower where there are multiple containers per shipment.*

Notification cost (£ per tonne)	£37.10	£61.54	£126.70

The total number of notifications required to export 19,604[102] tonnes of compressors in 2025 is 100 in the low-cost scenario, 200 in the central cost scenario and 400 in the high-cost scenario.

The central case scenario for motors assumes 10 notifications per site and 5 shipments per notification, with a £61.54 per tonne figure for the cost of putting in place notifications. The low-cost scenario assumes 5 notifications per site and 10 shipments per notification, with a figure of £37.10 per tonne for the cost of arranging notifications. The high notification cost scenario for motors assumes 20 notifications per site and 3 shipments per notification on average, with overall notification costs of £126.70 per tonne.

Table 49: Impact on Export Margins for Motors (£ Per Tonne)

Export of Motors Revenue[105]			Notification Costs			Other Shipping Costs[103]			Export Margin[104]		
Low	Central	High	Low	Central	High	Freight	Inspec-tion	Total other	Low	Central	High
£840	£700	£560	£37	£62	£127	£74	£10	£84	£719	£555	£350

This analysis suggests that under a range of realistic assumptions UK businesses exporting motors would likely continue to export them under PIC and pay notification costs. There is a substantial margin on exporting even in the high notification costs scenario. There's no realistic scenario in which motors with a market value of £700 per tonne (central case) would go to disposal in the UK at a cost of over £130 per tonne. The possibility of motors being dismantled for recovery of intrinsic value in the UK is considered in section 10.4.2.2.

10.4.1.3 Electronic Scrap (High Value)

In the S-G scenario 1,475 tonnes of electronic scrap (high value) is exported under PIC control notifications in 2025. The notification cost (£ per tonne) includes the fee for arranging the financial guarantee.

Table 50 shows possible realistic options in terms of the number of notifications per site and the number of shipments. The notification cost (£ per tonne) includes the fee for arranging the financial guarantee.

Table 50: Notification Cost Scenarios for Electronic Scrap (High Value)

Notification Costs Scenarios	Low	Central	High
Number of notifications per site	5	10	20
Number of shipments per notification	10	5	2
Total number of notifications	15	30	60
Notification cost (£ per tonne)	£55.05	£99.03	£224.18

[102] Using the higher projected 2035 export tonnages for motors changes the notification cost per tonne by approximately £1 - £2.
[103] The freight costs for motors are a weighted average of the costs of a 40ft container to Europe and to selected non-OECD destinations (India, Indonesia and Pakistan) downloaded from https://www.dfsworldwide.com on 16.03.2022. It is assumed the container weighs 20 tonnes. The inspection cost is an assumed figure for the costs of an internal inspection and checking paperwork prior to the shipment leaving the site.
[104] This is the calculated net revenue from export per tonne. For example, in the central case £555 = £700 – £62 - £84.
[105] Current value, ex-works. The central case export value per tonne figures for motors are taken from the survey responses, the low/high scenario values are assumed to be +/- 20% of the central figure.

Table 51 shows a range of cost scenarios for export of electronic scrap (high value) under PIC control notification.

Table 51: Notification Cost Scenarios for Electronic Scrap (High Value), (£ Per Tonne)

Export of Electronic Scrap Revenue[108]			Notification Costs			Other Shipping Costs[106]			Export Margin[107]		
Low	Central	High	Low	Central	High	Freight	Inspec-tion	Total other	Low	Central	High
£480	£400	£320	£55	£99	£224	£53	£10	£63	£362	£238	£33

This analysis suggests that under realistic assumptions (as is assumed here) businesses exporting electronic scrap (high value) would likely continue to export under PIC and pay the notification costs. There is a substantial margin £ per tonne over UK landfill costs in these scenarios. There's no realistic scenario in which this stream would go to landfill in the UK at a cost of over £130 per tonne. The possibility of further refining electronic scrap in the UK rather than exporting it is considered below.

10.4.2 Margins on Further Refining or Dismantling and Recovery in the UK

This section first discusses potentially available UK capacity i.e., whether the exported outputs from the WEEE industry that potentially might divert to the UK to avoid the cost and hassle of PIC controls actually are (or potentially are) able to be further refined (extraction of precious metals from circuit boards) and/or dismantled in the UK (compressors and motors) for recovery of the intrinsic value of copper, aluminium and steel. It then turns to a discussion of the potential margins from further dismantling and recovery of intrinsic value from compressors and motors in the UK instead of exporting them under PIC control notification.

10.4.2.1 Circuit Boards

While circuit boards are not considered to be impacted by the implementation of the S-G scenario they are mentioned here because potentially capacity to treat circuit boards could also take some of the electronic scrap (high value) that is currently exported to metal refiners. Recent announcements indicate that dedicated capacity for recovery of precious metals and critical raw materials from circuit boards is operational in the UK.

- The Royal Mint[109] has a facility to recover gold and other precious metals from circuit boards at its site in Llantrisant, Wales. The plant can provide a stream of gold directly into its business. The site is thought to be capable of processing up to 80 tonnes of circuit boards per week (up to ~4,000 tonnes of

[106] *The freight costs for electronic scrap are a weighted average cost of a 40ft container to Europe and to selected non-OECD destinations (India, Indonesia and Pakistan) downloaded from https://www.dfsworldwide.com on 16.03.2022. It is assumed this cost would be similar for a truckload. It is assumed the container/truck payload is 20 tonnes, on average. The inspection cost is an assumed figure for the costs of an internal inspection and checking paperwork prior to the shipment leaving the site*

[107] *This is the net revenue from export per tonne. For example, in the central case £261 = £400 – £76 - £63.*

[108] *Current value, ex-works. The central case export value per tonne figures for electronic scrap represents a reasoned (and cautious) assumption based on the project team's market knowledge.*

[109] *https://www.bbc.co.uk/news/articles/c6p2k11e41po*

circuit boards a year from WEEE) and generating hundreds of kilograms of gold per year, in addition to supporting jobs in the local area.
- GAP has also established a facility in the Northeast that has an annual capacity to recycle ~5,000 tonnes of circuit boards from WEEE.

Together, the two sites represent substantial UK capacity to process circuit boards from WEEE and possibly electronic scrap in the UK.

10.4.2.2 Compressors and Motors

There is currently only a small amount of dedicated capacity for dismantling and recovery of intrinsic value from compressors and motors in the UK. In addition to this dedicated capacity some of these items may just be shredded[110]. Manual dismantling and recycling could be done in the UK, the technology and processes to do the dismantling operation is not complex. The modelling here assumes that motors and compressors are manually dismantled, however, there have been recent advances in automated equipment to dismantle compressors and these may ultimately provide a better solution to UK recycling operations.

Approximate but reasonable figures for what this could entail in terms of UK business costs are as follows.

On average, compressors and motors weigh around 10 kg, so there are approximately 100 devices per tonne. Assuming it takes roughly five minutes to manually dismantle them, an 8-hour shift could process (approximately) a tonne of compressors and motors. If UK labour costs are £25.88[111] per hour (all in) then this equates to £215.70 per tonne. For the cost's comparison, it is assumed that compressors and motors are mostly exported to South Asian countries where labour costs are estimated to be £5.51[112] per tonne. The difference is therefore approximately £210 per tonne (see additional labour costs in Table 52).

- Dismantling compressors and motors in the UK would save notification costs of approximately £24 per tonne to £127 per tonne, depending on the scenario for notification costs (Table 52). For the central case scenario, it would be £36 per tonne for compressors and £62 per tonne for motors.
- The savings on shipping costs are around £54 per tonne for motors and £64 per tonne for compressors (note that there would still likely be a cost for haulage to dismantling operations in the UK[113]).
- In total, the net cost from not exporting compressors and motors under PIC control notification are in the range £30 to £122 per tonne, depending on the scenario.

In the central case scenario for UK dismantling and recycling of compressors and motors, the total net cost from not exporting for both is approximately £100 per tonne (compressors £110 per tonne, motors £95 per tonne). (Table 52). Compared to exporting under PIC control notification, the margin for dismantling and recycling compressors and motors in the UK is estimated to be -£95 per tonne (compressors) and -£110 per tonne (motors).

In all scenarios shown in Table 52 for dismantling and recovery of intrinsic value from compressors and motors in the UK, the margin is below that for export of compressors and motors under PIC control notification. Therefore, it is seems likely that in a scenario in which PIC control notifications are introduced for compressors and motors, UK exporting businesses will continue to export compressors and motors and pay the costs of notification – based on this analysis, it is more profitable to do so.

[110] *Compressors would have to be de-polluted prior to shredding*
[111] *The average UK labour cost per hour £25.88/hour in 2023. https://www.ons.gov.uk/economy/economicoutputandproductivity/productivitymeasures/datasets/labourcostsandlabourshare.*
[112] *Figure is based on minimum wage per month in Pakistan of $114.34. https://www.minimum-wage.org/international/pakistan.*
[113] *Or to ship the recovered products if dismantling is done on recovery sites.*

Table 52: Further Treatment in the UK Compared to Export Under Notification: Compressors and Motors

Additional Labour Costs	Low	Central	High
Compressors	£210	£210	£210
Motors	£210	£210	£210
Saving on Notification Costs	**Low**	**Central**	**High**
Compressors	£24	£36	£67
Motors	£37	£62	£127
Saving on Shipping Costs	**Low**	**Central**	**High**
Compressors	£64	£64	£64
Motors	£54	£54	£54
Net cost from UK Dismantling versus Export	**Low**	**Central**	**High**
Compressors	£122	£110	£80
Motors	£119	£95	£30
Margin[114] from UK Dismantling	**Low**	**Central**	**High**
Compressors	£378	£275	£172
Motors	£600	£460	£320
Margin from UK Export	**Low**	**Central**	**High**
Compressors	£500	£385	£252
Motors	£719	£555	£350
Margin from UK Dismantling versus Export Under PIC	**Low**	**Central**	**High**
Compressors	-£122	-£110	-£80
Motors	-£119	-£95	-£30

10.4.2.3 Electronic Scrap (High Value)

This stream is primarily exported to Europe – Belgium and Germany are typically the key destinations. The plants there that process these materials are large metal smelting operations that historically were established for smelting and refining of base metals but have been adapted so that they are able to accept WEEE and recover precious metals and critical raw materials.

The investment cost to establish these plants is very large. It is extremely unlikely that similar plants would be established in the UK just to process the 1,000 to 2,500 tonnes a year of high value electronic scrap that is estimated to be exported in the scenarios developed in this assessment.

[114] *This is net revenue from dismantling in the UK compared to export under PIC.*

It is possible that some of this material would be able to go to the dedicated capacity mentioned above that is being installed in the UK for circuit board processing were it unable to be exported for any reason. Importantly, it would not go to landfill in the UK in a PIC control scenario. A worse-case scenario would be that UK recyclers would just decide to not remove the high value WEEE components from devices prior to shredding, rather than incur landfill costs at over £130 per tonne.

10.4.3 Number of Businesses

It is possible to get some indication of the scale of the number of businesses by looking at accreditation data from the EA for AATFs and AEs.

Figure 6 shows the number of AATF sites by size accreditation (small means below 400 tonnes per year, large means > 400 tonnes per year). There are currently 105 AATFs sites in the UK of which 55 (52%) are large in terms of their accreditation and 50 (48%) are small.

Figure 6: Number of AATFs by Size of Accreditation, 2015 to 2024

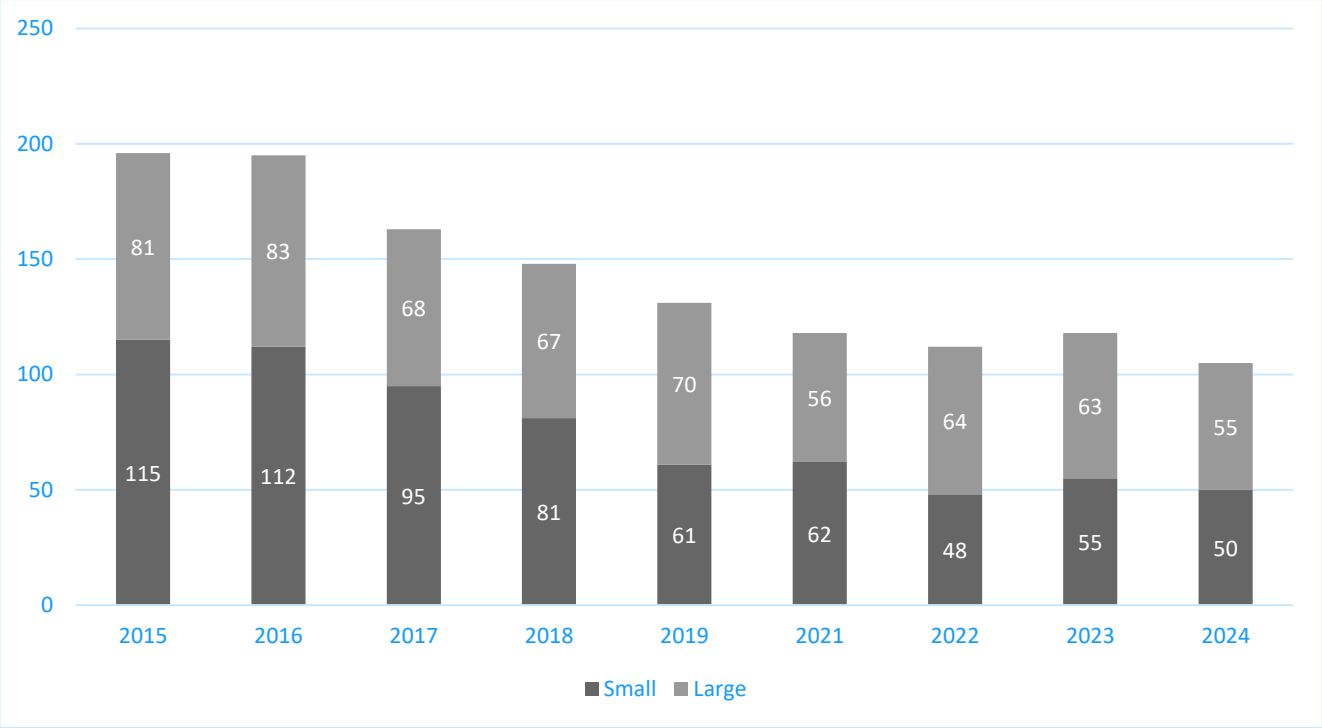
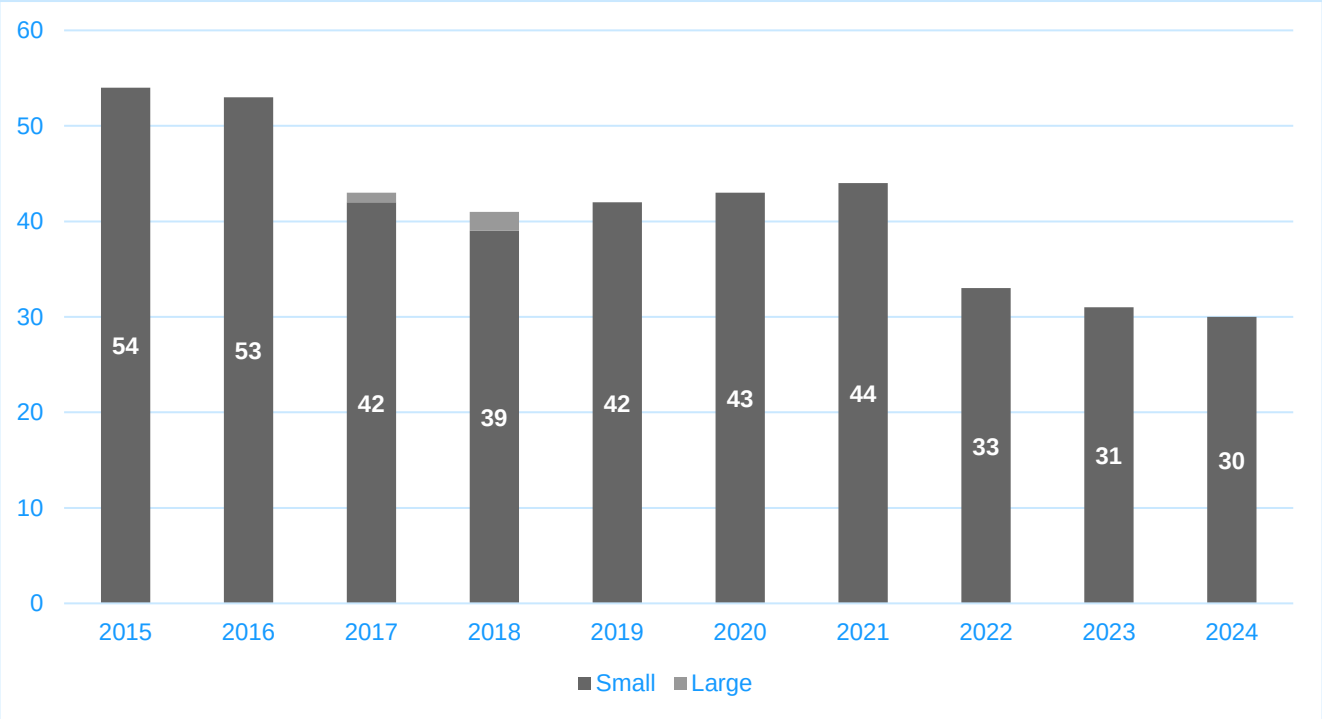


Figure 7 shows the number of AEs by size accreditation. There are currently 30 AEs in the UK, all are small in terms of their accreditation. Note that 13 of the AATF sites have in place approvals to export and these are primarily the biggest businesses in the UK industry.

Figure 7: Number of AEs by Size of Accreditation, 2015 to 2024



In terms of the number of businesses (adjusting for multiple sites and removing supply chain approvals not impacted by the S-G proposals e.g. they only deal with plastics or only deal with lighting), there are 105 businesses that are AATFs and 30 AEs, of which 13 also hold AATF approvals. Therefore, there are 122 businesses (105-13+30) that are likely to be directly impacted by S-G amendment.

There will be an unknown number of other small players doing reuse/repair (and not directly exporting) who may be indirectly impacted because they deal with the 122. However, it is likely that this number is small, possibly around 20 or so but it is acknowledged here that this is an area of uncertainty.

Data are also available on the number and size of industries by employment for the UK[115]. SIC codes for the WEEE recycling and reuse businesses approached to take part in the survey were obtained from Company House. Table 53 shows that WEEE recycling and reuse businesses tend to align themselves to activities in the overall waste and recycling sector when choosing a SIC code sector for reporting to Company House. Note that not all WEEE recycling businesses choose these SIC codes in the waste and recycling sector (some regard their main activity as being metals manufacturers).

Table 53: Number of Businesses in the UK by 4-Digit SIC Code, 2023

SIC Code	Description of the Activity of the Sector	Number of UK Businesses
3811	Collection of non-hazardous waste	4,405
3821	Treatment and disposal of non-hazardous waste	2,000
3822	Treatment and disposal of hazardous waste	190
3832	Recovery of sorted materials	1,995
	TOTAL	8,590

Table 54 shows the distribution of businesses by employment size for the waste and recycling sector in the UK. The majority of WEEE recycling and reuse businesses are likely to be captured by these figures particularly the larger players in terms of WEEE tonnage throughout per year. The assumption is that the distribution of WEEE recycling and reuse businesses by size of employment is broadly similar to that of the UK recycling industry as a

[115] *Business Population Estimates for the UK and Regions 2023*

whole. Based on the known number of AATFs and AEs it is unlikely that many are in the 250+ employment size band, although there although there will be some as there are large metal recyclers involved with WEEE treatment. It is also unlikely that many of the accredited WEEE recyclers are micro businesses (fewer than 10 employees).

There is uncertainty as to where WEEEE recyclers are located in this distribution, to provide an indication of the size of businesses that are potentially impacted by the amendments to the Basel Convention proposed by S-G, it appears likely that most of the WEEE recycling and reuse businesses would be in the Small (10 to 49) and Medium-sized (50 to 249) employment size bands. Valpak's knowledge from working relationships with many of the accredited businesses suggests that all are in the Small (10 to 49) employment size band.

Table 54: Distribution of Businesses by Employment Size in the UK by 4-Digit SIC Code, 2023

	Micro	Small	Medium-sized	Large
	(0 to 9)	(10 to 49)	(50 to 249)	(250+)
3811 Collection of non-hazardous waste	72%	20%	7%	1%
3821 Treatment/disposal of non-haz waste	68%	25%	8%	0%
3822 Treatment/disposal of hazardous waste	50%	34%	13%	3%
3832 Recovery of sorted materials	69%	26%	5%	0%
TOTAL	70%	23%	7%	1%

10.4.4 Location of Businesses

Figure 8 shows the regional distribution of AATF sites across the UK. The data are from the EA's public register[116]. There's one site in Scotland and none in Wales, the rest are in England. Across the regions in England the majority of AATF sites are located in the East and West Midlands, the Northwest, the East of England and the Southeast.

Figure 8: Regional Dispersion of AATF Sites, 2024

[116] https://www.gov.uk/government/publications/waste-electrical-and-electronic-equipment-weee-public-registers. *(Accessed September 2024).*

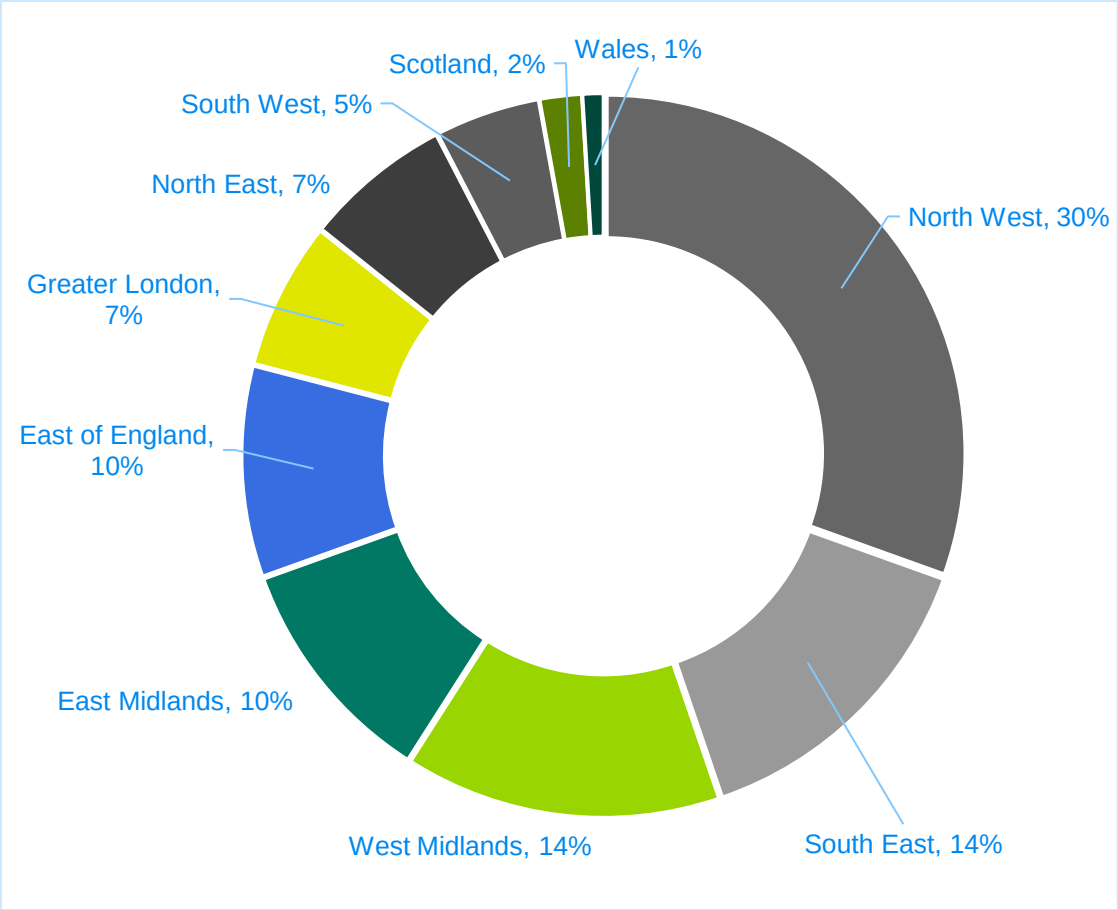
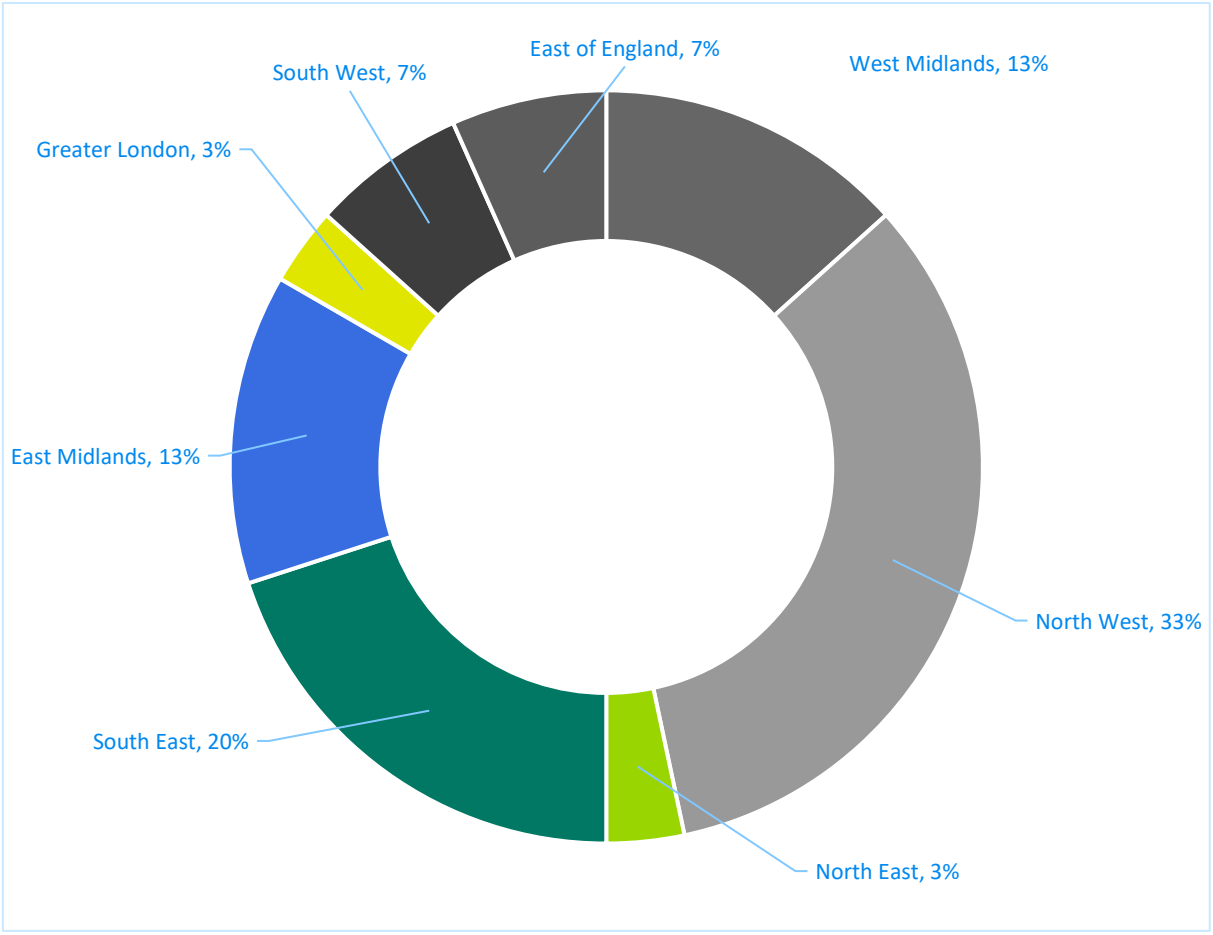


Figure 9 shows the regional distribution of AEs across the UK. There's are no AE businesses in Scotland and Wales. Across the regions in England the majority of AEs are located in the Northeast and the Northwest, the West Midlands, and the Southeast.

Figure 9: Regional Dispersion of AEs, 2024


East of England, 7%
West Midlands, 13%
South West, 7%
Greater London, 3%
East Midlands, 13%
North West, 33%
South East, 20%
North East, 3%

11. Conclusions

The key conclusions from this analysis in this report are:

- Globally, production of EEE is growing year-on-year due to growth in demand, the continuous development of new products, and the shorter life spans in many product categories. As a result, the amount of WEEE generated is increasing, and is one of the fastest growing waste streams. The Global E-Waste Monitor[117] estimates that around 62 million tonnes of WEEE were generated in 2022. By the end of this decade, 80 million tonnes of WEEE per annum is projected.
- Management of WEEE in an environmentally sound manner makes economic and environmental sense. Recycling of WEEE yields a supply of valuable and critical secondary raw materials. Better still (in terms of circular economy) is extending the lifetimes and the use-phases of EEE through reuse of UEEE, both in terms of whole items and fully functioning components obtained from dismantling such items at end-of-life. However, recycling/reuse activities are not keeping pace with the growth of EEE and the associated WEEE, both globally and in the UK.
- WEEE is traded as a commodity in markets internationally. Waste management companies and businesses operating in the WEEE recycling industry in developed countries, including the UK, export outputs recovered from EEE wastes for further reprocessing. Primarily, the intention is that these wastes are being sent for recycling and/or legitimate repair for reuse in the countries receiving them, but some receiving countries may not have the capacity to manage them in an environmentally sound manner, leading to citizens, land and marine wildlife being exposed to toxic pollutants.
- There are exporters who side-step the regulations by wrongly declaring shipments of WEEE as functioning product or 'for repair and reuse' when in reality such shipments are quite simply scrap. However, it is acknowledged that such activity may not in all instances be intentional, it could be because of a lack of understanding by importers or exporters leading to a misinterpretation of the requirements which could unintentionally also result in the export of items that can't be repaired/reused.
- The economic, social and environmental impacts from import of UEEE/WEEE in developing countries are complex. Import for repair and/or reuse is able to provide affordable access to digital technology, electronic and electrical appliances and devices to meet the increasing demands from growing populations in developing countries for information, communication, and developed country lifestyles. But this demand, combined with the desire of developed countries to move the burden of their waste, is generating a growing amount of WEEE.
- Repair and recycling of UEEE and WEEE is labour intensive, therefore it is more economically feasible in developing countries because of the low labour costs. However, as a consequence, extensive informal sectors have developed with poor working conditions (such as child labour[118] and exploitation[119]) to undertake recycling, repair and reuse activities. While there is some gain in economic and social benefit from the opportunities provided by these activities, there is pervasive use of environmentally unsound methods which lead to health and environmental hazards. Waste mismanagement is prevalent in developing countries due to the low cost, including practices such as open dumping and open burning[120], which are used so often due to their low cost as a disposal option or material scavenging opportunities[121].
- There is a rationale for the Government to consider placing further controls on UK export of WEEE as such wastes (whether they are hazardous or not) may ultimately end up in destination countries that lack environmentally sound management methods. In general, tighter controls within the Basel Convention could help mitigate the adverse effects on the environment and health in countries receiving shipments of WEEE and achieve the desired outcome of reducing negative impacts from such exports.
- The UK's Waste Shipment Regulations require PIC for export of circuit boards by default. In addition, used EEE must be fully functional and for direct re-use in order to be exported, except for the WEEE Regulations Schedule 9 derogation which allows for export for repair for reuse under certain circumstances. Use of that derogation was negligible. Compliance with the UK regulations, effectively means that there will be no significant impacts on UK exporters if the BAN amendments to the Basel Convention were to be implemented as proposed.
- The main impacts on UK WEEE exporters from the perspective of the UK regulations are under the amendments to the Basel Convention proposed by S-G. The impacts would be on UK exporters who ship non-hazardous motors, compressors, and electronic scrap destined for base/precious metals

[117] https://www.itu.int/en/ITU-D/Environment/Documents/Toolbox/GEM_2020_def.pdf
[118] https://www.who.int/news-room/questions-and-answers/item/children-and-digital-dumpsites-e-waste-and-health
[119] https://www.ilo.org/wcmsp5/groups/public/@ed_dialogue/@sector/documents/publication/wcms_315228.pdf
[120] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6466021/
[121] https://journals.sagepub.com/doi/full/10.1177/0734242X12469169

recovery (hard drives etc). These would all move to PIC control notification. It should be noted that some electronic scrap will already require PIC.

- The TechUK proposal is put forward as an alternative to the S-G and BAN proposals, but it would not amend the Basel Convention. A trusted trader scheme could work well and be a practical alternative to a more regulatory approach. However, ensuring that a trusted trader scheme operates as intended and provides the necessary levels of checks and controls, will require significant effort to set up. In addition to the development of inspection and auditing protocols supporting systems will need to be established. For example, training and approval of auditors, accreditation of inspectors, set up of online data reporting, governance structures, etc.
- Exports of used EEE for repair and reuse are subject to Schedule 9 of the WEEE Regulations, so the set-up and operational costs of such a scheme would appear excessive.
- In the impact assessment of implementing the S-G scenario it is estimated that the cumulative total additional costs 2025 to 2035 that would be incurred by UK businesses exporting under PIC controls (excluding circuit boards) is ~£30.3m, or approximately £2.75m per year.
- Under a range of realistic scenarios for export of compressors, electronic scrap (high value) and motors under PIC controls, UK businesses would be very likely to continue to export and pay the costs of notification – it is more profitable to do so than dispose of these streams. As automated processing of compressors continues to develop this is likely to facilitate their recycling in the UK. Such a scenario has not been modelled here.
- There is no credible scenario under which UK exporting businesses would opt to send these valuable products to disposal in the UK at a cost of over £130 per tonne. In an extreme scenario where adverse market conditions caused a collapse in exporter margins, then compressors and motors would be treated in the UK as even manual disassembly would be financially preferential to disposal. For high value electronic scrap, a worse-case scenario would be that AATFs would choose not to remove these components prior to shredding. Treatment processes for motors and compressors, to recover the ferrous and non-ferrous fractions, would be put in place in the UK.
- The size of businesses that are potentially most likely to be impacted by the amendments to the Basel Convention proposed by S-G are small and medium sized businesses. By size of employment these are 10 to 49 employees and 50 to 249 employees. However, there are several large metals recycling companies involved in the treatment of WEEE where the number of employees is 250+.
- In terms of cost pass through, the most likely scenario is that WEEE recyclers pass through cost impacts via the gate fees they charge for the WEEE streams impacted. All exporters are impacted equally, and they would be in a reasonable position to pass on these costs. Where cost uplifts are passed on, smaller businesses upstream and downstream of WEEE recycling businesses are the most likely to be impacted following the implementation of the S-G amendments.
- There is a potential risk to UK exporting businesses that following the implementation of the S-G amends to the Basel Convention some countries either lack the systems to process notifications or choose not to receive certain outputs exported from the UK. This risk can be assumed to be greater for motors and compressors which typically go to non-OECD countries.

12. Appendix 1: Further Details on Survey Responses

In addition to the key streams that are the focus of this impact assessment and are discussed in section 6.4, survey respondents also provided detailed information on other output streams generated through processing of WEEE in their businesses.

12.1.1 Plastic

Plastics (of various polymers) were listed nine times within the survey by five organisations across four input categories (cooling, LDAs, SDAs, WEEE residues), contributing 9% (by count) of potentially impacted materials. Of these organisations, two included POPs plastic, one specified PVC, and one specified floated non-POPs recyclable plastics as the area of concern. One organisation did not confirm the code fields, with another stating that that (normal) plastic is exported under Basel code B3011[122] and that POPs plastic is not exported (OECD fields were not confirmed). The one other organisation processing POPs plastic has 75% recycled in the UK while 15% is recycled in EU/OECD countries; this same organisation has 50% of general plastic recycled in the UK and the other 50% in EU/OECD countries. Another organisation processing general plastic recycles 72% in the UK and 28% is sent as fines for further processing (seemingly within the UK), and another processes plastic 100% in the UK.

Where plastic's contribution to an organisation's input category is known, it contributes an average of 15.2% of the output of cooling, 36.4% of the output of SDAs, 29% of the output of LDAs, and 20% of the output of WEEE residues.

12.1.2 PUR Foam

Two organisations identified PUR foam as potentially impacted. One reports under Basel code B3011 and ships under Article 18 Annex VII and TFS Notification controls (the other left these fields blank), and both left OECD code fields blank. One organisation has 5% of PUR foam output (by weight) recycled in the UK and 95% recycled in EU or OECD countries, while the other has 100% recovered in EU or OECD countries.

12.1.3 Metals

Metals were listed 14 times within the survey by five organisations across six input categories (cooling, LDAs, SDAs, WEEE residues, and both CRT and FPD display screens), contributing 13% (by count) of potentially impacted materials.

One listed only metal, one listed metal / steel, two specified that both ferrous and non-ferrous metals would be impacted, and one specified that copper and precious metals smelter concentrate as well as zorba (94% aluminium, 4% brass/zinc/copper) would be impacted.

Where listed, the Basel codes for these are B1010[123] with the exception of one organisation's response where metal is listed as B1110 (for cooling and SDA). This is an incorrect category for metals, and the tonnage of those listed as B1110 is a total of 7678.3 (3190.5 tonnes of metal from cooling and 4487.0 tonnes of metal from SDAs). The only respondent to specify OECD code exported under GC010.

Copper and precious metals smelter concentrate is listed, by the one organisation exporting it, as N/A for Basel and OECD, with the shipping control of TFS prenotification. This material is recycled 100% in the EU or OECD with a value output of £1800/tonne. The Zorba and metal/steel processed by the same organisation is recycled 100% in non-EU/non-OECD countries at £1100/tonne and 20% EU/OECD, 75% non-EU/OECD and 5% UK at £900/tonne respectively (both would be shipped under Article 18 Annex VII).

Other organisations responded that either all metals are recycled 100% in the UK, that 100% of metals are exported by intermediaries (with no data on value or destination), or that ferrous metals from SDA and all metals from LDA are exported 90% to EU / OECD countries and 10% processed in the UK and all other metals are exported 100% to EU / OECD countries.

[122] *Basel B3011: Waste plastics including non-halogenated polymers, cured resins or condensation products, and fluorinated polymers – but only those specifically named and excluding post-consumer wastes.*
[123] *Basel B1010: Metal and metal-alloy wastes in metallic, non-dispersible form.*

12.1.4 Categories of Low Quantity

- Two organisations identified batteries as potentially impacted (two counts of this material contributes to 2% of total potentially impacted materials), both of which remove them from SDAs. No export information has been provided, and both organisations have indicated that almost 100% of batteries are recycled at AATFs as opposed to non-accredited facilities.
- One organisation identified plugs as potentially impacted (making up 1% of total potentially impacted materials). They are sourced from LDAs and recycled 100% at AATFs. No export information is provided.
- One organisation identified DVDs / 'high value' items as potentially impacted (making up 1% of total potentially impacted materials). They are sourced from SDAs and recycled 100% at AATFs. No export information is provided.
- One organisation identified ink cartridges as potentially impacted (making up 1% of total potentially impacted materials). They are sourced from SDAs and recycled 100% at AATFs. No export information is provided.
- One organisation identified wire as potentially impacted (making up 1% of total potentially impacted materials), however it is specified that none is exported.
- One organisation identified foam (unspecified) as potentially impacted (making up 1% of total potentially impacted materials), however it is specified that none is exported.
- One organisation identified CFC as potentially impacted (making up 1% of total potentially impacted materials), however it is specified that none is exported, however it is specified that none is exported.
- One organisation identified oil as potentially impacted (making up 1% of total potentially impacted materials), however it is specified that none is exported.
- One organisation identified aggregate as potentially impacted (making up 1% of total potentially impacted materials), however it is specified that none is exported.
- One organisation identified glass as potentially impacted (making up 1% of total potentially impacted materials), however it is specified that none is exported.
- One organisation identified fines (unspecified) as potentially impacted (making up 1% of total potentially impacted materials), however it is specified that none is exported.
- One organisation identified 'waste' (unspecified) as potentially impacted (making up 1% of total potentially impacted materials), however it is specified that none is exported.
- One organisation identified 'other' (unspecified) as potentially impacted (making up 1% of total potentially impacted materials), however it is specified that none is exported.

13. Appendix 2: Recycling Questionnaire

Valpak Consulting has been commissioned by Defra to undertake research on the potential impacts on Used EEE (UEEE) and WEEE exports of proposals put forward to amend the Basel Convention. There are significant gaps in the UK data, particularly for certain exports of non-hazardous UEEE and WEEE, as UK exporters either do not have to report this information to regulators and genuine UEEE suitable for repair/reuse is out of scope of current waste legislation (it is a non-waste).

Why is it important to engage with the survey?

The proposals put forward by Switzerland and Ghana (S-G) and the Basel Action Network (BAN) will introduce PIC controls or 'notification' procedures for certain non-hazardous WEEE derived waste streams, *if the proposals are implemented as they are currently set out*.

All data is confidential. It will not be visible to anyone outside of Valpak's Consulting team. Once the project is complete all data will be destroyed. Only aggregated and unattributable data will be used for the analysis in the research and the report.

The outputs of this research will provide Defra with an evidence-based understanding of the potential impacts to inform their negotiating position when the proposed amends are discussed at the Basel Conference of Parties (COP15) in July 2022.

Name of organisation	
Date	
Type of organisation	AATF, ATF, WMC, scrap metal operation, asset management company, other
Contact name	
Email address	
Telephone number	

The tables referring to your on-site recycling operations in the sections below should be completed for each process on site.

Where a process takes more than one input catagory[1] (for example LDA and Cooling) and it is possible to separate output data by the different input streams (i.e., you batch feed the process and record outputs separately) please complete separate recycling process tables for each input category i.e., as if they were treated by different processes.

Do you do any reuse of whole items of WEEE or WEEE Derived components? (Y/N)	

13.1 Recycling Processes On-Site

Please describe the recycling processes that your facility carries out by input stream

Processes carried out on site	Basic details of each process
Process 1	
Process 2	
Process 3	

13.2 Recycling Process 1

Please complete the tables below for your on-site recycling process 1

Name of recycling process 1	

Input category[1] (Split by input category, where possible/applicable)	Input tonnage 2019	Are input tonnages for 2021 significantly different compared to 2019?	Do you expect input tonnages to change significantly in future?
Add rows as necessary			

[1]Input categories	[2]Outputs potentially impacted by the export proposals
• Large domestic appliances • Small domestic appliances • Cooling devices • Display screens: CRT • Display screens: Flat Screen Display (FSD) • Other (please add detail).	Give the name of the output stream here. For example, circuit boards. Outputs potentially impacted are: • B1110 – Exported Non-Hazardous electricals and electrical assemblies • B4030 – Used single use cameras, with batteries not included on hazardous waste list • Any whole WEEE exported for recycling currently shipped as non-hazardous • Mixed or non-mixed fractions derived from WEEE not having another Basel code.

Table 2: Details of Recycling Process 1

For guidance on completing Table 2, the box above describes the input categories, and the outputs potentially impacted by the export proposals. An example of a completed row is shown below.

Input category[1]	Input category as a % of input to process 1	Outputs potentially impacted by export proposals[2]	Output as % of input category (by weight)	Current export Basel code	Current export OECD code	Current shipping controls	% of output recycled in the UK (by weight)	Is the UK outlet a recycler or intermediary[3]?	% recycled in EU or OECD (by weight)	% recycled in non-EU or non-OECD	Typical value of output (ex-works) £/t
EXAMPLE: Small Domestic Appliances	*100%*	*Circuit boards*	*10%*	*B1110*	*GC020*	*Article 18 (Annex VII)*	*25%*	*Recycler*	*100%*	*0%*	*~300*
Add rows as necessary											

[3] Where you have indicated the UK outlet is an 'intermediary', what % of the material is ultimately likely to get exported?	

We are trying to evaluate how much of the input categories[1] are processed by recyclers that are accredited under the WEEE Regulations. For the input categories you treat in recycling process 1 please complete the table below (split by input category if the process takes multiple inputs).				
	What percentage of the UK market do you estimate passes through:			
Input category	AATFs for recycling (%)?	Non-accredited facilities for recycling (%)?	AATFs for reuse (%)?	Non-accredited facilities for recycling (%)?
Add rows as necessary				

Please complete the table below for the input categories[1] you treat in recycling process 1 (Split by input category if the process takes multiple inputs).		
Input category	What types of non-accredited facilities handle these streams?	May these non-accredited facilities be generating outputs that are potentially impacted by the export proposals[2]?
Add rows as necessary		

All data is confidential. It will not be visible to anyone outside of Valpak's Consulting team. Once the project is complete all data will be destroyed. Only aggregated and unattributable data will be used for the analysis in the research and the report.

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13.3 WEEE/WEEE Derived Items Not Processed on Site

Table 3 WEEE/WEEE Derived Items Received from Third Parties (not produced from your own operation)

Note that Table 3 is <u>not</u> process specific.
Please list any WEEE/WEEE derived items not processed on your site received from third parties. These are typically items you just buy-in, bulk, and sell on.
Once you have completed Table 3, please move on to the tables below for your other recycling processes (where applicable).

Description of WEEE/WEEE derived component	Tonnage 2019	Current Export Basel Code	Current Export OECD Code	Current Shipping Controls	% of material recycled in the UK (by weight)	Is the UK outlet a recycler or intermediary[3]?	% of material recycled in EU or OECD (by weight)	% of material recycled in non-EU or non-OECD (by weight)	Typical value of material ex-works (£/t)
EXAMPLE: Circuit board	*2*	*B1110*	*GC020*	*Article 18 (Annex VII)*	*10%*	*Recycler*	*100%*	*0%*	*400*
Add rows as necessary									

[3] Where you have indicated the UK outlet is an 'intermediary', what % of the material is ultimately likely to get exported?	

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13.4 Recycling Process 2

Please complete the tables below for your on-site recycling process 2 (where applicable)

Name of recycling process 2	

Input category[1] (Split by input category, where possible/applicable)	Input tonnage 2019	Are input tonnages for 2021 significantly different compared to 2019?	Do you expect input tonnages to change significantly in future?
Add rows as necessary			

[1]Input categories	[2]Outputs potentially impacted by the export proposals
• Large domestic appliances • Small domestic appliances • Cooling devices • Display screens: CRT • Display screens: Flat Screen Display (FSD) • Other (please add detail).	Give the name of the output stream here. For example, circuit boards. Outputs potentially impacted are: • B1110 – Exported Non-Hazardous electricals and electrical assemblies • B4030 – Used single use cameras, with batteries not included on hazardous waste list • Any whole WEEE exported for recycling currently shipped as non-hazardous • Mixed or non-mixed fractions derived from WEEE not having another Basel code.

Additional Table 2: Details of Recycling Process 2

For guidance on completing the additional Table 2, the box above describes the input categories, and the outputs potentially impacted by the export proposals. An example of a completed row is shown below.

Input category[1]	Input category as a % of total input to process 2	Outputs potentially impacted by export proposals[2]	Output as % of input category (by weight)	Current export Basel code	Current export OECD code	Current shipping controls	% of output recycled in the UK (by weight)	Is the UK outlet a recycler or intermediary[3]?	% recycled in EU or OECD (by weight)	% recycled in non-EU or non-OECD	Typical value of output (ex-works) £/t
EXAMPLE: Small Domestic Appliances	*100%*	*Circuit boards*	*10%*	*B1110*	*GC020*	*Article 18 (Annex VII)*	*25%*	*Recycler*	*100%*	*0%*	*~300*
Add rows as necessary											

[3] Where you have indicated the UK outlet is an 'intermediary', what % of the material is ultimately likely to get exported?	

All data is confidential. It will not be visible to anyone outside of Valpak's Consulting team. Once the project is complete all data will be destroyed. Only aggregated and unattributable data will be used for the analysis in the research and the report.

The outputs of this research will provide Defra with an evidence-based understanding of the potential impacts to inform their negotiating position when the proposed amends are discussed at the Basel Conference of Parties (COP15) in July 2022.

We are trying to evaluate how much of the input categories[1] are processed by recyclers that are accredited under the WEEE Regulations. For the input categories you treat in recycling process 2 please complete the table below (split by input category if the process takes multiple inputs).				
	What percentage of the UK market do you estimate passes through:			
Input category	AATFs for recycling (%)?	Non-accredited facilities for recycling (%)?	AATFs for reuse (%)?	Non-accredited facilities for recycling (%)?
Add rows as necessary				

Please complete the table below for the input categories[1] you treat in recycling process 2 (Split by input category if the process takes multiple inputs).		
Input category	What types of non-accredited facilities handle these streams?	May these non-accredited facilities be generating outputs that are potentially impacted by the export proposals[2]?
Add rows as necessary		

All data is confidential. It will not be visible to anyone outside of Valpak's Consulting team. Once the project is complete all data will be destroyed. Only aggregated and unattributable data will be used for the analysis in the research and the report.

The outputs of this research will provide Defra with an evidence-based understanding of the potential impacts to inform their negotiating position when the proposed amends are discussed at the Basel Conference of Parties (COP15) in July 2022.

13.5 Recycling Process 3

Please complete the tables below for your on-site recycling process 3 (where applicable)

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Name of recycling process 3	

Input category[1] (Split by input category, where possible/applicable)	Input tonnage 2019	Are input tonnages for 2021 significantly different compared to 2019?	Do you expect input tonnages to change significantly in future?
Add rows as necessary			

[1]Input categories	[2]Outputs potentially impacted by the export proposals
• Large domestic appliances • Small domestic appliances • Cooling devices • Display screens: CRT • Display screens: Flat Screen Display (FSD) • Other (please add detail).	Give the name of the output stream here. For example, circuit boards. Outputs potentially impacted are: • B1110 – Exported Non-Hazardous electricals and electrical assemblies • B4030 – Used single use cameras, with batteries not included on hazardous waste list • Any whole WEEE exported for recycling currently shipped as non-hazardous • Mixed or non-mixed fractions derived from WEEE not having another Basel code.

Additional Table 2: Details of Recycling Process 3

For guidance on completing the additional Table 2 for recycling process 3, the box above describes the input categories, and the outputs potentially impacted by the export proposals. An example of a completed row is shown below.

Input category[1]	Input category as a % of total input to process 3	Outputs potentially impacted by export proposals[2]	Output as % of input category (by weight)	Current export Basel code	Current export OECD code	Current shipping controls	% of output recycled in the UK (by weight)	Is the UK outlet a recycler or intermediary[3]?	% recycled in EU or OECD (by weight)	% recycled in non-EU or non-OECD	Typical value of output (ex-works) £/t
EXAMPLE: Small Domestic Appliances	*100%*	*Circuit boards*	*10%*	*B1110*	*GC020*	*Article 18 (Annex VII)*	*25%*	*Recycler*	*100%*	*0%*	*~300*
Add rows as necessary											

[3] Where you have indicated the UK outlet is an 'intermediary', what % of the material is ultimately likely to get exported?	

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The outputs of this research will provide Defra with an evidence-based understanding of the potential impacts to inform their negotiating position when the proposed amends are discussed at the Basel Conference of Parties (COP15) in July 2022.

We are trying to evaluate how much of the input categories[1] are processed by recyclers that are accredited under the WEEE Regulations. For the input categories you treat in recycling process 3 please complete the table below (split by input category if the process takes multiple inputs).

	What percentage of the UK market do you estimate passes through:			
Input category	AATFs for recycling (%)?	Non-accredited facilities for recycling (%)?	AATFs for reuse (%)?	Non-accredited facilities for recycling (%)?
Add rows as necessary				

Please complete the table below for the input categories[1] you treat in recycling process 3 (Split by input category if the process takes multiple inputs).

Input category	What types of non-accredited facilities handle these streams?	May these non-accredited facilities be generating outputs that are potentially impacted by the export proposals[2]?
Add rows as necessary		

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The outputs of this research will provide Defra with an evidence-based understanding of the potential impacts to inform their negotiating position when the proposed amends are discussed at the Basel Conference of Parties (COP15) in July 2022.

Thank you for engaging with this survey and for your time completing your responses

14. Appendix 3: Reuse Questionnaire

Valpak Consulting has been commissioned by Defra to undertake research on the potential impacts on Used EEE (UEEE) and WEEE exports (including WEEE derived waste Streams) of proposals put forward to amend the Basel Convention. There are significant gaps in the UK data, particularly for exports of non-hazardous UEEE and WEEE, as UK exporters either do not have to report this information to regulators and genuine UEEE suitable for repair/reuse is out of scope of current waste legislation (it is a non-waste).

Why is it important to engage with the survey?

The proposals put forward by Switzerland and Ghana (S-G) and the Basel Action Network (BAN) will introduce PIC controls or 'notification' procedures for certain non-hazardous WEEE derived waste streams, and export for repair (for reuse), *if the proposals are implemented as they are currently set out*.

All data is confidential. It will not be visible to anyone outside of Valpak's Consulting team. Once the project is complete all data will be destroyed. Only aggregated and unattributable data will be used for the analysis in the research and the report.
The outputs of this research will provide Defra with an evidence-based understanding of the potential impacts to inform their negotiating position when the proposed amends are discussed at the Basel Conference of Parties (COP15) in July 2022.

Name of organisation	
Date	
Contact name	
Email address	
Telephone number	

14.1 Reuse Operations

This survey is for reuse operations

Table 1 Input Categories

[1]**Input categories**
• Large domestic appliances • Small domestic appliances • Cooling devices • Display screens: CRT • Display screens: Flat Screen Display (FSD) • Other (please add detail) An input category may be a full WEEE collection category (e.g., LDA, Cooling) or part of one if more applicable (IT equipment)

Number	Input category[1]	Additional Detail	Tonnage 2019
1			
2			
3			
4			
Add rows as necessary			

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The outputs of this research will provide Defra with an evidence-based understanding of the potential impacts to inform their negotiating position when the proposed amends are discussed at the Basel Conference of Parties (COP15) in July 2022.

14.2 Export for Repair and Recycling

Table 2 Used EEE Exported for Repair (for reuse)

Table 2 is asking about any Used EEE (UEEE) whole items or components you exported for repair (for reuse) in 2019 that was shipped as a non-waste.

Note in particular the derogation in Schedule 9 2(b) of the WEEE Regulations which indicates '… *used EEE for professional use [may under specific conditions], … be exported for refurbishment or repair with the intention of reuse…*'

Input category number (from Table 1)	Tonnage of UEEE exported for repair (for reuse) in 2019
1	
2	
3	
4	
Add rows as necessary	

All data is confidential. It will not be visible to anyone outside of Valpak's Consulting team. Once the project is complete all data will be destroyed. Only aggregated and unattributable data will be used for the analysis in the research and the report.

The outputs of this research will provide Defra with an evidence-based understanding of the potential impacts to inform their negotiating position when the proposed amends are discussed at the Basel Conference of Parties (COP15) in July 2022.

Table 3 Details of Outputs Exported for Recycling

[2]Whole WEEE or WEEE components potentially impacted by the export proposals
Give the name of the output stream here. For example, circuit boards. Outputs potentially impacted: • B1110 – Exported Non-Hazardous electricals and electrical assemblies • B4030 – Used single use cameras, with batteries not included on hazardous waste list • Any whole WEEE exported for recycling currently shipped as non-hazardous • Mixed or non-mixed fractions derived from WEEE not having another Basel code

Table 3 is asking about WEEE components removed during the repair process at your site which you send for recycling

Whole WEEE or WEEE components potentially impacted[2]	Tonnage in 2019	Current Basel code	Current OECD Code	Current shipping controls	% of output recycled in the UK (by weight)	Is the UK outlet a recycler or intermediary[3]?	% of output recycled in EU or OECD (by weight)	% of output recycled in non-EU or non-OECD (by weight)	Typical value of material (ex-works) £/t
EXAMPLE: Circuit boards	*0.5*	*B1110*	*GC020*	*Article 18 (Annex VII)*	*25%*	*Recycler*	*100%*	*0%*	*600*
Add rows as necessary									

[3] Where you have indicated the UK outlet is an 'intermediary', what % of the material is ultimately likely to get exported?	

All data is confidential. It will not be visible to anyone outside of Valpak's Consulting team. Once the project is complete all data will be destroyed. Only aggregated and unattributable data will be used for the analysis in the research and the report.

The outputs of this research will provide Defra with an evidence-based understanding of the potential impacts to inform their negotiating position when the proposed amends are discussed at the Basel Conference of Parties (COP15) in July 2022.

Thank you for engaging with this survey and for your time completing your responses

15. Appendix 4: Full Details of the S-G Scenario

Table 55 reports the full details of the central scenario modelled to estimate the impacts of the amendments to the Basel Convention proposed by S-G on UK export of outputs from the WEEE industry.

It is assumed that the proposed amendments are implemented in 2025 and that from then 100% of the output categories identified in the table that are exported are required to be shipped under PIC control notifications.

The impacts relative to the baseline scenario discussed in section 10.

Table 55 S-G Scenario: Full Details, 2022 to 2035

Description	Units	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Output streams from all input streams (Tonnes)	Tonnes	58,906	59,549	59,153	60,534	61,978	63,486	65,061	66,706	68,421	70,211	72,077	74,024	76,054	78,171
Circuit boards	Tonnes	7,558	7,832	7,968	7,902	7,849	7,807	7,777	7,759	7,751	7,755	7,770	7,796	7,832	7,880
Compressors	Tonnes	29,242	29,535	28,779	29,799	30,856	31,950	33,082	34,255	35,469	36,727	38,029	39,377	40,773	42,219
Electronic scrap (contains base/precious metals)	Tonnes	1,354	1,411	1,441	1,475	1,511	1,548	1,586	1,627	1,669	1,713	1,760	1,808	1,860	1,914
Motors	Tonnes	20,752	20,770	20,965	21,357	21,763	22,182	22,616	23,065	23,531	24,016	24,519	25,043	25,589	26,159
Description	Units	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
All outputs exported (Tonnes)	Tonnes	57,220	57,844	57,427	58,773	60,181	61,652	63,189	64,793	66,467	68,213	70,034	71,934	73,914	75,980
Circuit boards	Tonnes	7,551	7,825	7,960	7,895	7,841	7,799	7,769	7,750	7,743	7,747	7,761	7,787	7,823	7,870
Compressors	Tonnes	29,242	29,535	28,779	29,799	30,856	31,950	33,082	34,255	35,469	36,727	38,029	39,377	40,773	42,219
Electronic scrap (contains base/precious metals)	Tonnes	1,354	1,411	1,441	1,475	1,511	1,548	1,586	1,627	1,669	1,713	1,760	1,808	1,860	1,914
Motors	Tonnes	19,073	19,072	19,246	19,604	19,974	20,356	20,751	21,161	21,586	22,026	22,485	22,962	23,458	23,977
Description	Units	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
All outputs exported under PIC controls (Tonnes)	Tonnes	8,228	8,530	8,681	58,773	60,181	61,652	63,189	64,793	66,467	68,213	70,034	71,934	73,914	75,980
Circuit boards	Tonnes	7,551	7,825	7,960	7,895	7,841	7,799	7,769	7,750	7,743	7,747	7,761	7,787	7,823	7,870
Compressors	Tonnes	0	0	0	29,799	30,856	31,950	33,082	34,255	35,469	36,727	38,029	39,377	40,773	42,219
Electronic scrap (contains base/precious metals)	Tonnes	677	706	721	1,475	1,511	1,548	1,586	1,627	1,669	1,713	1,760	1,808	1,860	1,914
Motors	Tonnes	0	0	0	19,604	19,974	20,356	20,751	21,161	21,586	22,026	22,485	22,962	23,458	23,977
Description	Units	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
All outputs exported to EU or OECD (Tonnes)	Tonnes	14,173	14,646	14,898	14,988	15,097	15,225	15,371	15,536	15,721	15,925	16,150	16,396	16,664	16,955
Circuit boards	Tonnes	7,544	7,818	7,953	7,887	7,834	7,792	7,761	7,742	7,735	7,738	7,752	7,778	7,814	7,861
Compressors	Tonnes	146	148	144	149	154	160	165	171	177	184	190	197	204	211
Electronic scrap (contains base/precious metals)	Tonnes	1,219	1,270	1,297	1,328	1,360	1,393	1,428	1,464	1,502	1,542	1,584	1,628	1,674	1,723
Motors	Tonnes	5,264	5,410	5,504	5,624	5,750	5,881	6,017	6,159	6,307	6,462	6,624	6,794	6,972	7,160
Description	Units	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
All outputs exported to non-EU or non-OECD (Tonnes)	Tonnes	43,048	43,198	42,529	43,785	45,084	46,428	47,818	49,257	50,746	52,288	53,884	55,538	57,250	59,025
Circuit boards	Tonnes	7	7	7	7	8	8	8	8	8	9	9	9	9	10
Compressors	Tonnes	29,096	29,387	28,635	29,650	30,701	31,790	32,917	34,084	35,292	36,543	37,839	39,180	40,569	42,007
Electronic scrap (contains base/precious metals)	Tonnes	135	141	144	148	151	155	159	163	167	171	176	181	186	191
Motors	Tonnes	13,809	13,662	13,743	13,980	14,224	14,475	14,735	15,002	15,279	15,565	15,861	16,168	16,486	16,817
Description	Units	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Total value outputs exported to EU or OECD (£m)	£m	£12.8	£13.3	£13.5	£13.8	£14.0	£14.3	£14.6	£14.9	£15.2	£15.5	£15.9	£16.3	£16.7	£17.1
Circuit boards	£m	£8.6	£8.9	£9.1	£9.2	£9.4	£9.5	£9.7	£9.9	£10.1	£10.3	£10.5	£10.7	£11.0	£11.3
Compressors	£m	£0.1	£0.1	£0.1	£0.1	£0.1	£0.1	£0.1	£0.1	£0.1	£0.1	£0.1	£0.1	£0.1	£0.1
Electronic scrap (contains base/precious metals)	£m	£0.5	£0.5	£0.5	£0.5	£0.5	£0.6	£0.6	£0.6	£0.6	£0.6	£0.6	£0.7	£0.7	£0.7
Motors	£m	£3.7	£3.8	£3.9	£3.9	£4.0	£4.1	£4.2	£4.3	£4.4	£4.5	£4.6	£4.8	£4.9	£5.0
Description	Units	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035

Total value of outputs exported to non-EU or non-OECD (£m)	£m	£24.7	£24.8	£24.5	£25.2	£25.9	£26.6	£27.4	£28.2	£29.0	£29.8	£30.7	£31.6	£32.6	£33.5
Circuit boards	£m	£0.0	£0.0	£0.0	£0.0	£0.0	£0.0	£0.0	£0.0	£0.0	£0.0	£0.0	£0.0	£0.0	£0.0
Compressors	£m	£15.0	£15.1	£14.7	£15.3	£15.8	£16.4	£17.0	£17.6	£18.2	£18.8	£19.5	£20.2	£20.9	£21.6
Electronic scrap (contains base/precious metals)	£m	£0.1	£0.1	£0.1	£0.1	£0.1	£0.1	£0.1	£0.1	£0.1	£0.1	£0.1	£0.1	£0.1	£0.1
Motors	£m	£9.7	£9.6	£9.6	£9.8	£10.0	£10.1	£10.3	£10.5	£10.7	£10.9	£11.1	£11.3	£11.5	£11.8
Description	**Units**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**
Total value of outputs exported (£m)	£m	£37.6	£38.1	£38.0	£38.9	£39.9	£40.9	£41.9	£43.0	£44.2	£45.4	£46.6	£47.9	£49.2	£50.6
Circuit boards	£m	£8.6	£8.9	£9.1	£9.3	£9.4	£9.6	£9.7	£9.9	£10.1	£10.3	£10.6	£10.8	£11.0	£11.3
Compressors	£m	£15.1	£15.2	£14.8	£15.3	£15.9	£16.5	£17.0	£17.6	£18.3	£18.9	£19.6	£20.3	£21.0	£21.7
Electronic scrap (contains base/precious metals)	£m	£0.5	£0.6	£0.6	£0.6	£0.6	£0.6	£0.6	£0.7	£0.7	£0.7	£0.7	£0.7	£0.7	£0.8
Motors	£m	£13.4	£13.4	£13.5	£13.7	£14.0	£14.2	£14.5	£14.8	£15.1	£15.4	£15.7	£16.1	£16.4	£16.8
Description	**Units**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**
Total value of outputs exported under PIC controls (£m)	£m	£8.9	£9.2	£9.4	£38.9	£39.9	£40.9	£41.9	£43.0	£44.2	£45.4	£46.6	£47.9	£49.2	£50.6
Circuit boards	£m	£8.6	£8.9	£9.1	£9.3	£9.4	£9.6	£9.7	£9.9	£10.1	£10.3	£10.6	£10.8	£11.0	£11.3
Compressors	£m	£0.0	£0.0	£0.0	£15.3	£15.9	£16.5	£17.0	£17.6	£18.3	£18.9	£19.6	£20.3	£21.0	£21.7
Electronic scrap (contains base/precious metals)	£m	£0.3	£0.3	£0.3	£0.6	£0.6	£0.6	£0.6	£0.7	£0.7	£0.7	£0.7	£0.7	£0.7	£0.8
Motors	£m	£0.0	£0.0	£0.0	£13.7	£14.0	£14.2	£14.5	£14.8	£15.1	£15.4	£15.7	£16.1	£16.4	£16.8
Description	**Units**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**
Total number of shipments	Number	446	463	472	3014	3087	3161	3241	3323	3409	3499	3592	3689	3790	3896
Circuit boards	Number	378	392	399	395	393	390	389	388	388	388	389	390	392	394
Compressors	Number	0	0	0	1490	1543	1598	1655	1713	1774	1837	1902	1969	2039	2111
Electronic scrap (contains base/precious metals)	Number	68	71	73	148	152	155	159	163	167	172	176	181	186	192
Motors	Number	0	0	0	981	999	1018	1038	1059	1080	1102	1125	1149	1173	1199
Description	**Units**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**
Number of notifications	Number	60	60	60	370	390	400	410	420	420	440	440	450	460	470
Circuit boards	Number	40	40	40	40	40	40	40	40	40	40	40	40	40	40
Compressors	Number	0	0	0	100	110	110	120	120	120	130	130	140	140	150
Electronic scrap (contains base/precious metals)	Number	20	20	20	30	40	40	40	40	40	40	40	40	40	40
Motors	Number	0	0	0	200	200	210	210	220	220	230	230	230	240	240
Description	**Units**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**
EA & destination notification costs (£m)	£m	£312.8	£312.8	£312.8	£1,785.5	£1,885.2	£1,928.4	£1,985.0	£2,028.2	£2,028.2	£2,128.0	£2,128.0	£2,184.6	£2,227.7	£2,284.4
Circuit boards	£m	£226.4	£226.4	£226.4	£226.4	£226.4	£226.4	£226.4	£226.4	£226.4	£226.4	£226.4	£226.4	£226.4	£226.4
Compressors	£m	£0.0	£0.0	£0.0	£566.1	£622.7	£622.7	£679.3	£679.3	£679.3	£735.9	£735.9	£792.5	£792.5	£849.2
Electronic scrap (contains base/precious metals)	£m	£86.3	£86.3	£86.3	£129.5	£172.7	£172.7	£172.7	£172.7	£172.7	£172.7	£172.7	£172.7	£172.7	£172.7
Motors	£m	£0.0	£0.0	£0.0	£863.4	£863.4	£906.6	£906.6	£949.7	£949.7	£992.9	£992.9	£992.9	£1,036.1	£1,036.1
Description	**Units**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**
EA & destination notification costs (£000s)	£000s	£313	£313	£313	£1,785	£1,885	£1,928	£1,985	£2,028	£2,028	£2,128	£2,128	£2,185	£2,228	£2,284
Circuit boards	£000s	£226	£226	£226	£226	£226	£226	£226	£226	£226	£226	£226	£226	£226	£226
Compressors	£000s	£0	£0	£0	£566	£623	£623	£679	£679	£679	£736	£736	£793	£793	£849
Electronic scrap (contains base/precious metals)	£000s	£86	£86	£86	£130	£173	£173	£173	£173	£173	£173	£173	£173	£173	£173
Motors	£000s	£0	£0	£0	£863	£863	£907	£907	£950	£950	£993	£993	£993	£1,036	£1,036
Description	**Units**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**
Cost of financial guarantees, admin costs (£000s)	£000s	£93	£96	£98	£970	£995	£1,020	£1,047	£1,075	£1,104	£1,135	£1,166	£1,199	£1,233	£1,268
Circuit boards	£000s	£85	£88	£90	£89	£88	£88	£87	£87	£87	£87	£87	£88	£88	£89
Compressors	£000s	£0	£0	£0	£521	£540	£559	£579	£599	£621	£643	£666	£689	£714	£739
Electronic scrap (contains base/precious metals)	£000s	£8	£8	£8	£17	£17	£17	£18	£18	£19	£19	£20	£20	£21	£22
Motors	£000s	£0	£0	£0	£343	£350	£356	£363	£370	£378	£385	£393	£402	£411	£420

Description	Units	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Total cost of notification (£000s)	£000s	£405	£409	£410	£2,755	£2,880	£2,949	£3,032	£3,103	£3,133	£3,263	£3,294	£3,383	£3,461	£3,553
Circuit boards	£000s	£311	£314	£316	£315	£315	£314	£314	£314	£314	£314	£314	£314	£314	£315
Compressors	£000s	£0	£0	£0	£1,088	£1,163	£1,182	£1,258	£1,279	£1,300	£1,379	£1,401	£1,482	£1,506	£1,588
Electronic scrap (contains base/precious metals)	£000s	£94	£94	£94	£146	£190	£190	£191	£191	£191	£192	£192	£193	£194	£194
Motors	£000s	£0	£0	£0	£1,206	£1,213	£1,263	£1,270	£1,320	£1,327	£1,378	£1,386	£1,395	£1,447	£1,456
Description	Units	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
GHG emissions from export to EU or OECD (tCO2eq)	tCO2eq	1,814	1,875	1,907	1,919	1,932	1,949	1,967	1,989	2,012	2,038	2,067	2,099	2,133	2,170
Circuit boards	tCO2eq	966	1,001	1,018	1,010	1,003	997	993	991	990	990	992	996	1,000	1,006
Compressors	tCO2eq	19	19	18	19	20	20	21	22	23	24	24	25	26	27
Electronic scrap (contains base/precious metals)	tCO2eq	156	163	166	170	174	178	183	187	192	197	203	208	214	220
Motors	tCO2eq	674	693	704	720	736	753	770	788	807	827	848	870	892	916
Description	Units	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
GHG emissions from export to non-EU or non-OECD (tCO2eq)	tCO2eq	12,182	12,225	12,036	12,391	12,759	13,139	13,532	13,940	14,361	14,797	15,249	15,717	16,202	16,704
Circuit boards	tCO2eq	2	2	2	2	2	2	2	2	2	2	2	3	3	3
Compressors	tCO2eq	8,234	8,317	8,104	8,391	8,689	8,997	9,315	9,646	9,988	10,342	10,708	11,088	11,481	11,888
Electronic scrap (contains base/precious metals)	tCO2eq	38	40	41	42	43	44	45	46	47	48	50	51	53	54
Motors	tCO2eq	3,908	3,866	3,889	3,956	4,025	4,096	4,170	4,246	4,324	4,405	4,489	4,575	4,666	4,759
Description	Units	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
GHG emissions from export of outputs (tCO2eq)	tCO2eq	13,997	14,100	13,943	14,310	14,691	15,088	15,500	15,928	16,373	16,836	17,316	17,816	18,335	18,874
Circuit boards	tCO2eq	968	1,003	1,020	1,012	1,005	1,000	996	993	992	993	995	998	1,003	1,009
Compressors	tCO2eq	8,253	8,336	8,122	8,410	8,708	9,017	9,337	9,668	10,010	10,365	10,733	11,113	11,507	11,915
Electronic scrap (contains base/precious metals)	tCO2eq	194	203	207	212	217	222	228	233	239	246	253	260	267	275
Motors	tCO2eq	4,582	4,559	4,594	4,676	4,761	4,849	4,940	5,034	5,131	5,232	5,336	5,445	5,558	5,676
Description	Units	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Monetised GHG emissions from all export of outputs (£m)	£m		£0.479	£0.572	£0.673	£0.793	£0.920	£1.038	£1.179	£1.326	£1.482	£1.662	£1.835	£2.035	£2.227
Circuit boards	£m		£0.034	£0.042	£0.048	£0.054	£0.061	£0.067	£0.074	£0.080	£0.087	£0.095	£0.103	£0.111	£0.119
Compressors	£m		£0.283	£0.333	£0.395	£0.470	£0.550	£0.626	£0.715	£0.811	£0.912	£1.030	£1.145	£1.277	£1.406
Electronic scrap (contains base/precious metals)	£m		£0.007	£0.008	£0.010	£0.012	£0.014	£0.015	£0.017	£0.019	£0.022	£0.024	£0.027	£0.030	£0.032
Motors	£m		£0.155	£0.188	£0.220	£0.257	£0.296	£0.331	£0.373	£0.416	£0.460	£0.512	£0.561	£0.617	£0.670
Description	Units	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Jobs related to WEEE processing plants															
Jobs in WEEE processing plants	Number	3,278	3,189	3,185	3,233	3,282	3,333	3,385	3,438	3,492	3,548	3,606	3,665	3,726	3,789

16. Appendix 5: Analysis of HM Customs Trade Data

This section of the report looked at HM Customs trade data for information on the quantity and value of electronic and electrical products shipped to OECD and non-OECD destinations. Commodity codes do not distinguish between export of new products and second-hand products and are typically not sufficiently disaggregated to look in detail at components that might be recovered from EEE.

However, there is potential to look at EEE product codes and calculate export deflators by destination to assess second hand or scrap flows, the hypothesis being that export destinations with low values (£ per kg) compared to the product category as a whole serves as a possible indicator of second-hand or scrap export flows. That being said it is noted here that this analysis can only be indicative and is subject to a high degree of uncertainty. For example, even within six-digit HS commodity codes there could be sufficient heterogeneity across products to account for the differences in value per Kg as indicated by export deflators, so the uncertainty is that 'low value' could potentially be an indicator of second-hand or scrap items being exported but it might not be a valid inference.

A summary of the findings from looking at HM Customs export data for fridges and air conditioning, computers, Vacuum Cleaners, phones, TVs and monitors and circuit boards is provided below.

16.1 Fridges and Air Con

For fridges and air con the Middle East and North Africa are most frequently exported to with the lowest £/kg. Within these continents North America has the highest average £/kg. Overall, Egypt has lowest £/kg spanning the most CN Codes.

Household refrigerators (HS Codes: 841821, 841829) have a weighted average export cost of £2.40/kg. North America as previously stated has the highest average £/kg at £86.3/kg. Within North America, the United States has the highest £/kg at £85, however only a small amount of EEE is exported to the US. This may show that the products being exported to the US are of a better quality. Refrigerators exported to the Middle East and Northern Africa are exported at a lower rate of £1.6/kg.

Within the Middle East/North Africa Sierra Leone has the lowest £/kg at £0.40. Other countries such as Libya, Morocco, South Africa and Kenya also have a very low export value to weight ratio of £1/kg. This may indicate that low quality (used or scrap) goods are being exported and lines up with our research that low quality/illegal UEEE/WEEE is being exported to African countries.

As with refrigerators, the Middle East and Northern Africa have the lowest average £/kg for freezers (HS Codes: 841830, 841840, at £7.10. Within the Middle East/North Africa Egypt has the lowest £/kg at £0.30. Other countries such as Lebanon (£1/kg) and Ghana £2/kg also have low export rates. There is less of a pattern with regards to those countries with the higher export costs with chest freezers (841830) being exported to Latin America and Caribbean having a cost of £39.4/kg and upright freezers (841840) being exported to Asia and Oceania at the cost of £166.6. Hong Kong has the highest £/kg with £310/kg however only around 3 tonnes were exported to Hong Kong in 2019.

For air conditioning units Europe has shown to have the lowest £/kg at £10.4 and the highest cost again being North America with £158.9. Eastern European countries such as Romania, Hungary, Slovakia have the lowest export value.

16.2 Computers

Computers are exported to the European Union, Sub-Saharan Africa and Asia Oceania for the lowest £/kg. The highest £/kg is from exports to Western Europe excl. EU and North America.

Computers (HS Codes: 847130, 847141, 847149) have a weighted average cost of £106.2/kg. Western Europe excluding the EU has an average cost higher than the weighted average with £283.7/kg. Iceland has extremely high £/kg with a cost of £1043 with around 14 tonnes of 847141 being exported in 2019. Computers exported to Asia and Oceania are exported at a lower rate average of £20.10/kg. Pakistan has consistently the lowest

export rates with the Asia and Oceania continent ranging from £1-4/kg. This lines up with our research that much of worlds e-waste is exported to Pakistan, including illegal e-waste.

Other codes within computer waste have a low rate of £/kg in areas such as the European Union, Sub-Saharan Africa and the Middle East and Northern Africa. Within the European Union the data shows that the lowest £/kg are Eastern European countries such as Romania and Hungary. Within Africa, countries like Kenya and Egypt have the lowest £/kg as well as Israel within the Middle East. Again, this lines up with our research of where low value EEE is being exported to from the UK.

16.3 Vacuum Cleaners

Vacuum Cleaners and component parts are exported to Sub-Saharan Africa for the lowest £/kg. The highest £/kg is from exports to North America.

Vacuum Cleaners (HS Codes: 850811, 850819, 850860) have a weighted average cost of £9.8/kg. Latin America and Caribbean has a higher cost than the weighted average with £21/kg. Brazil has a very high £/kg with $785/kg as well as Ecuador with £590/kg. Both however have less than 1 tonne exported in 2019. Sub-Saharan Africa on the other has a lower cost than the weighted average with £2.10/kg. The countries with the lowest £/kg are the Congo (£1/kg), Kenya (£3/kg), Libya (£0.9/kg) and Tanzania (£1/kg). For other hoover components Tanzania again has a low £/kg.

16.4 Phones

Phones have less of a pattern of high value export destinations, low value waste seems to be more commonly exported to Latin America and Caribbean. Within Latin America and Caribbean countries Chile has the cheapest £/kg rate for phone component parts (HS Codes: 851762, 851769, 851770).

Telephone sets (CN Codes: 851711, 851712) have a weighted average cost of £593.1/kg. Sets are exported to Sub-Saharan Africa for £240.5/kg. Zambia has the lowest £/kg at £51/kg followed by Tanzania with £115/kg. Mobile phones on the other hand are exported to North America for the lowest £/kg. Within North America, Mexico has the lowest export value with £30/kg.

16.5 TV and Monitors

TV and Monitors are exported to the European Union and Latin America/Caribbean for the lowest £/kg. The highest £/kg is from exports to Eastern Europe excl. EU.

Within the European Union, Ireland has the lowest export values per kg spanning the most HS codes from (£13-31/kg). Poland also has a number of low value export values varying from £2- 18kg).

Monitors have a weighted average value of £56.8/kg. The European Union has an export rate lower than the weighted average with £26.5/kg. Within the EU, eastern European countries such as Bulgaria, Czech Republic and Poland have the lowest value per kilogram with over 207 tonnes exported from the UK in 2019. This may indicate that lower quality e-waste is exported to these countries. Latin America and Caribbean also has a lower average cost per kilogram at of £41.1. Chile has the lowest £/kg from £2-23/kg. Eastern Europe excl. EU on the other hand has the highest £/kg at £576.50. Russia has the highest rate for exports varying from £526-3776/kg however only around 2 tonnes were exported to Russia within 2019. This may mean that higher quality products are being exported to Russia.

16.6 Circuit Boards

Within Circuit boards the lowest value exports are to countries within the European Union and Latin America/Caribbean. There is less of pattern when it comes to the countries that have higher export values however, they seem to be within Middle East and North Africa as well as North America.

In the European Union, again there are no clear pattern, however countries that have the lowest values for exports are Germany and Poland. Within Latin America and Caribbean countries such as Brazil and Dominica have a low value for exports (£4/kg).

17. Appendix 6. Schedule 9 Minimum Requirement for Shipments of Used EEE suspected to be WEEE

SCHEDULE 9 Regulation 54

Minimum requirements for shipments of used EEE suspected to be WEEE

1. In order to distinguish between EEE and WEEE, where the holder of the object claims that he intends to ship or is shipping used EEE and not WEEE, Member States shall require the holder to have available the following to substantiate this claim:

(a) a copy of the invoice and contract relating to the sale and/or transfer of ownership of the EEE which states that the equipment is destined for direct re-use and that it is fully functional;

(b) evidence of evaluation or testing in the form of a copy of the records (certificate of testing, proof of functionality) on every item within the consignment and a protocol containing all record information according to paragraph 3;

(c) a declaration made by the holder who arranges the transport of the EEE that none of the material or equipment within the consignment is waste as defined by Article 3(1) of Waste Directive(**1**); and

(d) appropriate protection against damage during transportation, loading and unloading in particular through sufficient packaging and appropriate stacking of the load.

2. By way of derogation, paragraph 1(a) and (b) and paragraph 3 do not apply where it is documented by conclusive proof that the shipment is taking place in the framework of a business-to-business transfer agreement and that:

(a) the EEE is sent back to the producer or a third party acting on his behalf as defective for repair under warranty with the intention of re-use; or

(b) the used EEE for professional use is sent to the producer or a third party acting on his behalf or a third-party facility in countries to which Decision C(2001)107/Final of the OECD Council concerning the revision of Decision C(92)39/Final on control of transboundary movements of wastes destined for recovery operations applies, for refurbishment or repair under a valid contract with the intention of re-use; or

(c) the defective used EEE for professional use, such as medical devices or their parts, is sent to the producer or a third party acting on his behalf for root cause analysis under a valid contract, in cases where such an analysis can only be conducted by the producer or third parties acting on his behalf.

3. In order to demonstrate that the items being shipped constitute used EEE rather than WEEE, Member States shall require the following steps for testing and record keeping for used EEE to be carried out:

Step 1: Testing

(a) Functionality shall be tested and the presence of hazardous substances shall be evaluated. The tests to be conducted depend on the kind of EEE. For most of the used EEE a functionality test of the key functions is sufficient.

(b) Results of evaluation and testing shall be recorded.

Step 2: Record

(c) The record shall be fixed securely but not permanently on either the EEE itself (if not packed) or on the packaging so it can be read without unpacking the equipment.

(d) The record shall contain the following information:

(i) name of item (name of the equipment if listed in Annex II or Annex IV, as appropriate, and category set out in Annex I or Annex III, as appropriate),

(ii) identification number of the item (type No) where applicable,

(iii) year of production (if available),

(iv) name and address of the company responsible for evidence of functionality,

(v) result of tests as described in step 1 (including date of the functionality test),

(vi) kind of tests performed.

4. In addition to the documentation requested in paragraphs 1, 2 and 3, every load (e.g. shipping container, lorry) of used EEE shall be accompanied by:

(a) a relevant transport document, e.g. CMR or waybill;

(b) a declaration by the liable person on its responsibility.

5. In the absence of proof that an object is used EEE and not WEEE through the appropriate documentation required in paragraphs 1, 2, 3 and 4 and of appropriate protection against damage during transportation, loading and unloading in particular through sufficient packaging and appropriate stacking of the load, which are the obligations of the holder who arranges the transport, Member State authorities shall consider that an item is WEEE and presume that the load comprises an illegal shipment. In these circumstances the load will be dealt with in accordance with Articles 24 and 25 of Regulation (EC) No 1013/2006.

(**1**) OJ No L 312, 22.11.2008, p.3.