

UK Energy-related Products Policy Study

Material Efficiency Standards - Horizontal
Measures Case Studies

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Glossary

BAMB: Building as Materials Banks

B2B: Business to Business

B2C: Business to Consumer

BAT: Best Available Technology

BEIS: Department for Business, Energy and Industrial Strategy

BS: British Standard

CE: Circular Economy

CRM: Critical Raw Materials

Defra: Department for Environment, Food & Rural Affairs

EC: European Commission

ECHA: European Chemicals Agency

EEE: Electrical and Electronic Equipment

EEB: European Environmental Bureau

EELWP: EU Ecodesign and Energy Labelling Working Plan

EN: European Standards

EPD: Environmental Product Declaration

EPR: Extended Producer Responsibility

ErP(s): Energy related Product(s)

ETL: Energy Technology List

EU: European Union

EU GPP: European Green Public procurement

GHG: Greenhouse gases

ISO: International Organization for Standardization

JRC: Joint Research Centre

LCA: Life Cycle Assessment

LCI: Life Cycle Inventory

LED: Light Emitting Diode

MEPS: Minimum Energy Performance Standard

PCR: Product Category Rules

PET: Polyethylene Terephthalate

PEFCRs: Product Environmental Footprint Category Rules

QR code: Quick Response code

R&D: Research and Development

RoHS: Restriction of Hazardous Substances in Electrical and Electronic Equipment

RoW: Rest of the World

S&L: Standards & Labelling

SPI: Sustainable Products Initiative

TV: Television

UK: United Kingdom

UN: United Nations

USA: United States of America

VAT: Value Added Tax

WEEE: Waste Electrical and Electronic Equipment

WP: Working Plan

MtCO_{2e}: Million Tonnes of Carbon Dioxide Equivalent

kgCO_{2e}: Kilogrammes of Carbon Dioxide Equivalent

Executive summary

Following the UK's departure from the EU, new EU Ecodesign and Energy Labelling measures will not automatically apply in Great Britain from 2021. The Department for Business, Energy and Industrial Strategy (BEIS) and The Department for Environment, Food and Rural Affairs (Defra) will take on responsibility for setting standards and developing policy to limit the environmental impacts of Energy-related Products ('ErPs' - products that have an impact on energy consumption during use) in the UK.

ICF Consulting was commissioned by BEIS and Defra to deliver a UK Energy-related Products Policy Study with regard to ErPs. The research brief was to identify and assess alternatives for putting in place product standards with regard to circularity/material resource efficiency, as well as energy efficiency. The research was to have regard to the environmental impacts of Energy-related Products considering in particular the potential to reduce carbon emissions and resource depletion and otherwise improve their environmental performance.

The expectation at inception was that in the case of measures relating to circular economy and material resource efficiency, there may be scope to apply a standard set of requirements across a wide range of products, in order to increase the efficiency of setting standards/requirements. This is sometimes described as a more 'horizontal' application, as opposed to the 'vertical' product-specific approach that is favoured for energy efficiency implementing measures. The proposition is that a more horizontal approach, or one that is at least underpinned by generic requirements, would enable more effective use of the Ecodesign framework to improve the material resource efficiency of Energy-related Products.

The study initially identified a long list of horizontal measures that could be deployed in the UK to improve energy efficiency, resource efficiency or circular economy aspects of ErP product groups. This long list was refined and consolidated using the available evidence and stakeholder feedback. The initial analysis is in the main report. This report follows a process of prioritisation. Further detail on this prioritisation process is explained below and in the accompanying main report¹.

This report presents the **Circular Economy horizontal measures case study assessment, exploring 4 specific measures**, and forms part of the wider research project. The circular economy horizontal measures study was developed alongside the rest of the research study and was completed using a similar approach.

¹ <https://erpproductspolicystudy.uk/>

ICF's study team prepared a long list of 40 horizontal measures divided into 8 different categories. The long list was consolidated into 14 horizontal measures for the Task 3 analysis, based on two sets of criteria and two shortlisting exercises.

The results of these exercises helped inform the selection of the four priority horizontal measures for Task 4 that are presented below:

- Requirements for material content and declaration
- Repairability measures - modular design
- Product support
- Mandatory minimum warranty/ guarantee

The purpose of Task 4 was two-fold; to carry out further analysis of the shortlisted product groups to identify existing evidence on product performance, improvement potential and the policy levers available to realise that potential in the UK, and also to assess the shortlisted horizontal measures in further detail and present evidence using case studies.

As part of Task 3 and 4 ICF's study team also assessed the number of products from the long list that could be covered by the horizontal measures. It was identified that the four short listed horizontal measures could apply to all product groups.

For each horizontal measure case study the relevant policies, legislation and standards in the UK, Europe and in the rest of the world were identified. The review highlighted the importance of the European Union in terms of leading the circular economy agenda (regulation and strategies). Each horizontal measure was also aligned with the three main UK strategies, 25 Year Environmental Plan, Resources and Waste Strategy for England, and Waste Prevention Programme for England (consultation version). This exercise underlined the need of a holistic approach to reinforce and promote successful implementation of a horizontal measure and a further mapping/ cross-referencing exercise should be considered.

The study highlighted the difficulty posed by separately assessing discrete potential measures, and consequently defining the scope of each supporting case study. Broadly speaking and by focussing on product design, greater resource efficiency of Energy-related Products can be brought about by:

- Using different or fewer materials, for example by increasing the proportion of recycled content or by reducing the overall quantity of material required to manufacture the product
- Taking steps to prolong the usable life of the product for example through greater repairability and durability

- Designing products so that their constituent components and materials can be recovered for reuse and recycling when the original product reaches end of life.

In practice there are a wide variety of potential measures that could be used to work towards achieving each of these objectives, and the optimal solution is likely to be a package of mutually supportive measures working in tandem. For example, 'Product Support' in this study includes the type of Ecodesign measures that were introduced in Summer 2021 relating to spare part availability and information for repairers. Modular design has been considered here in a separate case study, but is closely linked to the provision of spare parts and in practice, we might expect an ecodesign requirement on modular design to strengthen a requirement on spare part availability, for example, with both contributing to product lifetime extension via increased repairability. However, for the purposes of this study the research team has defined a scope for each case with the acknowledgment that there is some overlap. Further research is required to thoroughly map these interrelationships, the feedback effects between them and ultimately the optimal package of measures.

A further challenge was the lack of available data on the potential or observed impacts of the measures being considered, either ex ante or ex post. This is in part due to the existing resource efficiency Ecodesign measures being in their infancy, but also relates to the inherent challenges in quantifying costs and benefits of discrete measures where impacts may be complex to assess and involve numerous contributing factors.

A fully quantified assessment of costs and benefits of policy options relating to resource efficiency is not in scope of this research and further analysis is required to appraise, select and develop policy options for cost/benefit modelling. The findings from this report do however indicate that the four case study subjects are all viable options for further development, all of which could potentially be implemented across all ErP and which on the basis of the qualitative appraisal carried out by the research team, are some of the options of greatest interest.

Summaries of each measure selected for case study and the overall recommendations of this report are briefly summarised as part of this Executive Summary, below:

Requirements for material content and declaration

This measure involves limiting the environmental footprint of products by setting requirements relating to either the material content of ErP or requiring the provision of information about material content (examples include % recycled / hazardous substances / critical raw materials (CRM)).

The pre-existence of British Standards on the methods for declaring the use of CRM, and for assessing the proportion of recycled material content and proportion of reused components offer a pre-existing and standardised means on which to base new Ecodesign requirements. However, concerns with declarations exist relating to the format that should be developed, as there is a need to guarantee that these are universally understandable and comparable with relevant information readily available to consumers. The in-development EU Sustainable Products Initiative introduces the concept of digital product passport to present requirements on mandatory sustainability labelling and/or disclosure of information to market actors along value chains.

No measurable impacts with reference to costs and benefits or carbon savings were found in the literature for the implementation of this measure. Carbon savings were identified for reducing the weight of packaging of products and the weight of materials (e.g. light weighting) as well as the savings using virgin versus recycled materials for plastics.

Repairability measures – modular design

Modular design facilitates non-destructive disassembly into smaller components and sub-assemblies that can be replaced and upgraded, repaired, remanufactured, used in a different product, or adapted to other functionalities. By keeping products and materials in the cycle of repair and reuse, this measure could help drive circularity by moving to a closed material loop system and reducing waste/disposal.

Modular design enables quick and easy repairs. It is defined as “an approach that divides a system into smaller parts (modules) which can be independently used in different systems to drive multiple functionalities”. By designing products so that components can be easily removed, repaired, and replaced, the lifespan of the product can be extended, and upgrades can be made to individual components of a product.

The repair and reuse sectors are growing quickly and studies indicate that repairability could have a large impact on creating new, specialised jobs. The impact of implementing this measure might entail additional costs in the short term, to enable capacity building for designers and manufacturers and to facilitate the

necessary changes in product design. However, it is not possible to identify the time it would take for the market to shift towards repairability via modular design measures due to limited data availability and the need for greater engagement with stakeholders to explore this.

Product Support – including availability of spare parts / repair information

Product support refers to the ongoing facilitation of product maintenance and repair by manufacturers, through the provision of the necessary information and parts to fix faults and keep products working. This may include software and firmware updates as well as physical parts, and it is primarily product support measures to improve material resource efficiency that have been introduced for certain ErPs in Summer 2021.

The research team did not evidence of potential impacts, cost and benefits or carbon savings of product support measures were identified in the literature, and this requires further study.

Mandatory minimum warranty / guarantee

Warranties and guarantees are already provided with products or made available to consumers, in addition to underlying statutory rights. This case study considers the possibility of setting mandatory minimum guarantee periods or specifying minimum levels of durability (as already seen in respect of the ecodesign regulations for vacuum cleaner motors).

The identified literature found little information and only a few initiatives of the implementation of this measure in Denmark, France and Portugal. These provisions had been developed in the consumers rights context and little evidence was found on the environmental impacts. Further evidence is therefore needed to assess environmental benefits.

Conclusions

Although the industry is gaining expertise in this subject area, as indicated by many voluntary initiatives and research projects, the use of the Ecodesign framework to implement material resource efficiency measures is new, meaning there is not yet data to support quantitative analysis of the success of these policies or support the modelling of proposals for future interventions.

Only a small number of responses were received from stakeholders to the project consultation questions related to horizontal measures.

Detailed studies involving primary research with industry and stakeholders will be needed to understand better how these horizontal measures might impact embodied energy and material consumption and the potential for future carbon savings and wider environmental benefits.

Based upon the research conducted for this study and the largely qualitative assessments in this report, the following findings have been arrived at:

1. The four horizontal measures selected for detailed assessment (this report) all have some merit. To take them forward a consultation or targeted engagement is required to assess costs and benefits to UK industry including skills/capacity of repairers as well as relevant logistical arrangements and infrastructure.
2. Whilst it may be desirable to set horizontal requirements across all ErP, the heterogeneity of products mean it will be necessary to have some product group specific requirements, or elements of requirements.
3. Taking forward the new EU Ecodesign and Energy Labelling Regulations is a good initial step to testing how consumers respond to product support type measures. In future the complexity of manufacturers responding to different requirements in the EU and in the UK should be carefully considered.
4. As well as the options detailed in this report, there may be further opportunities for the UK to show leadership on material resource efficiency policy for ErP:
 - Consumer information relating to relative durability/repairability and recycling , relating to the second, third and fourth case studies in this report.
 - Developing digital solutions to provide information to both consumers and to recyclers searching for certain materials.

1 Study definition

The study definition defines the relevant background and purpose of this horizontal measures study, clarifies context and scope, and presents the approach used during the study.

1.1 Background

Following the UK's departure from the EU, new EU Ecodesign and Energy Labelling measures will not automatically apply in Great Britain from 2021 onwards². Instead of the European Commission, the UK Government has taken on responsibility for setting standards and designing policy to limit the environmental impacts of Energy-related Products (ErPs) in the UK. The UK Government seeks to:

- **Maximise energy and carbon savings** - Supporting the Government's Net Zero target through minimising energy bills, reducing GHG emissions and promoting more resource-efficient products.
- **Reduce demand on resources** – EU Ecodesign and Energy Labelling measures can be used to ensure that products and materials are kept in use for longer, placing less demand on the planet's natural resources and supporting the Government's commitment to double resource productivity by 2050.
- **Support a world class regulatory framework** – Establish a world class Energy-related Products policy framework that encourages UK innovation and works for businesses.

In addition, the UK Government seeks to present high-level, horizontal measures for meeting **Circular Economy objectives** in alignment with setting standards for limiting environmental impacts of Energy-related Products in the UK. Although the circular economy is not a new concept, it is now more critical for sustainable development. As defined by the Ellen McArthur Foundation, a circular economy is a set of principles and actions among the value chain that encourages the following key aspects:

- **Design out waste and pollution (resource efficiency)** – reduce disposal and landfill of products by optimising resource efficient product design that offers waste preventative solutions (e.g., adaptability, upgradeability, repairability, modular design).
- **Keep products and materials in use & regenerate natural systems** – drive closed material loop systems which cater for the requirements for material

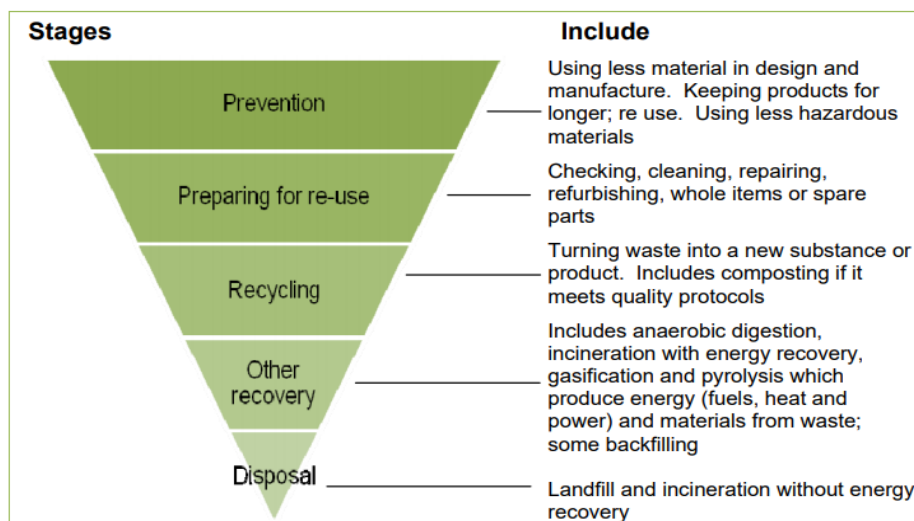
² Subject to the terms of the Northern Ireland Protocol, existing and future EU Ecodesign and Energy Labelling regulations will continue to apply in Northern Ireland

content and declaration, that promotes recyclable and durable materials. Ensure limited use of finite resources, hazardous substances and strive towards renewable energy consumption, and enable positive environmental impact.

Principles of circular economy move away from the traditional cradle to grave approach, a linear supply chain of production and waste generation. A circular system with a whole-life cycle approach drives demand for resource efficient design of ErPs and circular supply chains, which optimise reuse and a closed material loop and has a positive society-wide benefit; decoupling economic activity from the consumption of finite resources, designing waste out of the system; and assisting the transition to renewable energy sources³.

In addition, the EU-wide Waste Management Hierarchy⁴ and life cycle thinking indicates the demand for optimising circular design and provides a structural hierarchy on the key principles for a circular economy, see Figure 1.1. The top priorities to reduce environmental impact are seen for processes at the top of the hierarchy. They are prevention, repair, and reuse, as well as to prevent product obsolescence and disposal. In line with this, the UK Resource and Waste Strategy commits the UK to doubling resource productivity by 2050⁵.

Figure 1.1 Waste management hierarchy⁶



1.2 Purpose of this study

To meet the objectives described in 1.1, Government will need a robust evidence base that informs decision making on ErPs to investigate further as candidates for potential policy development. This study enables BEIS and Defra to assess which

³ [What is a Circular Economy? | Ellen MacArthur Foundation](#)

⁴ [Waste prevention and management - Environment - European Commission \(europa.eu\)](#)

⁵ [Resources and Waste Strategy - Monitoring Progress \(publishing.service.gov.uk\)](#)

⁶ [Applying the Waste Hierarchy: evidence summary](#)

products are the most relevant in terms of their overall environmental impact considering their contribution to carbon emissions, resource depletion and technical potential for improving their environmental performance or facilitating improved performance.

In addition, this study is intended to help provide an initial indication of which policy measures may be most appropriate in encouraging better environmental performance and driving the uptake of more energy and resource efficient products and systems. The study does not provide an assessment of specific policy options for individual products and recommendations around suitability of policy levers do not necessarily reflect the direction of Government policy. It will be for policy makers to decide exactly which policies and products to take forward.

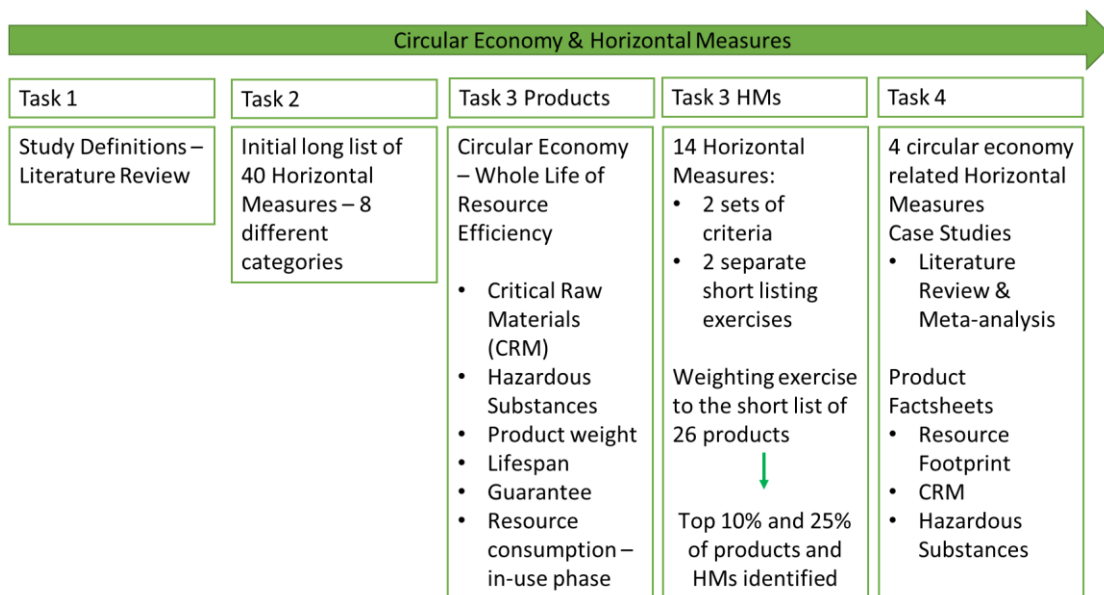
1.3 Approach

1.3.1 Overall approach

The overall approach to this study is summarised in Figure 1.2. This report presents the **Circular Economy horizontal measures case study assessment (Task 4)** undertaken by ICF and forms part of the wider research project commissioned by BEIS and Defra to help inform the future Energy-related Product standards in the UK.

The approaches taken to deliver Tasks 2, 3 and 4 are described here.

Figure 1.2 Overall approach to the Circular Economy Horizontal measures study



1.3.1.2 Task 2: Creating a long list of horizontal measures

Desk research assessed the information in the European Commission Ecodesign Workplan preparatory study, reviewed documentation⁷⁸⁹¹⁰¹¹ and developed a longlist of measures to assess further and to attribute to products or product groups.

The following list separates out horizontal measures by the phase of the product lifecycle. Items 1-6 contain aspects of product design that could potentially be addressed with Ecodesign requirements. Item 7 relates to alternative business models and item 8 is about product information. Note that some measures feature in more than one group.

1. **Production**

- Energy demand
- Other resource/material demand
- Hazardous materials and chemicals
- Minimum recycled content
- Production waste

2. **Resource/energy in use**

- Energy - standby and off mode
- Energy smart reporting and functionality (e.g., energy smart appliances)
- Water efficiency
- Demand & footprint of other consumables (e.g., printer ink)
- Universal power supplies
- Universal batteries

3. **Extend use – durability**

- Expected lifetime
- Extended warranties
- Availability of firmware updates
- Address premature obsolescence

4. **Extend use – reparability / upgradeability**

- Modular design
- Ease of disassembly
- Availability of spare parts
- Information for repairers
- Diagnostic software and systems
- Information for consumers

5. **End of use – recyclability**

- Ease of extraction of constituent materials e.g., CRM
- Product composition with recyclable materials
- Information for recyclers
- Reverse logistics e.g., take back schemes

⁷ [25 Year Environment Plan](#)

⁸ [Clean growth strategy](#)

⁹ [Our Waste, Our Resources: a strategy for England](#)

¹⁰ [Environmental Bill](#)

¹¹ [A new Circular Economy Action Plan: For a cleaner and more competitive Europe](#)

6. End of use – remanufacture / refurbishment

- Ease of extraction of components / core suitable for remanufacture/ refurbishment
- Ease to refurbish whole device
- Information for remanufacturers / refurbishers
- Reverse logistics e.g., take back schemes

7. Servitisation

- Product as a service
- Shared / pooled services

8. Product information/labelling and market surveillance

- Product passports
- Environmental footprint
- Information for consumers
- Information for repairers
- Information for remanufacturers / refurbishers
- Information for recyclers
- QR codes
- Tagging / RFID chipping
- Smart reporting

1.3.1.3 Task 3: Consolidating and prioritising the horizontal measures

Task 3 started with the long list of horizontal measures identified in Task 2 and consolidated them into 14 high level horizontal measures to make the scoring exercise more manageable. The following list presents the consolidated list of horizontal measures:

- Product passport - information for industry
- Product passport - Information for consumers
- Modular design and ease of disassembly
- Product support
- Minimum expected lifespan / minimum warranty
- Premature Obsolescence
- Suitability for remanufacture or refurbishment
- Material content
- Recyclability
- Universal power supplies/batteries
- Standby and off modes
- Energy smart reporting and functionality
- Servitisation and sharing or pooling.
- Reverse logistics and take-back schemes.

BEIS, Defra and stakeholder feedback also contributed to this exercise.

ICF then evaluated the consolidated list of horizontal measures against the shortlisted product groups using the following criteria:

- Breadth of coverage across products and product groups;
- Measure being planned, considered or previously implemented;
- Costs of implementation; and
- Predicted impact on resource efficiency and energy demand.

Table 1.1 presents a second set of criteria used during the shortlisting exercise. Criteria included market data (price per unit) and the circular economy whole life of resource efficiency data (e.g., materials, hazardous substances, CRM content, etc.). These criteria were applied to each product group. High/low scores were assigned to each criterion based on how each measure aimed to reduce the environmental footprint of products.

Weighting was assigned to each criterion and scored against the shortlist of 26 products (see Annex 1). The top 10% and 25% of products were identified. The results of this exercise helped inform the four horizontal measures selected for Task 4.

Table 1.1 Task 3 – scoring criteria for horizontal measures.

Horizontal Measure	How does this measure primarily aim to reduce environmental footprint?	Typical price per unit	Materials (weight)	Hazardous substances	CRM content	Lifespan	Duration of guarantee
HM 1	e.g., recovery and recycling of more material at EoL	Low	High	High	Low	Low	High
HM 2	e.g., more sustainable purchasing decisions	High	High	High	High	High	High
HM 3	e.g., products longevity	High	High	High	High	High	Low

1.3.1.4 Task 4: Further analysis of shortlisted horizontal measures

The purpose of Task 4 was to carry out further analysis of the shortlisted horizontal measures to identify existing evidence on product performance, improvement potential and the policy levers available to potentially realise that potential in the UK.

The four shortlisted horizontal measures are presented in the figure below. Table 1.2 summarises the four shortlisted horizontal measures and details, per measure, the other aspects that were considered for each case study. This table outlines one of

the main challenges encountered during the development of this study, that was the interlink between the measures and content found in the literature and the complexity to set up a succinct scope for each of them.

Figure 1.3 Policy lever options for Circular Economy Strategy

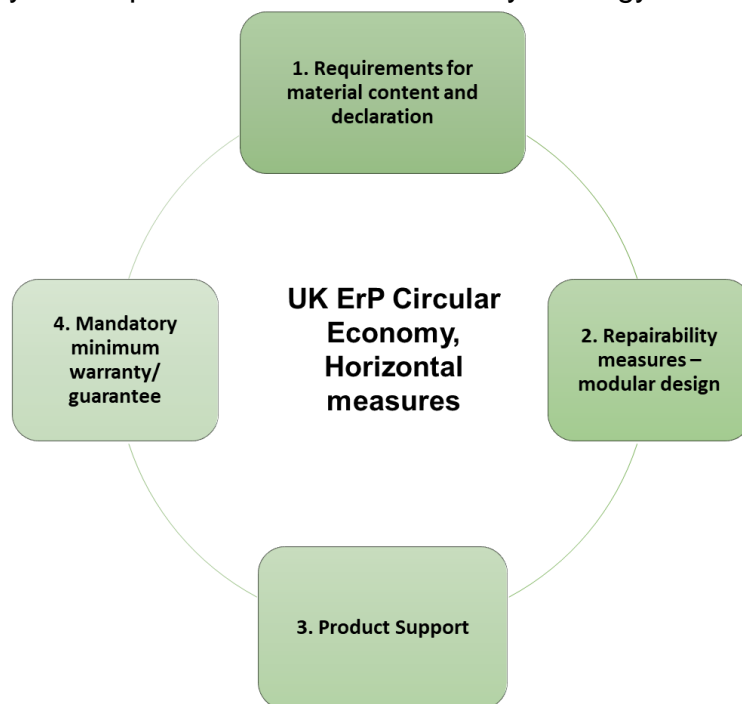


Table 1.2 Summary of the circular economy horizontal measures descriptions and alignment with other circular aspect

Policy lever/ Horizontal measure	Description	Alignment with other circular aspects that could potentially be addressed through Ecodesign requirements
1. Requirements for material content and declaration	This measure reviews the potential of limiting the environmental footprint of products by setting requirements in respect of the material contents of products (e.g., % recycled / hazardous substances / critical raw materials (CRM)).	<ul style="list-style-type: none"> • Ease of extraction of constituent materials e.g., CRM • Product composition with recyclable materials • Information for recyclers • Product information/labelling and market surveillance • Product passports • Environmental footprint • Production - Energy demand, other resource/material demand • Hazardous materials and chemicals • Minimum recycled content • Production waste • Energy smart reporting and functionality (e.g., energy smart appliances)
2. Repairability measures –	This measure reviews the potential of reducing the environmental footprint of products by setting	<ul style="list-style-type: none"> • Ease of disassembly • Extend use – durability.

Policy lever/ Horizontal measure	Description	Alignment with other circular aspects that could potentially be addressed through Ecodesign requirements
modular design	requirements for: non-destructive disassembly into smaller components, replaceability and upgradeability and repairability. It alternatively explores the potential for products that have exceeded their lifespan to be remanufactured, or used in a different product with similar functions, or adapted to other functionalities. This would enable more resource-efficient, repairable, and adaptable products.	<ul style="list-style-type: none"> • Extend use – reparability / upgradeability. • End of use – recyclability • End of use – remanufacture / refurbishment. • Ease of extraction of components / core suitable for remanufacture/ refurbishment. • Ease to refurbish whole device. • Information for manufacturers, re-sellers and third-party repair services. • Reverse logistics e.g., take back schemes
3. Product Support	This measure explores the potential for reducing the environmental footprint of products by setting a requirement for manufacturers or distributors to provide the necessary means for products to be kept in use for as long as possible. Examples include: continuing software and firmware updates, technical support, provision of spare parts, use of remote and/or automated diagnostic tools to identify faults, etc.	<ul style="list-style-type: none"> • Expected lifespan. • Extended warranties. • Availability of firmware updates • Diagnostic software and systems • Information for consumers • Information for repairers • Information for remanufacturers / refurbishments. • Information for recyclers • Smart reporting, QR codes, Tagging / RFID chipping • Reverse logistics e.g., take back schemes. • Extend use – durability, address premature obsolescence, reparability / upgradeability. • Availability of spare parts • Extended Producer Responsibility
4. Mandatory Minimum Warranty/ Guarantee	This measure indicates the potential for reducing the environmental footprint of products by setting a minimum lifespan of a product, (e.g., the operational lifespan). A minimum guarantee period for specified products can help achieve this. It can be linked to issuing labels to indicate the expected lifespan or guarantee period for a product.	<ul style="list-style-type: none"> • Expected lifespan • Extend use – durability. • Extended warranties • Minimum warranty/guarantee

1.4 Assessment of 4 priority measures

This section summarises the criteria used to assess the four shortlisted horizontal measures and is detailed in the table below. Each case study can be read as a separate report independent of the others.

Table 1.3 Horizontal measure assessment criteria and description

HM Case Study Assessment Criteria	Description
Case Study Objective and Horizontal measure description	Literature review based outline of what a measure could encompass, supported by case studies and the methods which can be applied.
Coverage	Alignment of the measure with the shortlisted Task 4 product groups as a part of the wider ErP study. Discussion of specific products that the measure could cater to, or in other cases where it would present more of a challenge.
Key Enablers and Stakeholders	Key drivers to promote and enable the implementation of the measures. The structure of this section applies the Ellen MacArthur Foundation's Circulytics measures ¹² , which categorise enablers in the following structure: Strategy and Planning, Innovation, People and skills, Operations and External Engagements. Key actors across the value chain important to implementation of future measures are listed here.
Relevant policies, legislation, and standards	Summary of key current policies, legislation, and standards relative to the specific measure within the UK, EU or globally.
Opportunities for alignment with other UK strategies	A review of the wider application of the measure towards outreach and promotion of broader UK strategies for sustainable production, product policy, circular economy and minimising environmental impact.
Key initiatives and best practices	Summary of initiatives and/or best practices implemented within the UK, EU or globally. Challenges and opportunities of the implementation were also presented here.
Options of interaction with other HM	The potential crossovers seen with setting criteria to the four shortlisted measures.
Assessment	Measuring the impact - Outlining the impact potential from implementing each horizontal measure by reflecting on case studies to establish the degree of associated cost savings, carbon savings and other environmental impacts. Discussion of the likely effectiveness of the measure under consideration.

¹² [circulytics-method-introduction.pdf \(ellenmacarthurfoundation.org\)](https://www.ellenmacarthurfoundation.org/circulytics-method-introduction.pdf)

HM Case Study Assessment Criteria	Description
	<p>Challenges and Opportunities - A review of the challenges and opportunities to implement each measure is considered by reflecting on literature review and case study examples. Topics include challenges and opportunities present for future policy, within industry and society.</p> <p>Evidence Gaps – A summary of the specific lack of existing data, research, standardisation, or legislations that are required for this measure.</p>
Recommendations	A summary of the policy recommendations based on the evidence and analysis.

2 Requirements for material content and declaration

2.1 Horizontal Measure 1: assessment objective

This chapter presents the study on the potential from horizontal measure requirements for material content and related declarations. It forms part of the wider research project commissioned by BEIS and Defra to help inform the future Energy-related Product standards in the UK. This study has identified the product groups and horizontal measures that can provide a high potential for savings (energy, emissions, resources), for application to these proposed UK standards.

In all cases, horizontal measures were defined as requirements that could be applied to many or all Energy-related Products. Horizontal measures could also apply to products where specific Ecodesign requirements do not yet exist. Horizontal measures may relate to energy efficiency and/or to resource efficiency.

This case study will provide descriptions, coverage, a summary of key stakeholders, alignment with UK policies, our analysis on impacts, and recommendations and next steps.

The case study provides evidence to inform future decision making around these measures and investigates recommendations for future policy interventions.

2.2 Horizontal measure description

This option involves setting requirements for products material content and the reporting of this material content data in a declaration (e.g., product passports, material content labelling and design considerations). Examples include % recycled / hazardous substances / critical raw materials (CRM).

Currently there are different existing voluntary standards that establish how the requirements for material content should be declared and assessed e.g. . Communicating the requirements for the material content and declaration is specified according to procedure, content, and form of the information. Setting requirements for material content aligns with understanding and reviewing a product's material efficiency. This includes the following topics:

- Durability, ability to remanufacture, ability to repair, reuse and upgrade.
- Recyclability and recoverability.
- The proportion of reused components; proportion of recycled content.
- The use of Hazardous Substances and CRM.

the evidence suggests??? That presenting material efficiency descriptions and data with clarity and consistency, means target audiences are more likely to understand relative product and material information. Quantitative information may include the percentage or mass of a CRM or hazardous material [or recycled content] and could form the basis of a material declaration.

The criteria and topics under this measure can be effective across the supply chain of an ErP. For example, providing information on CRM in electrical products and standardising the list of declarable substances could enable key information to be compared between suppliers at each stage of the supply chain and assist with selection of a supplier. It could also help track the flow of those materials through waste streams in combination with the new waste tracking system that Defra is developing, ultimately supporting sourcing and use of those materials.

However, information provision does not mitigate concerns related to recovery, recycling and the low cost of several virgin materials. To mitigate this, it is possible to assign and regulate a minimum recycled content figure for bulk materials. Mandating minimum recycled content in products could increase the demand for recycled materials from manufacturers, ensuring that there is a market incentive for recycling across the entire lifecycle of a product. The most recent Preparatory study for the EU Ecodesign and Energy Labelling Working Plan (EELWP) 2020-2024 has focused on post-consumer recycled content of plastics in ErPs.

2.3 Coverage

This horizontal measure could apply to all product groups assessed as part of Task 3 and 4 of the ErP Products Policy Study. For example, via enabling Product Passports (one of the Task 3 shortlisted measures), that convey valuable material content and declaration. Annex 2 presents Task 3 assessment results on potential coverage of the horizontal measures, per shortlisted product.

2.4 Key enablers and stakeholders

As defined by the Ellen McArthur Foundation, enablers for driving circular economy measures can be categorised by the following: Strategy and Planning, Innovation, People and Skills, Operations and External Engagements. Table 2.1 below identifies the relevant enablers for the requirements for Material Content and Declaration measures using these categories.

Table 2.1 Requirements for Material Content and Declaration - enablers for implementation

Enabler	Description
Strategy & planning	<ul style="list-style-type: none"> ▪ Life cycle thinking should consider all the materials and processes over the whole lifecycle of the product. Ideally, a manufacturer will disclose their processes to a material level at each stage.
Innovation	<ul style="list-style-type: none"> ▪ Digital Product Passports enhance data on products to be accessible from a single source (typically accessible electronically). A digital passport can provide information on a product's origin, material composition, durability, supplier, reuse, repair and dismantling options, testing/certification, and end of life handling. Data could be integrated into a product and a sharing platform. ▪ Optimising manufacturing methods/logistics to design and produce products with the intention for minimal waste, use of recycled materials, and resource-efficient systems with longevity. (e.g., especially among key players of the value chains inclusive to manufacturers of ErPs, and Raw material extraction companies).
People and skills	<ul style="list-style-type: none"> ▪ Development of training, education and awareness-raising programmes for consumers, designers, producers, and distributors of products. Topics can include material content, reparability, reuse, and recyclability.
Operations	<ul style="list-style-type: none"> ▪ Reverse logistics - returning a product to the manufacturer or distributor, forwarding it on for servicing, repair, or recycling. ▪ Market demand - Second-hand markets for recycled products or materials, including resale, reuse, and take-back schemes.
External engagements	<ul style="list-style-type: none"> ▪ Encouraging the number of voluntary contribution schemes that influence value chain and cross-sectoral initiatives and information sharing. The integration of circular aspects in public procurement schemes.

Under “people and skills” and “operations” described in Table 2.1, the key stakeholders and value chain actors for the requirements for Material Content and Declaration include the following:

- Raw material extraction companies – would require increased responsibility and revised protocols/business models to address the traceability of material content, as well as sustainable production and extraction of resources.
- The manufacturers of ErPs – will be impacted by a potential increasing of costs to produce products which cater for circular material content (e.g., recyclability), and incorporate new manufacturing systems that allow to reprocess waste back into manufacture.

- Distributors and dealers who supply products to consumers/users – will have increased responsibilities in providing support to customers to minimise disposal facilities for Waste from Electrical and Electronic Equipment (WEEE).
- Consumers/users – will envisage to have greater awareness of material content, recyclability, and market incentives to minimise disposal of ErPs.
- Waste recycling centres/ waste management companies – may see increased demand and require enhanced facilities to collect waste, manage its recovery and/or disposal .
- Recyclers – may see increased demand to accept waste from recycling centres and/or waste management companies; some of these are in partnership with the manufacturers.

2.5 Key initiatives and best practices

This section presents current best practices and initiatives related to requirements for material content and declaration.

- **Plastic packaging tax** will be implemented from April 2022 in the UK and will affect all plastic packaging components produced or imported into the UK that do not contain at least 30% recycled plastic.
- **The Sustainable Products Initiative¹³ (SPI)** is under development by the European Commission and presents the concept of **Digital Product Passport**. It is a format that can be used to present requirements on mandatory sustainability labelling and/or disclosure of information to market actors along value chains.
- The Horizon 2020 research project **Building as Materials Banks (BAMB)¹⁴** has developed more than 300 material passports for construction products. This study defined Material Passports as ‘electronic and interoperable data sets’ that collect characteristics of materials and assemblies. This enables suppliers, designers, and users to have the highest possible value and guidance towards material loops. The availability and relevance of the use history and reuse potential of a component can facilitate reuse, recycling and biodegradation of that component. Moreover, it is crucial for choosing components that can be reused in the future. Accordingly, the development of materials passports is seen as a mechanism to encourage innovative product design and the implementation of circular business models¹⁵.
- The **E-waste calculator¹⁶** is a WEEE calculator developed by the WEEE4FUTURE project. This calculator asks consumers how many broken,

¹³ [Sustainable products initiative](#)

¹⁴ [Building as Material Banks – Material Passports](#)

¹⁵ https://www.designingbuildings.co.uk/wiki/Materials_Passports#References

¹⁶ [E-waste calculator - WEEE4Future \(eitrawmaterials.eu\)](#)

old and unwanted appliances they have at home and helps identify appliance materials that can be recycled and the potential emissions saved. It also has several educational modules that allow the user to educate themselves.

- **CEN-CLC/JCT 10**¹⁷: Energy-related Products - Material Efficiency Aspects for Ecodesign¹⁸: An existing group of 8 standards and one technical report that contain generic principles to consider when addressing the material efficiency of ErPs. This is inclusive of the ability to reuse components or recycle materials from products at the end-of-life, the use of reused components and/or recycled materials in products.

2.6 Relevant policies, legislation, and standards

This section maps out the policies, legislation and standards currently in place, or being considered which relate to the horizontal measure of the requirements for Material content and declaration. This allows visibility of which policy levers have been used, which have not, and which can be expanded upon. This has been done for policies in the UK, in the EU and for the rest of the world.

2.6.1 UK

Table 2.2 presents policies, legislation and standards in place in the UK.

¹⁷ CEN-CENELEC Joint Technical Committee 10 on Energy-related Products – Material Efficiency Aspects for Ecodesign

¹⁸ [CEN - Technical Bodies - CEN/CLC/JTC 10](#)

Table 2.2 Relevant policies, legislation, and standards in the UK for horizontal measure: Requirements for Material content and Declaration

Title	Existing/ Proposal/ Working Plan (Date)	Description	Relevance
BS EN IEC 62474:2019	Existing standard, 2019	British standard on material declaration for products related to the electrotechnical industry. Establishes requirements for reporting of material declaration data, standardising protocols, and facilitating the transfer and processing of data.	Technical standard that specifies the procedure, content and form relating to material declarations.
PAS 2050:2011	Existing standard, 2011	Specification for the assessment of the life cycle greenhouse gas emissions of goods and services.	Details requirements for assessing the lifecycle GHG emissions of goods and services.
BS EN 45557:2020	Existing standard, 2020	General method for assessing the proportion of recycled material content in ErPs. Framework to be used for defining the assessment of recycled materials content in specific product groups	Technical standard that specifies the assessment procedures for the recycled material content of ErPs.
BS EN 45558:2019	Existing standard, 2019	General method to declare the use of critical raw materials in ErPs. Standardised format for reporting information on the use of CRMs in ErPs by applying the EN IEC 62474. However, does not provide or determine any specific method or tool to collect CRM data.	Technical standard that specifies the assessment procedures for the declaration of critical raw materials in ErPs.
BS EN 45559:2019	Existing standard, 2019	Methods for providing information relating to material efficiency aspects of ErPs.	Defines the method for the provision of information related to the material efficiency of ErP.
Waste electrical and electronic equipment: evidence and national protocols guidance May 2020	Existing legislation, 2020	UK WEEE collection targets. WEEE evidence provides proof of reuse or treatment by an approved authorised treatment facility or export of the whole appliance by an approved exporter.	UK regulation, applicable to the majority of the product groups.

Title	Existing/ Proposal/ Working Plan (Date)	Description	Relevance
UK Chemical Framework 2020	Proposal, 2020	Study on the drivers and scope for a UK chemicals framework inclusive of the UK's place in global circular economy supply chains. This involves establishing a dedicated UK Chemicals Agency, UK Institute for Chemicals Safety Assessment. Provides data on chemicals and annual consumption in the UK.	Defines the scope for recording and tracking the environmental impact of chemical consumption and related waste streams.
Environment Bill: Chemicals Regulation 2020	Proposal, 2020	Committee briefing on the Environment Bill's provisions relating to formulating a REACH legislation for the UK. Seeking to regulate substances that are known to be hazardous and data to be generated for new substances whose safety is unknown.	Proposed UK regulation which promotes the requirements for data and traceability of hazardous substances.
UK Government's Environmental Audit Committee report into e-waste Nov. 2020	Proposal, 2020	A study into how the UK can enhance its environmental management and access to critical materials by better minimising its e-waste. Reporting on electronic waste and the circular economy.	Presents a scope for the reporting and traceability of waste streams, particularly within the electronics sector in the UK.
WRAP Electrical and Electronic Equipment Sustainability Action Plan March 2015	No longer active.	A voluntary agreement with 74 signatories focussed on extending product durability through design and encouraging circular business models. This is now closed as WRAP was unable to meet their business plan targets for funding from businesses and governments due to an unwillingness to sign an agreement that limited the scope to the UK.	Although no longer active, this action plan presents both the challenges and demand for encouraging circular business models, including material durability standards.
WRAP REBus 2013	No longer active. This project has been completed.	European wide LIFE-funded project to create resource efficient business model pilots.	Presents the demand and potential for encouraging resource efficient business models, which incorporates aspects of material content and declaration.

2.6.2 Europe

Table 2.3 presents policies, legislation and standards and should be read to apply to all legal entities established in the European Union and the other Member States of the European Economic Area as of 2021 (e.g., Norway, Iceland, and Liechtenstein), unless stated otherwise.

Table 2.3 Relevant policies, legislation, and standards in Europe for horizontal measure: Requirements for Material content and Declaration

Title	Existing/ Proposal/ Working Plan (Date)	Description	Relevance
EU green public procurement criteria for data centres, server rooms and cloud services: 2020	Existing standard, 2020	This criterion is only applicable to the procurement of new servers and data storage in an enterprise data centre. Methods for providing information relating to material efficiency aspects of Energy-related Products. Test results obtained for CE marking may be used as verification.	Promotes the declaration of material efficiency relevant to the procurement of new servers and data storage, in an enterprise data centre.
The EU Classification, Labelling and Packaging (CLP) Regulation EC No 1272/2008	Existing regulation, 2008	To determine whether a substance or mixture displays properties that lead to a hazardous classification. To ensure a high level of protection of health and the environment, as well as the free movement of substances, mixtures, and articles.	Promotes the declaration of material content, specifically hazardous substances.
The Prior Informed Consent Regulation (EU) 649/2012 European Chemicals Agency (ECHA)	Existing regulation, 2012	Administers the import and export of certain hazardous chemicals and places obligations on companies who wish to export these chemicals to non-EU countries.	Promotes the declaration and traceability of hazardous substances.
The raw materials initiative EC 2741/2008	Existing legislation, 2008	Fair and sustainable supply of raw materials from global markets. Sustainable supply of raw materials within the EU. Resource efficiency and supply of 'secondary raw materials' through recycling	Promotes material circularity via the sustainable supply of raw materials and secondary raw materials through recycling.

Title	Existing/ Proposal/ Working Plan (Date)	Description	Relevance
EU chemicals policy and legislation – REACH EC No 1907/2006	Existing legislation, 2006	A legislation which supports the protection of human health and the environment from the risks that can be posed by chemicals, while enhancing the competitiveness of the EU chemicals industry. It works to encourage a shift to ‘safe-by design chemicals’ through the progressive substitution of hazardous substances to better protect citizens and the environment.	Promotes the declaration and traceability of hazardous substances.
Restriction of Hazardous Substances in Electrical and Electronic Equipment (RoHS)	Existing legislation, 2011	EU rules restricting the use of hazardous substances in electrical and electronic equipment to protect the environment and public health.	Promotes the declaration and traceability of hazardous substances among electrical and electronic equipment.
Waste Electrical and Electronic Equipment Directive (WEEE Directive 2012/19/EU)	Existing standard, 2012	WEEE encourages producers to integrate recycled material into new equipment.	Promotes material recyclability, remanufacturing and upgradeability.
EU Ecodesign and Ecolabelling Preparatory study for the Ecodesign and Energy Labelling	Proposal for new regulation (Working Plan 2020)	This preparatory study outlines the demand for the European Commission in preparing the 'Ecodesign and energy labelling working plan 2020-2024'. It will be the first 5-year plan to combine formally the future priorities for the implementation of the Ecodesign Directive 2009/125/EC and Energy Labelling Regulation (EU) 2017/1369. It provides incentives for enhanced regulation that complies with enhanced product support information for both consumers and producers.	This EU proposed regulation supports the future priorities of the existing Ecodesign Directive and Energy Labelling regulation, via promoting enhanced product support information for both consumers and producer.
EU Sustainable Product Policy & Ecodesign	Proposed legislation, 2020	Under the EU Ecodesign directive the commission is developing a new policy that will be inclusive to: <ul style="list-style-type: none"> measures on raw materials and products (e.g., certifications demonstrating due diligence to eliminate child or slave labour and environmental impacts) 	Promotes material efficiency, recyclability and circularity via measures on raw materials and production processes.

Title	Existing/ Proposal/ Working Plan (Date)	Description	Relevance
		<ul style="list-style-type: none"> measures on production processes (e.g., to facilitate recycled content or remanufacturing and to minimise the use of hazardous substances) 	
Sustainable Products in a Circular Economy - Towards an EU Product Policy Framework contributing to the Circular Economy.	Proposal for new regulation (Commission Staff Working Document 2019)	The European Commission is assessing whether and how a tracking system could contribute to improving the workability of information requirements for substances of very high concern (SVHC). Introduce the potential of digitalisation of product information, including solutions such as digital passports and tagging.	Proposed EU regulation which seeks to enhance traceability and material declaration of SVHC, by encouraging digital product passports among other measures.
CleaR, Clean Material Recycling Project	Project underway, 2020	A study to develop an evidence-based approach to support regulators when assessing how to manage the presence of substances of concern in recycled materials.	A study which seeks to enhance the traceability and material declaration of SVHC.
Chemicals Strategy for Sustainability	Proposal for new regulation, (Working Plan 2020)	Proposal/road map that includes the EU ambition to adopt regulatory tools to ensure a 'safe and sustainable-by-design criteria for chemicals' approach, reaching a clean circular economy. This also incorporates motivation to increase the safety and trust in recycled materials and products. A part of the wider EU Green Deal ambition.	A proposed EU ambition/road map which promotes the regulation of sustainability, safety and circularity among the chemicals sectors.
EU Circular Economy Action plan 2020	Proposal of new regulation, (Working Plan 2020)	Establish sustainability principles and other appropriate ways to regulate the increase of recycled content in products, mobilise the potential of digitalisation of products information, including solutions such as digital passports, tagging and watermarks and reward products based on their different sustainability performance.	Promotes the traceability and demand of recycled material content in products, by encouraging digital product passports among other measures.

2.6.3 Rest of the World

The relevant policies, legislation and standards in the rest of the world are presented in Table 2.4.

Table 2.4 Relevant policies, legislation, and standards globally with exception to the UK and Europe, for horizontal measure: Requirements for Material content and Declaration

Title	Existing/Proposal/Working Plan (Date)	Description	
ISO 14025:2006	Existing Standard, 2006	Environmental labels and declarations — Type III environmental declarations — Principles and procedures	Technical standard that specifies the procedure, content and form relating to environmental labels and declarations, relevant to all ErPs.
ISO 14027:2017	Existing standard, 2017	Environmental labels and declarations — Development of product category rules. Principles, requirements, and guidelines for developing, reviewing, registering and updating PCR within a Type III environmental declaration or footprint communication programme based on life cycle assessment	Technical standard that specifies the procedure, content and form relating to environmental labels and declarations, relevant to all ErPs.
EPEAT Ecolabel	Existing standards, 2019	Managed by the Global Electronics Council (GEC). The standard provides a global ecolabel for green electronic equipment (inclusive to PCs and Displays, Televisions, and Imaging Equipment (printers, copiers, scanners, multifunction devices, fax machines and mailing machines). It also addresses the elimination of toxic substances, the use of recycled and recyclable materials, product design for recycling, product longevity, energy efficiency, corporate performance and packaging attributes.	Technical standard that specifies the requirements of environmental labels, energy efficiency, material recyclability and the elimination of toxic substances - relevant to electronic equipment.
The Global Recycle Standard (GRS)	Existing standard, 2008	The GRS is an international, voluntary, full product standard that sets requirements for third-party certification of recycled content, chain of custody, social and environmental practices, and chemical restrictions.	Technical, voluntary standard which promotes traceability of recycled material content.
The Basel Convention	Existing standard, 2020.	The Basel Convention establishes standards for the transboundary movement of hazardous waste, solid waste, and municipal incinerator ash, including notice to and written confirmation from the receiving country prior to export. As of November 2020, 187 countries and the European Commission are parties to the Convention. The United States is a signatory to the Basel Convention, but has not yet become Party to the Convention.	Technical standard which promotes the traceability of hazardous substances and their waste streams.

Title	Existing/Proposal/Working Plan (Date)	Description	
Universal circular economy policy goals: enabling the transition to scale	Proposed standard, 2021.	Ellen MacArthur Foundation - The proposal outlines 5 universal circular economy policy goals around which governments and businesses can align to achieve their common objectives. Applicable across sectors and local contexts. The proposal aims to establish criteria to help create alignment and foster collaboration so that the full potential of the circular economy can be captured.	A proposed global standard which presents meeting high level circular economy policy objectives, including the requirements for material content and declaration via digital product passports.
Policy Platform for Chemicals & Waste Management	Proposed standard, 2021.	Support for an Independent United Nations Intergovernmental Science-Policy Platform for Chemicals & Waste Management (IPCWM)	Presents the support for implementing a platform to assist new policies and regulations for chemicals and waste management.
Global Chemicals Outlook II – From Legacies to Innovative Solutions: Implementing the 2030 Agenda for Sustainable Development	Proposed regulation, 2021.	Mandated by the UN Environment Assembly, the agenda seeks to alert policymakers and other stakeholders to the critical role of the management of chemicals and waste. It takes stock of global trends, market development and gaps from the chemicals and waste sector, and sustainability by 2020.	Promotes an enhanced global traceability of chemicals and waste.

2.7 Opportunities for helping deliver on other UK strategies

The UK is committed to embracing circular economy measures into different policies and several strategies are being developed to achieve this. This case study focuses on the potential of this horizontal measure to be implemented for a group of ErPs, aligned with other initiatives. This mapping/cross-referencing exercise identifies opportunities for successful implementation of the horizontal measure. Table 2.5 below summarises potential benefits that could be achieved through the implementation of this horizontal measure and alignment with key policy and regulatory measures.

Table 2.5 Alignment opportunities of the requirements for material content and Declaration with key existing policy and regulatory measures.

Alignment with 25 Year Environment Plan ¹⁹	Alignment with Resources and Waste Strategy for England ²⁰	Alignment with Waste Prevention Programme for England ²¹	Expected benefits from requirements for material content and declaration
<ul style="list-style-type: none"> • Use resources from nature more sustainably and efficiently. • Minimise waste. • Manage exposure to chemicals. Specifically, harmful chemicals: PCBs, Mercury, POPs. • Enhance sustainability. • Achieve zero avoidable plastic by the end of 2042. 	<ul style="list-style-type: none"> • Introduce a tax on plastic packaging with less than 30% recycled plastic. • Manage chemical sustainability and address barriers to reuse and recycling through a Chemicals Strategy. • Establish an electronic waste tracking system giving more granular data on the location and content of waste materials. • Ban plastic products where there is a clear case for it and where alternatives exist. • Address information barriers to the 	<ul style="list-style-type: none"> • Adopt a precautionary approach concerning chemicals used in products. This will help guard against future chemical bans leading to products and materials wasted. • Establish a National Materials Datahub to provide detailed information to enable the visibility of materials flow and encourage circularity. • Establish an electronic waste tracking system. • Introduce product passports. 	<ul style="list-style-type: none"> • The traceability system can track materials from the moment they are placed on the market until the end of life, which can provide the following benefits: <ol style="list-style-type: none"> 1. Access to certified reused and recycled materials to provide resources, cost, and carbon savings. 2. Easier recovery and recycling processes for materials, CRM and hazardous materials. 3. Access to product information by consumers.

¹⁹ [25 Year Environment Plan](#)

²⁰ [Our Waste, Our Resources: a strategy for England](#)

²¹ [Waste Prevention Programme for England](#) – Consultation Version

Alignment with 25 Year Environment Plan ¹⁹	Alignment with Resources and Waste Strategy for England ²⁰	Alignment with Waste Prevention Programme for England ²¹	Expected benefits from requirements for material content and declaration
	<ul style="list-style-type: none"> • use of secondary materials. • Encourage waste producers and managers to implement the waste hierarchy in respect to hazardous waste. • Support further investment and innovation in resource efficiency, working with the UK. • Research and Innovation (UKRI) on our Areas of Research Interest • Launch a call for evidence on the development of standards for bio-based and biodegradable plastics. 		

2.8 Options of interaction with other Horizontal Measures

This section reviews the potential interaction of the requirements of Material Content and Declaration with other horizontal measures proposed. Material declarations may facilitate the enactment of repairability measures and product support features as they could provide a standardised framework for all products to work from.

Interaction with Product Support

Product Support measures can relate to material content and declaration via the implementation of Product Passports, which can declare the accessibility to repair

and recycle material content in addition to material content information. Product support information could help consumers prolong the lifespan of a product.

2.9 Assessment

2.9.1 Measuring the impact

No measurable impacts with reference to costs and benefits or carbon savings were found in the literature. The reference documents only emphasise the importance of implementing these types of measures, but no data was found.

The impact of establishing a horizontal measure for the requirements for Material Content and Declaration can be hard to quantify, as it is a horizontal measure which is impacted by the whole product lifecycle. As a result, the effectiveness of implementing this measure can be better understood by reviewing the following:

1. How requirements for material content and declaration drives demand for adaptable, reversible design strategies and resources,
2. How material content requirements reduce waste, and enhance recycle and reuse, by understanding the relative carbon and cost savings.

Through material requirements and declaration policies, a materials content limit could be set to maximise materials efficiency, for example, bulk plastics in plastic casing or light weight products as a result of material limits. This could also have an impact to reduce packaging of products. One study found that reducing the weight of PET packaging trays reduced the carbon footprint of the product by 28%²². and the EELWP 2020-2024, estimates a 15-20% reduction in carbon dioxide and other emissions from materials production for ErP through light-weighting. A 2018 Green Alliance report²³ estimated 2.65 MtCO_{2e} could be saved between 2023-2032 from reduced steel use in electronics and appliances.

The relative carbon and cost savings of recycled plastics, driven by the requirements for material content and declaration:

Material requirements for recycled plastic material content could have a large impact on reducing carbon emissions, as well as reducing waste and the use of toxic chemicals in synthesising new polymers. Incorporating recycled materials into a product reduces the carbon footprint and cost of the product. It also fosters the development of the plastic recycling industry which would be further assisted with this policy measure.

The EELWP 2020-2024 looked at the carbon savings and environmental impact of using virgin versus recycled materials for three plastics: high-density polyethylene (HDPE), polyvinyl chloride (PVC) and polyester (PET). They found that using

²² [Recycled plastic reduces carbon footprint of packaging](#)

²³ [Less in, more out: using resource efficiency to cut carbon and benefit the economy – Green Alliance 2018](#)

recycled materials over virgin materials reduced the global warming emissions of the manufacturing process by up to 50% (2.31 kg CO₂e.). A saving of 25-50% materials costs was also found. Axion Polymers found the carbon savings of using recycled polymers could be as high as 82.5% for high impact polystyrene (HIPS), used in water tanks, refrigerators and instrument control knobs²⁴.

Table 2.6 presents a brief analysis of cost and benefits undertaken in Task 3. The potential costs and benefits criteria scores were based on the potential impact that the implementation of the horizontal measures might have across the supply chain. Evaluating actual costs of implementation of horizontal measures will require a whole-system approach that would be more complex and would include a wider range of stakeholders and therefore, this analysis was based on existing references and studies, per measure and product group, supported by previous experience from the research team by engaging with different stakeholders and policy related studies.

Table 2.6 Typical distribution of costs and benefits (extracted from the Task 3 ErP Policy Study report).

Energy related policy lever & horizontal measures	Costs						Benefits			
	Government	Manufacturers	Retailers	Energy suppliers	End-users	Society	Manufacturers	Government	End users/ Society	Repairers/
Requirements for material content and declaration		X						X	X	X

2.9.2 Challenges and Opportunities

The lack of direct control over the implementation of this measure is a big challenge to limiting the environmental footprint of products. There are standards that define the method to declare material usage or define the material declaration for products, but doubts remain on how to verify these criteria, such as the metric for recycled content of a product. Much of this is attributed to the difficulty in the extraction of certain materials and substances within a product. Moreover, once a material or chemical is recycled or deconstructed, the traceability of recycled feedstock is a key challenge. As a result, it is difficult to be certain of a specific value of recycled content for any given ErP.

Although there are some independent standards on the requirements for material content and declaration (e.g., recommendations by Rethink Plastic, Ellen MacArthur Foundation, Intertek among others), there lacks a streamlined assessment for the calculation, verification, and reporting of recycled content. However, as detailed in

²⁴ [Carbon footprint review shows 'large' savings for Axion's recycled polymers - Axion \(axiongroup.co.uk\)](https://axiongroup.co.uk)

the 2020 Ellen McArthur Foundation white paper²⁵, the following approaches offer some scope to overcome this:

- a) Identity preservation – tracking the product to its origin, ensuring unique traceability and physical separation of products from other sources along the supply chain.
- b) Segregation of volumes of products of identical origin or produced according to the same standards.
- c) Mass Balance – ensure that volumes in and out of scope source are maintained along the system/supply chain. And guarantee that the volume or the ratio of sustainable material integrated is reflected in the product produced and sold to customers.
- d) Book and claim (certificate trading) – credits or certificates are issued at the beginning of the supply chain by an independent body reflecting the sustainable content of supplies. The intended outcome is that outputs from one supply chain is associated with total credit claims corresponding to the certified input.

Market barriers and opportunities

A key challenge relative to recycled materials is to make them economically competitive with virgin plastics. Recycled material access and price may be improved through improved logistics and material sorting techniques. However voluntary approaches, such as labelling, were identified to not provide sufficient incentives for businesses to offer more sustainable products.

As part of the stakeholder's consultation, one trade association stated that information to aid purchasing decisions is more impactful for professional buyers than the end consumer, as the professional buyers decide what consumers can choose from.

Some studies suggest that declarations might evolve to use labels to convey information on material content, presence of hazardous substances or CRM as well as the recovery potential of the materials from the product could be evaluated from this. Material requirements and declarations on CRM and hazardous materials, is important for regulating and minimising the use of these substances, this can be aided with clear information relating to distribution and recovery. In addition, developing rules on measuring and declaring recycled content in products also will contribute to preventing a mismatch between supply and demand of secondary raw materials and ensure the smooth expansion of the recycling sector in the EU²⁶.

Product passports, smart reporting & market surveillance

Studies on the effectiveness of labelling material content and product information have mixed opinions on its effectiveness to drive market demand for resource efficiency. There is a consensus that labels are useful to share information for

²⁵ [Mass-Balance-White-Paper-2020.pdf \(ellenmacarthurfoundation.org\)](#)

²⁶ [A new Circular Economy Action Plan For a cleaner and more competitive Europe 2020](#)

consumers to aid purchasing decisions, as well as an important awareness instrument. However, existing labels (e.g., energy labelling or EU ecolabel), can be improved to better reflect the product impact (e.g., lifespan, material composition and end of life options).

The use of smart tags and QR codes connected to a digital database is a potential solution to provide additional information for consumers and manufacturers (e.g., traceability of products/materials). This also works in alignment with the Ellen MacArthur Foundation recommendations for Universal Circular Economy Goal 1, which includes the sharing of information and tracking through product labels, tags, and digital product material passports, provision of repair manuals, as well as guarantee and warranty provision²⁷.

The main challenge with instruments like product passports is related to the diversity of existing sets of requirements, standards, datasets and tools with thematic relations to Product Passports. The potential for these digital passports is to establish a unique datapoint that will also enable the incorporation of existing mechanisms (bill of materials, bill of substances, product specification, Environmental Product Declarations, etc.).

It is important that such information is relevant as support for circularity to manufacturers and consumers, and to also avoid reproducing any existing data. This presents the key concerns of manufacturers and their suppliers, who will play an important role in populating these passports.

2.9.3 Evidence gap

During the research for this study, the following evidence gaps were identified:

- **Lack of measurement and assessment of impacts related to material content of products**
- **Lack of information on costs and benefits and carbon savings**
- **Limited data and research on environmental impacts across manufacturing processes and the whole supply chain.** There is limited evidence related to the design stage and manufacturing process of products. In most of the cases where data exists, it had been commissioned by the manufacturers and is not always publicly available.
- **Lack of standardisation on what is waste and post-recycled content.** Clarification is needed on the classification of waste (Waste and WEEE regulations), as there are still barriers related to what is classified as waste, by products or secondary resources. Defra is planning to consult on the WEEE regulations this summer and therefore this is an opportunity to address some of these questions with the industry.

²⁷ [Universal circular economy policy goals](#)

- **Lack of insight and review on the burden of proof for breach of guarantees.**

2.10 Recommendations and proposed next steps

This section summarises the key proposed next steps and recommendations. Key services proposed under the requirements for Material Content and Declaration:

Product Passports

- Online provision of information offers the ability to convey a large degree of data in a targeted way, and it is also a convenient method to update data (e.g., with any new or additional data provided by the manufacturer).
- The development of Digital Product Passports is recommended in a format of a digital platform/directory, but only if aligned with other international standards and requirements, otherwise, it may be a barrier and additional costs to enter the UK market. ISO has started working on a standard for “Product Circularity Data Sheets” – its objective can be compared to the Product Passport concept. It is recommended to wait for ISO to deliver its work, as well as the publication of the EU Sustainable Products Initiative (December 2021), to ensure the UK approach is in alignment.

Promoting regulations aligned with Post-consumer Recycled Content.

- Any standards or requirements which deliver on recycled content needs to acknowledge that the market might not always provide the required quantity and quality for upcycled goods. In addition, such standards might disrupt current supply chains, due to instilling a new cycle of production and market demand.
- Alignment with other regulations is recommended, like the recently adopted requirement to notify shipments of waste plastics under the Basel Convention. “As of January 1, 2021, the Basel Convention controls international shipments of most plastic scrap and waste destined for recycling or disposal. In other words, transboundary movements of most plastic scrap and waste are subject to Basel Convention prior notice and consent requirements. This includes hazardous and most non-hazardous plastic scrap and waste.”²⁸
- Improved communication and engagement with producers, distributors, and dealers to ensure they are aware of legal requirements and future initiatives e.g., to determine ideal % post-consumer recycled content values for regulation.

²⁸ [New International Requirements for the Export and Import of Plastic Recyclables and Waste | Hazardous Waste Generators | US EPA](#)

The requirements for Material Content and Declaration should incorporate enhanced transparency and regulation on the relative environmental impacts for any given ErP.

- Clarification on the classification of waste and non-waste (Waste and WEEE regulations) - the differentiation between materials that are wasteful and those which are not.
- Enhanced transparency, disclosure, and data management on waste streams for various product categories.
- Enhanced traceability of recycled feedstock – this will need to be tailored to each product category; however, guidance should be sought from the approaches suggested in the 2020 Ellen McArthur Foundation white paper²⁹. Emphasis on alignment of future policies with addressing a mass balance approach or a book and claim approach could be feasible across majority of ErPs. However, further research and stakeholder engagement is required in this respect.
- Better co-operation and information sharing between authorities, and across multi-national governments.

²⁹ [Mass-Balance-White-Paper-2020.pdf \(ellenmacarthurfoundation.org\)](https://ellenmacarthurfoundation.org/mass-balance-white-paper-2020)

3 Repairability measures – including modular design

3.1 Assessment objective

This chapter presents the study on the horizontal measure requirements for Repairability Measures – including modular design, and forms part of the wider research project commissioned by BEIS and Defra to help inform the future Energy-Related Product standards in the UK. This study has identified the product groups and horizontal measures that can provide a high potential for savings (energy, emissions, resources).

For this study, horizontal measures were defined as requirements that could be applied to many or all Energy-related Products. The horizontal measures also apply to products where specific Ecodesign requirements do not yet exist. Horizontal measures may relate to energy efficiency or to resource efficiency.

This case study will provide descriptions, coverage, a summary of key stakeholders, alignment with UK policies, our analysis on impacts, and recommendations and next steps.

The case study outlined in this chapter will look at the possibility of limiting the environmental footprint of products by setting requirements to increase repairability. This includes the suitability of non-destructive disassembly into smaller components that can be replaced and upgraded, repaired, remanufactured, used in a different product, or adapted to other functionalities. This case study also provides evidence to inform future decision making around these measures and investigates recommendations for further policy investigation.

3.2 Horizontal measure description

Repairability is defined as the ability and ease of which a product can be repaired during its life cycle³⁰. Repairing broken or damaged products can save consumers money by helping them delay replacement purchases, while also benefiting the environment through lower waste production and use of resources³¹. By keeping products in the cycle of repair and reuse, this measure could help drive circularity by moving to a closed material loop system and reducing waste/disposal. Repairability measures can impact manufacturers, consumers and other stakeholders in the value chain such as suppliers and repairers.

³⁰ [New International Requirements for the Export and Import of Plastic Recyclables and Waste | Hazardous Waste Generators | US EPA](#)

³¹ [Consumers and repair of products \(europa.eu\)](#)

Modular design enables quick and easy repairs. It is defined as “an approach that divides a system into smaller parts (modules) which can be independently used in different systems to drive multiple functionalities”³². By designing products so that components can be easily removed, repaired, and replaced, the lifespan of the product can be extended, and upgrades can be made to individual components of a product. For example, Fairphone is a modular smartphone which allows its users to replace individual components and upgrade them, such as developments in camera technology³³.

This measure could include policies to design for disassembly, increase availability of spare parts, increase suitability for remanufacturing, modular design, and alignment with a repairability index. Essentially, the measure considers that any broken or damaged parts of a given product is to be either removed, repaired, and replaced, without scrapping the entire product. Repairability can greatly increase the lifespan of a product, extending its period of use and reducing the degree of material waste.

Durable products are those designed to last longer to maintain their operational utility for longer. This also benefits users by saving money on replacements³⁴. The durability of a product is linked with repairability, so these concepts should be considered together. For example, highly durable products may have greater resistance to be disassembled and remoulded, hence they may have reduced accessibility to repair and reuse individual components.

There are a variety of direct and indirect policy approaches to promote durability and repair in products. One study suggests that more than 80% of all product-related environmental impacts are determined in the design phase³⁵. Manufacturer initiatives to promote modular design and other circular economy design principles are therefore important. There are also a few approaches to set clear requirements on product lifespan, repairability and recyclability. These include the following:

- Integrating durability information into energy labelling.
- Setting durability requirements in public procurement criteria.
- Entering into voluntary agreements over durability across industry.
- Promoting modular design is also a means of enabling more direct policy approaches. This can involve setting a legal requirement to enable easier repairs via the availability of spare parts for several years after product purchase, or mandating manufacturers to provide information to facilitate repairs. It is also possible to promote repairability via repair schemes, reduced taxes on repairs and repair indexes.

³² [Modular Design – CIRP Encyclopedia of Production Engineering](#)

³³ [Fairphone | The phone that cares for people and planet](#)

³⁴ [Advancing to a Circular Economy: three essential ingredients for a comprehensive policy mix](#)

³⁵ [Building as Material Banks – Material Passports](#)

3.3 Coverage

This horizontal measure could apply to all product groups assessed as part of Task 3 and 4. For example, products can be theoretically be redesigned to be modular and be easy to disassemble, but practically speaking the cost of this resign would vary for each product. Annex 2 presents Task 3 assessment results on potential coverage of the horizontal measures, per shortlisted product.

3.4 Key enablers and stakeholders

The main circular economy enablers relevant to this horizontal measure focus on the development of quality processes and protocols, design for disassembly, durability, availability of spare parts and capacity building training.

As defined by the Ellen McArthur foundation, enablers for driving circular measures can be categorised by the following: Strategy and Planning, Innovation, People and skills, Operations and External Engagements. Table 3.1 below identifies the relative enablers for reparability, including modular design measures, under these categories.

Table 3.1 Reparability - Modular Design enablers for implementation

Enabler	Description
Strategy & planning	<ul style="list-style-type: none"> ▪ The development of quality protocols and processes, such as recertification of specific elements and composition of products. Ensuring compatibility between modules into the final product.
Innovation	<ul style="list-style-type: none"> ▪ Life cycle thinking - should consider all the materials and processes over the whole lifecycle of the product (including end of life). Ideally, the designer and/or manufacturer will adjust design processes and product system requirements to enable a modular design process. ▪ Standardising and defining the extent of remanufacturing – reconditioning of products to a level of quality, functionality, and warranty equal to new products; to enable the ease of disassembly, repair, and replacement of parts, whilst maintaining stable processes and technologies³⁶. ▪ Digitalisation and internet of things – to enhance smart solutions to aid the process of fault recognition and debugging modular systems, as well as improve communication between producer and consumer for repair and reuse
People and skills	<ul style="list-style-type: none"> ▪ The development of training, educational and awareness raising programmes for designers and producers on modular design covering design for reparability, disassembly and remanufacturing. ▪ Enhance research and development to obtain greater data on the impacts of modular systems.

³⁶ Matsumoto et al. (2016). Trends and research challenges in remanufacturing. International Journal of Precision Engineering and Manufacturing-Green Technology. Vol. 3, p129-142. Available online at: <https://link.springer.com/article/10.1007/s40684-016-0016-4>

Enabler	Description
Operations	<ul style="list-style-type: none"> ▪ Optimising manufacturing methods/logistics - the development of feasible production processes that cater for modular design for a variety of product categories, (e.g., product durability, spare parts, and ease of disassembly). ▪ Reusability - Feasibility assessment of utilising varying modules for various product system categories, understanding the extent of reusability/recyclability of each individual module as a means of post-recycled consumer content.
External engagements	<ul style="list-style-type: none"> ▪ Voluntary collaboration schemes - encouraging value chain and cross-sectoral initiatives and information sharing. ▪ Procurement - The integration of circular aspects in public procurement schemes, inclusive to modular design.

The key stakeholders and supply chain actors that could either enable or be impacted by the implementation of repairability measures, including modular design, includes the following:

- Product designers – would likely have increased costs to redesign products for modularity and improved repair.
- The manufacturers of ErP – who design and produce these products, would have responsibilities to minimise use of scarce resources and manage electrical and electronic equipment (EEE) but also can reprocess waste back into manufacturing new products.
- Distributors and dealers – supply the product to consumers/users and could have increased responsibility to provide customers with accessible disposal facilities and methods to potentially sell and repair individual product components.
- Consumers/users – would have increased access and motive to repair, with support from manufacturers/distributors/professional repairers.
- Professional repairers – would have increased demand for labour, a skilled workforce, and engagement with consumers on conducting feasible repairs on a range of ErPs.
- Waste recycling centres/ waste management companies may have greater demand for the collection and either recovery or disposal of waste.
- Recyclers may have greater demand to accept waste from waste recycling centres and/or waste management companies; some of these are in partnership with the manufacturers.

3.5 Key initiatives and best practices

This section presents a series of current best initiatives and practices representative of repairability measures including modular design.

Existing standards for best practice:

- Contemporary repairability standards include the **Blue Angel Standard**: a voluntary certification for environmentally friendly product design in Germany which considers durable and easy to repair products as a requirement.
- Another example is **iFixit**, a platform that provides free repair manuals online combined with people's anecdotal experiences for mainly electronic products. It also provides tools for repair and spare parts which can be ordered online.
- In 2015, the European Environmental Bureau (EEB) published a report investigating the **potential for developing a repairability and durability rating scale for products**. The report looked to define criteria in detail for two specific products: tablets and wardrobes. Tablets are representative of electrical and electronic products. The product group is a primary candidate for repairability due to the growth of the sector and CRM content, whose supply shortage is noted. The framework lays out criteria considered for repairability including the availability of repair manuals and spare parts, the ease of disassembly and ability to repair with accessible tools, and ease of identifying the location of spare parts. These criteria are then scored and the quality of the repairability level assessed.
- Several Austrian federal states have implemented a “**repair bonus**” that funds up to 50% of the total cost of a repair, up to a maximum of €100. This only applies to large and small electrical appliances from commercial establishments. In Vienna, the local government just approved a €1.6 million repair funding programme for 2020 to 2023 in collaboration with Repair Network Vienna³⁷, RepaNet³⁸ and the Austrian Institute of Ecology.
- The EU's **Right to Repair** campaign calls for legislation to ensure there are minimum design requirements for easy disassembly and replacement of key components – starting with smartphones, laptops, and other IT products³⁹. It argues products should be designed to ensure durability and easy repair and repair should be accessible, affordable and mainstream, e.g. repairing a product should not exceed the cost of purchasing a new product and there should be no legal barriers to individual or community repair groups.
- This is summarised in the groups call for universal 'Right to Repair' under which every stakeholder would have access to spare parts and repair manuals for the entire lifespan of the product. This is similar to the provisions made in the set of November Package⁴⁰ Ecodesign Regulations, covered in the Product Support case study. In the short term, the Right to Repair movement aims to introduce an EU repairability scoring system as part of the existing energy label for ErPs. By adding to a recognised label, the implementation process should be considerably shorter. Having all product information on a

³⁷ [Reparatur Netzwerk](#)

³⁸ [RepaNet](#)

³⁹ [What we want - Right to Repair Europe](#)

⁴⁰ In Winter 2018/2019, updated Ecodesign requirements were agreed at EU level for a package of products “the November Package”, which included resource efficiency measures.

single label could also make the information more easily accessible to the consumer.

Existing best practice products/services:

- The Dutch company **Fairphone** aims to make long life mobile phones that are easy to upgrade and repair. Through offering a modular design and spare parts at an affordable price to stimulate self-repair, Fairphone attempts to break the cycle of constant replacement of broken or out-of-date phones. The most recent Fairphone 3 has seven modules, such as the battery and audio jack. All seven modules are available for purchase. Conscious that an average phone is replaced every 24 months, Fairphone's aim is to provide modules that can be replaced/upgraded to keep in service for over five years.
- **Repair & Share**⁴¹ is a Belgium non-profit organisation dedicated to improving the quality, repairability and lifespan of products. It supports community initiatives like Repair Cafés⁴² and tool libraries by stimulating companies and policy makers to invest in share/repair schemes. Their policy proposals are: VAT decreases on repair, lower prices for spare parts, no extension of the legal guarantee, repair score scheme, setting up a repair register in Belgium, and availability of spare parts at a lower cost.
- The **French Repairability Index**⁴³ (a regulation that came into force on 1 January 2021) seeks to establish a repair score, inclusive of the availability of spare parts, covering a range of product categories: smart phones, washing machines, TVs, computers and lawn mowers⁴⁴. Manufacturers need to provide labels with a score from 0-10 to indicate how easily repairable they are (0: red, difficult to repair and 10: green, easily repairable). The manufacturer is free to find additional ways of displaying the index, such as placing the index on the product package or adding a QR code with a link to more information. The objective of the index is to encourage consumers to choose more repairable products, and manufacturers to improve the repairability of their products. Manufacturers are responsible for calculating the scores (which has already caused controversy) by entering all the parameters in a spreadsheet⁴⁵ provided by the *Ministère de la Transition écologique*.
- The Index also encourages consumers to self-repair by scoring available of manuals and repair instructions. Although the Index has been generally welcomed, there are challenges related to who verifies the Index, how the price of spare parts is assessed and how well consumers understand the scores. Future developments are scheduled, like expanding the number of

⁴¹ <https://repairshare.be/>

⁴² [Repair Cafe](#) - free meeting places, in where expert volunteers, with repair skills, will provide tools and materials to support repairing things by consumers.

⁴³ [Indice de réparabilité | Ministère de la Transition écologique \(ecologie.gouv.fr\)](#)

⁴⁴ [Repair made easier in France thanks to new law – prompt-project.eu \(prompt-project.eu\)](#)

⁴⁵ [Repairability Index Calculator](#)

products by the end of 2021. The Right to Repair campaign is already pushing for an EU-wide index.

Other best practice schemes:

- **Kids to Repair**⁴⁶ is an **iFixit** initiative that explores the benefits of introducing kids to repair culture and influencing actions of tinkering and fixing as a skill for kids to develop. It fosters independence, technical competence, and creative problem-solving, and improves attitudes to repair, reuse, and recycle. Through initiatives that engage, educate, and explore these themes among kids it brings attention to the 4 Rs: reduce, reuse, repair, recycle, and avoids contributing to throw-away culture and e-waste. It further promotes take back schemes such as from the Electronic TakeBack Coalition and takes example from San Francisco which have repair summer camps for kids—like Tinkering School and Maker Camp.

3.6 Relevant policies, legislation, and standards

This section maps out the policies, legislation and standards currently in place, or being considered which relate to the repairability measures – modular design horizontal measure. This allows visibility of which policy levers have been used, which have not, and which can be expanded upon. This has been done for policies in the UK, in the EU and for the rest of the world.

3.6.1 UK

Table 3.2 presents policies, legislation and standards in place in the UK.

⁴⁶ [Introducing Kids to Repair: It's Easier Than You Think - iFixit](#)

Table 3.2 Relevant policies, legislation, and standards in the United Kingdom for horizontal measure - Repairability including Modular Design.

Title	Existing/ Proposal/ Working Plan (Date)	Description	Relevance
BS EN 45553:2020	Existing standard, 2020	The general method for the assessment of the ability to remanufacture Energy-related Products	Technical standard that specifies the assessment procedures for remanufacturing of ErPs.
BS EN 45554:2020	Existing standard, 2020	General methods for the assessment of the ability to repair, reuse and upgrade Energy-related Products	Technical standard that specifies the assessment procedures for the repair and reuse of ErPs.
BS EN 45555:2019	Existing standard, 2019	General methods for assessing the recyclability and recoverability of Energy-related Products	Technical standard that specifies the assessment procedures for the recyclability and recoverability of ErPs.
BS EN 45558:2019	Existing standard, 2019	General method to declare the use of critical raw materials in energy-related products	Technical standard that specifies the assessment procedures for the declaration of critical raw materials in ErPs.
PAS 141:2011 - Reuse of used and waste electrical and electronic equipment (UEEE and WEEE). Process management. Specification	Existing standard, 2011	PAS 141 sets out the requirements to successfully manage the process of preparing used and waste electrical and electronic equipment (WEEE) for reuse.	Specifies the assessment requirements on waste electrical and electronic equipment (WEEE) for reuse.
Waste electrical and electronic equipment (WEEE): evidence and national protocols guidance May 2020	Existing legislation, 2020	UK Waste Electrical and Electronic Equipment (WEEE) collection targets. WEEE evidence provides proof of reuse or treatment by an approved authorised treatment facility (AATF) or export of the whole appliance by an approved exporter (AE).	Specifies the requirements on waste electrical and electronic equipment (WEEE) for reuse.

Resources and waste strategy for England, DEFRA (2018).	Existing regulation, 2018	This strategy sets out how we will preserve material resources by minimising waste, promoting resource efficiency and moving towards a circular economy in England. Inclusive strategies are: zero avoidable waste by 2050, double resource efficiency by 2050	Promotes the ambition for meeting zero avoidable waste by 2050, and double resource efficiency by 2050 in England.
Waste prevention programme for England, Defra (2020)	Existing legislation, 2020	The programme sets out the roles and actions for the government and others to reduce the amount of waste produced in England.	Promotes action on reduced waste production, as well as general resource and waste management across England.
25 Year Environment Plan	Existing legislation, 2018	Inclusive to increasing resource efficiency and reducing pollution and waste. Work towards eliminating all avoidable waste by 2050.	Promotes resource efficiency, minimising disposal as well as mitigating environmental impacts of waste production.
WRAP Electrical and Electronic Equipment Sustainability Action Plan March 2015	No longer active	A voluntary agreement with 74 signatories focussed on extending product durability through design and encouraging new business models keeping products in circulation for longer. This is now closed as WRAP was unable to meet their business plan targets for funding from businesses and governments to progress interventions in the sector as there was an unwillingness to sign an agreement that limited its scope to the UK.	Although no longer active, this action plan presents both the challenges and demand for encouraging circular business models, including resource efficiency.

3.6.2 Europe

Table 3.3 presents policies, legislation and standards which should be read to apply to all legal entities established in the European Union and the other Member States of the European Economic Area as of 2021 (e.g., Norway, Iceland, and Liechtenstein), unless stated otherwise.

Table 3.3 Relevant policies, legislation, and standards in Europe for horizontal Repairability measures - Modular Design

Title	Existing/ Proposal/ Working Plan (Date)	Description	Relevance
The Waste Framework Directive /EU waste legislation – 2018 revision	Existing legislation (revised), 2018	<p>The Waste Framework Directive is the EU's legal framework for treating and managing waste in the EU. It introduces an order of preference for waste management called the “waste hierarchy”. The revised EU Waste legislation promotes the reuse of products and packaging and emphasises the importance of waste prevention.</p> <p>It requires the EU Member States to promote sustainable production and consumption models via resource-efficient product design, reuse of products. It also promoted product repair activity via the availability of spare parts, product support information among others.</p>	This EU legislation presents the procedures, content and form relating to waste management and waste prevention, inclusive to all ErPs – via the promotion of resource efficient design and reuse of products.
The French Repairability Index	Existing standard	Seeks to establish a repair score, inclusive of the availability of spare parts, covering a range of product categories: smart phones, washing machines, TVs, computers and lawn mowers.	This French standard establishes the scope for a repairability index applicable to a wide range of ErPs.
EU Right to Repair	Existing legislation, 2019	This EU legislation sets minimum design requirements to ensure easy disassembly and replacement of key components – starting with smartphones, laptops and other IT products.	Presents minimum design requirements for the disassembly and replacement of key components (which assists modular design), relevant to electronics and IT products.
Unfair Commercial Practices Directive 2005/29/EC and	Existing legislation, 2011	The 2016 Commission guidance on the Unfair Commercial Practices Directive (UCPD) specifies that "planned obsolescence, or built-in obsolescence in industrial design, is a commercial policy involving deliberately planning or designing a	Presents requirements for acceptable planned obsolescence and consumer protection in the case of faulty products.

Title	Existing/ Proposal/ Working Plan (Date)	Description	Relevance
the Consumer Rights Directive 2011/83/EU.		product with a limited useful life so that it will become obsolete or non-functional after a certain time". EU Consumer Legislation offers consumer protection in the case of faulty products:	
Integrated Product Policy (IPP)	Existing standard, 2001	Integrated Product Policy (IPP) seeks to minimise and assess environmental degradation from products by looking at all phases of a products' life-cycle and taking action where it is most effective, through their design, manufacture, assembly, marketing, distribution, sale and use to their eventual disposal as waste.	Presents the procedure, content, and requirements for assessing environmental degradation from products, via LCA. It promoted prevent of waste and encourages reuse/remanufacturing of products.
EU Ecodesign and Ecolabelling Preparatory study for the Ecodesign and Energy Labelling Working Plan:2020	Proposal for new regulation (Commission Staff Working Document 2020)	This preparatory study outlines the demand for the European Commission in preparing the 'Ecodesign and energy labelling working plan 2020-2024'. It will be the first 5-year plan to combine formally the future priorities for the implementation of the Ecodesign Directive 2009/125/EC and Energy Labelling Regulation (EU) 2017/1369. It provides incentives for enhanced regulation that complies with enhanced product support information for both consumers and producers.	Presents the future priorities of the existing Ecodesign Directive and Energy Labelling regulation that encourages resource efficient design and promotes enhanced product support information for both consumers and producer.
Sustainable Products in a Circular Economy - Towards an EU Product Policy Framework contributing to the Circular Economy.	Proposal for new regulation (Commission Staff Working Document 2019)	The European Commission is assessing whether and how a tracking system could contribute to improving the workability of information requirements for substances of very high concern (SVHC). Introduce the potential of digitalisation of product information, including solutions such as digital passports and tagging.	Presents the requirements for the traceability and declaration of substances of very high concern (SVHC), by encouraging the use of digital product passports and tagging.

3.6.3 Rest of the World

The relevant policies, legislation and standards in the rest of the world are present in Table 3.4.

Table 3.4 Relevant policies, legislation, and standards globally with exception to the UK and Europe, for horizontal Repairability measures - Modular Design

Title	Existing/ Proposal/ Working Plan (Date)	Description	Relevance
EPEAT Ecolabel	Existing regulation, 2018	Managed by the Global Electronics Council (GEC). The standard provides a global ecolabel for green electronic equipment (inclusive to PCs and Displays, Televisions, and Imaging Equipment (printers, copiers, scanners, multifunction devices, fax machines and mailing machines). It also addresses the elimination of toxic substances, the use of recycled and recyclable materials, product design for recycling, product longevity, energy efficiency, corporate performance, and packaging attributes.	Technical standard that specifies the requirements of environmental labels, energy efficiency, material recyclability and the elimination of toxic substances - relevant to electronic equipment.
Universal circular economy policy goals: enabling the transition to scale	Proposed regulation, 2020	Ellen MacArthur Foundation - The proposal outlines 5 universal circular economy policy goals around which governments and businesses can align to achieve their common objectives. Applicable across sectors and local contexts. The proposal aims to establish criteria to help create alignment and foster collaboration so that the full potential of the circular economy can be captured.	Presents meeting high level circular economy objectives, including the requirements for product support to assist repair, accessibility of spare parts and digital product passports.

3.7 Opportunities for alignment with other UK strategies

The UK is committed to embracing circular economy measures into different policies and several strategies are being developed to achieve it. This case study focuses on the potential of this horizontal measure to be implemented for a group of energy-related products, but there should be wider alignment with other initiatives. A holistic approach will reinforce and promote successful implementation of the horizontal measure, and a further mapping/cross-referencing exercise should be considered.

Table 3.5 below summarises the alignment opportunities and likely benefits that would be achieved through the implementation of this horizontal measure and alignment with key strategies.

Table 3.5 Alignment opportunities of Repairability - Modular Design with key strategies

Alignment with 25 Year Environment Plan ⁴⁷	Alignment with Resources and Waste Strategy for England ⁴⁸	Alignment with Waste Prevention Programme for England ⁴⁹	Expected benefits from Repairability - Modular Design
<ul style="list-style-type: none"> • Use resources from nature more sustainably and efficiently. • Minimise waste. 	<ul style="list-style-type: none"> • Set minimum requirements through Ecodesign to encourage resource-efficient product design. • Address barriers to reuse. • Support the market for remanufactured goods. 	<ul style="list-style-type: none"> • Aims to transform product design and supporting factors such as spare part and repair information provision. • The government will implement the use of consumer information schemes to enable consumers to identify resource-efficient products and make sustainable 	<ul style="list-style-type: none"> • Access to certified reused and recycled materials to provide cost and carbon savings. • Improve the rate of recycling at the end of life/waste management stage. • Keep resources from being thrown away and prolonging the lifespan of products. • Easier recovery and recycling processes for materials, CRM and hazardous materials.

⁴⁷ [25 Year Environment Plan](#)

⁴⁸ [Our Waste, Our Resources: a strategy for England](#)

⁴⁹ [Waste Prevention Programme for England](#) – Consultation Version

Alignment with 25 Year Environment Plan ⁴⁷	Alignment with Resources and Waste Strategy for England ⁴⁸	Alignment with Waste Prevention Programme for England ⁴⁹	Expected benefits from Repairability - Modular Design
		<p>purchasing decisions.</p> <ul style="list-style-type: none"> • Encourage manufacturers to design products to reduce repair and recycling costs. • Product requirements and consumer information focus on repairability, take forward producer responsibility schemes. Local authorities to pilot local circular economy hubs which support repairs, provide guidance on Local Industrial Strategies and enable sharing of best practice examples. 	<ul style="list-style-type: none"> • Reduce the rate of product disposal and landfill waste.

3.8 Options of interaction with other HM

This section reviews the potential interaction of this measure with other horizontal measures. Modular design may facilitate the enactment of repairability measures and product support features, and it could provide a standard framework for designers of products to work from.

Interaction with Product Support

Resource-efficient systems offer durability, reparability, reuse, upgradeability, and recyclability, which together promotes extending a products' lifespan and minimising

disposal. Hence, product support measures align with enabling the conditions for repairability and modular design. The following measures can influence repair and reuse:

- Extended warranties.
- Availability of firmware updates
- Extend use – durability, address premature obsolescence, repairability / upgradeability.
- Availability of spare parts
- Diagnostic software and systems
- Repair information for re-sellers and third-party repair services.

Interaction with Extended Warranty/Guarantee

There is also a close alignment between repairability measures and a mandatory minimum warranty/guarantees horizontal measure, since extended warranties/guarantees can be considered as promoting repairability, via extended producer responsibility. Key areas of alignment among measures are listed below:

- Extend use – durability.
- Extend use – reparability / upgradeability.
- End of use – recyclability
- End of use – remanufacture / refurbishment.

3.9 Assessment

3.9.1 Measuring the impact

The impact of implementing repairability and modular design was reviewed by assessing the relative effect on market demands, reversible design strategies, and related carbon and cost savings.

Enhanced market demand of repairability and second-hand trade:

The repair and reuse sectors are growing quickly. It was estimated that in 2012 (latest data available) that 11,000 Full-Time Equivalent (FTE) jobs were supported by reuse organisations. Frontier Economics⁵⁰ estimated the UK repair sector employed 35,800 people in 2017. A 2015 REUSE survey of 20 RREUSE network members from EU and USA estimated 15-110 jobs can be associated with every 1,000 tonnes of WEEE generated. These estimates can be applied to the reuse industry (e.g., increasing market demand for repair as well as resource efficient/adaptable product

⁵⁰ [The UK Digital Sectors After Brexit: An independent report commissioned by techUK](#)

design)⁵¹ and indicates repairability could have a large impact on creating new, specialised jobs.

In the short term, the impact of repairability measures including modular design is likely to be low. Additional costs are anticipated in the short term to account for capacity building for designers and manufacturers and to aid the transition of existing manufacturing processes. In the longer term, there could be significant benefits from extended lifespans of products due to modular design and repairability measures being implemented. This considers the increase in accessibility of spare parts, and the greater practice of repairability, remanufacturing and reuse across the value chain.

It is not possible to identify the timescales for the market uptake of repairability and modular design measures due to limited data from the reviewed literature. However, given the rising interest in repair culture and sustainability, there is potential for a steep growth in competitive markets to influence a wide scale impact. This timescale is also dependant on the feasibility for manufacturers to restructure resources, increase investments and train workers to deliver this transition efficiently. With respect to modular design solutions, there is greater potential for faster market uptake, but this is product dependent. This is because modular systems are already favoured in some sectors, e.g., among large plant equipment and systems.

The effect of carbon and cost savings on ErPs, as a result of repairability and modular design:

The ability to repair products or a product component omits the need for its disposal and reduces demand for product replacement. This can contribute a degree of carbon and cost savings. A 2018 Green Alliance report found that greater resource efficiency in the electronics and appliances sector in the UK could reduce emissions by 16.36 MtCO₂e between 2023 and 2032. Most of these savings could come from a 70% increase in remanufacturing processes and increased reuse of electronics by 32%. This is in line with repairability processes which aim to keep the product in use for longer. Another study estimated that extending the lifespan of all smartphones in the EU by one year could save 2.1 MtCO₂e per year by 2030. Extending lifespan by three years could save 4.3 MtCO₂e and by five years could save 5.5 MtCO₂e⁵².

Modular design systems can offer increased reliability of plant equipment. For example, a modular boiler system can help ensure a constant energy supply in case of failure of individual components. Such systems often require additional floor space due to multiple modules and have increased cost of maintenance and repair. However, a key benefit of modular plant systems is that they enable the total load and duty of a system to have flexibility. This avoids any single unit being overloaded and reduces the rate of failure.

Tax incentives to enhance market demand for repairability.

⁵¹ [Final-briefing-on-reuse-jobs-website-2.pdf \(rreuse.org\)](#)

⁵² [Cool Products don't cost the Earth – report briefing](#)

To combat its ‘throwaway consumer culture’, the Swedish government announced in 2016 **tax breaks on repairs** of clothes, bicycles, fridges and washing machines. On repair services for bikes and clothes, VAT has been reduced from 25% to 12% and on white goods, consumers would be able to claim back from income tax 50% of the labour cost on repairs. The scheme is expected to cost the state some \$54 million in lost taxes, which will be balanced by income from a new tax on the harmful chemicals in white goods.

In 2020, a similar initiative was announced by Austria, with a reduction of VAT on “small repairs” for bikes, clothing and shoes. The VAT for these types of repairs will be reduced from 20% to 10%, making it more financially appealing to repair these products rather than throwing them away and buying new ones.

Table 3.6 presents a brief analysis of cost and benefits undertaken in Task 3. The potential cost and benefit criteria scores (from the shortlisting exercise) were based on the potential impact that the implementation of the horizontal measures might have across the supply chain. Evaluating actual costs of implementation of horizontal measures would require a whole-system approach that would be complex to assess and would include a wide range of stakeholders to be consulted. Therefore this analysis was based on existing references and studies, per measure and product group, supported by previous experience from the research team by engaging with different stakeholders and policy related studies.

Table 3.6 Typical distribution of costs and benefits (extracted from the Task 3 ErP Policy Study report).

Energy related policy lever & horizontal measures	Costs						Benefits			
	Government	Manufacturers	Retailers	Energy suppliers	End-users	Society	Manufacturers	Government	End users/ Society	Repairers/
Repairability measures - modular design		X			X		X	X	X	X

3.9.2 Challenges and Opportunities

Product Repair vs. New Product Purchase (repairability vs. durability)

There are several case studies which present challenges to the demand for repair services. For example, the average consumer changes their smartphone device every 2.5 years, often in line with service contract renewals, which shows a challenge to extend lifetimes.

As well as promoting replacement, some manufacturers design products that might not be as robust as expected and break down over a period of time. This is known as

planned obsolescence and reduces the durability of products⁵³. There is no proof that technical planned obsolescence is an overall business strategy, but there is considerable anecdotal evidence that it occurs⁵⁴. For example, Apple is currently being sued by Portuguese consumer group Deco Proteste over suspected planned obsolescence in their iPhone 6, 6 Plus, 6S, and 6S Plus⁵⁵.

Currently, many products are not designed to be easily disassembled, repaired, or upgraded. A reduction of the disassembly time and the related costs can increase the economic feasibility of product lifespan extension and therefore increase the viability of a circular economy in industrialised regions⁵⁶.

Disassembly has the potential to significantly increase the recycling yield and purity for precious metals, critical metals, and plastics, also relevant to the requirements for Material Content and Declaration. This can be seen especially in the smartphone market. Despite a faster processing speed, higher definition camera or larger screen size this, the main function of the phone remains largely unchanged from previous models. One study indicates that if a smartphone is kept in use for at least five years, the carbon impact per year of use could be cut by 50 per cent⁵⁷.

In addition, it is important to consider access to reasonably priced spare parts and relevant repair information, alongside the potential for product durability and repairability. For some products, there is differentiation to the provision of spare parts across supply chain actors, which would need accounting for in future measures.

Manufacturers may also be hesitant to release product information that could enable third party repairers. Examples exist of methods that limit repairability including making spare parts for old models incompatible with newer models, preventing disassembly without specific tools or fixing products with chemical adhesives and glues⁵⁸.

Promoting Access to Maintenance and Repair

Take-back schemes act as a product service solution that motivates repairability for scheme operators. They reduce waste to landfill and cater for increased product lifespan. Take-back services are becoming increasingly popular among the electrical and electronics sector, and in many cases is already being implemented. An example of this is Dell, the PC and laptop manufacturer, who offers a free consumer takeback service that allows consumers to recycle their devices, inclusive of batteries, computer games and printer ink cartridges.

⁵³ [Regulating Planned Obsolescence: A Review of Legal Approaches to Increase Product Durability and Repairability in Europe](#)

⁵⁴ [Making more Durable and Repairable Products](#)

⁵⁵ <https://www.deco.proteste.pt/aco-es-coletivas/apple>

⁵⁶ [Ease of disassembly of products to support circular economy strategies](#)

⁵⁷ [Repairability Index Calculator](#)

⁵⁸ [Regulating Planned Obsolescence: A Review of Legal Approaches to Increase Product Durability and Repairability in Europe](#)

A few of the EU Ecodesign and Energy Labelling measures were updated as of November 2019⁵⁹, resulting in more products subject to energy efficiency requirements. The measures also redirect the market towards resource-efficient products via a package of Circular Economy measures that promote repairability by requiring the availability of spare parts for certain products for a longer period (7 – 15 years).

Spare parts are required to be delivered within 15 working days and to be installed with the use of commonly available tools that do not damage the product. This enhances the convenience of repair and extends the lifespan of the specified products.

These measures could be extended to other product groups to multiply this effect. It should be noted that the cost of spare parts is often a deterrent to repair as the cost of a single spare part may be almost as high as the cost of purchasing a new product. Appropriate pricing solutions could be devised to ensure cost is not a key barrier to repair.

Another challenge is around potential for trade-offs between energy efficiency and resource efficiency. Trade-off impacts depend on the part of the product that fails and needs repair or replacing as replacement of some parts could reduce energy performance, especially if re-conditioned parts are used (such as re-wound motors) than if a product were replaced. However, repairing or replacing certain modules could also improve the energy performance of a product.

Lack of experience and know-how from manufacturers using modular principles might be seen as a challenge but it is also an opportunity to upskill professionals, introduce advanced design and modelling solutions and prototyping.

3.9.3 Evidence gap

During the research for this study, the following evidence gaps were identified:

- **Limited data and research on environmental impacts across manufacturing processes and whole supply chain.** There is limited evidence related to the design stage and manufacturing process of products. In most of the cases where data exists, it had been commissioned by the manufacturers and is not always publicly available.
- **Lack of measurement and assessment of impacts related with repairability measures including modular design.**
- **Lack of information on costs and benefits and carbon savings.**
- **Lack of measurement and assessment of impacts of repairability and second-hand trade.**

⁵⁹ In Winter 2018/2019, updated Ecodesign requirements were agreed at EU level for a package of products “the November Package”, which included resource efficiency measures.

- **Lack of standardisation on Modular Design** - There is no specific standard on Modular Design that could harmonise concepts, however BSI's has a committee working in this area.
- **Lack of measurement and assessment on the standards for repair** - Stakeholder feedback noted that it is difficult to meaningfully measure and evaluate the impact of this measure.

3.10 Recommendations and proposed next steps.

Recommendations for this circular economy horizontal measure are listed below.

Enhanced assessment of repairability:

- A stakeholder highlighted that beyond environmental impact, there are several advantages for integrated design, such as safety, miniaturisation and product functionality improvements. A dedicated study should consider the specific opportunities to some product groups, such as B2B and B2C products.
- Enhance relevant data tracking, management, and access across the supply chain. Recent R&D programmes, such as UKRI National Interdisciplinary Circular Economy Research⁶⁰, launched to move the UK towards a circular economy and offer the opportunity to strengthen data collection and evidence gathering particularly for tracking the environmental impact across the whole supply chain.

Promote existing standards which influence modular design:

- Encourage application of modular design solutions by instilling incentives/legislation such as certification for product design in Germany, eco-modulation or polluter pays' principle.
- Although there are no existing standards for modular design, it is recommended that manufacturers be encouraged to follow the BS EN 45554:2020, General methods for the assessment of the ability to repair, reuse and upgrade.

Carry out research on waste management

- A detailed study on waste infrastructures, repairers, recyclers and other key players should be developed to better understand the capacity of UK industry in this sector (e.g. several studies mentioned that the lack of professional repairers is a reason for low rates of repair and high prices for repair services).

Enhance market demand for repairability via mandatory requirements for resource efficient design

⁶⁰ [CE-HUB](#)

- The UK should expand the requirements set in the November package⁶¹ to other products. This will help expand repairability requirements and their benefits to other consumers, manufacturers, and retailers.

Improve engagement with stakeholders across the value chain

- Strong engagement across key actors in the value chain is essential for this measure since the demand for and management of repairability measures and modular design impacts the whole lifecycle of a product.
- Few stakeholders responded to the Task 3 and Task 4 feedback question related to this specific horizontal measure. Detailed studies involving primary research with industry and stakeholders are needed to understand better savings potential and the impact on carbon emissions resulting from the implementation of repairability and modular design for shortlisted products.

⁶¹ In Winter 2018/2019, updated Ecodesign requirements were agreed at EU level for a package of products “the November Package”, which included resource efficiency measures.

4 Product Support

4.1 Case study objective

This chapter presents the case study on the horizontal measure requirements for Product Support, and forms part of the wider research project commissioned by BEIS and Defra to help inform the future Energy-Related Product standards in the UK. This study has identified the product groups and horizontal measures that can provide a high potential for savings (energy, emissions, resources).

In this study, horizontal measures were defined as requirements that could be applied to many or all Energy-related Products (ErPs). The horizontal measures also apply to products where specific Ecodesign requirements do not yet exist. Horizontal measures may relate to energy efficiency or to resource efficiency.

This case study will provide descriptions, coverage, a summary of key stakeholders, alignment with UK policies, our analysis on impacts, and recommendations and next steps.

The case study also provides evidence related to the horizontal measures to inform future decision making and provides recommendations to investigate further as candidates for future policy intervention.

The case study outlined in this chapter will look at the possibility of limiting the environmental footprint of products by setting a requirement for manufacturers or distributors to provide the necessary means for products to be kept in use for as long as possible. This may be in the form of the following:

- Product passports for consumers
- Continuing software and firmware updates, and technical support
- Reverse logistics and take back schemes, including the provision of spare parts (with reference to reparability measures - modular design)
- Energy smart reporting and functionality and use of remote and/or automated diagnostic tools to identify faults
- Minimum warranties/guarantees and post-purchase information
- The continuing provision of whatever consumables the product requires (with reference to horizontal measure setting Requirements for Material Content and Declaration).

Product Support works as an enabler for other horizontal measures, behaving as an inclusive umbrella category⁶². It requires alignment with other measures. Further insight towards this alignment is detailed in section 4.8.

⁶² Umbrella category used to refer to a group of measures with similar objectives.

4.2 Horizontal Measure description

Product support consists of a range of initiatives which ensures that products are kept in use for as long as possible, establishing a prolonged product lifespan whilst delaying obsolescence⁶³. The expected lifespan of a product (as set by a manufacturer) is generally based on its optimal design criteria and efficiency. However, the lifespan of a product can be compared to the actual lifetime and desired lifetime dependant on the consumer. Essentially, product support is a set of requirements for manufacturers or distributors to provide the necessary means for products to be kept in use by consumers, for as long as possible. Product support can be offered via policy, legislation, market incentives, standards, best practices, voluntary schemes, customer services and other outstanding initiatives.

EU Ecodesign and Energy Labelling measures were updated as of November 2019⁶⁴, extending energy efficiency requirements to more products. Circular economy objectives are also included in the requirements for the first time. These objectives prioritise the availability of spare parts and professional maintenance information for consumers, which are key elements of enabling product support services. These measures identify requirements that spare parts for specific ErPs are made available for a long period of time after purchase. This is to promote reparability and to increase the lifespan of appliances. To enhance the repair market, manufacturers must ensure the availability of repair and professional maintenance information for professional repairers e.g., spare parts should be made available for a minimum of 10 years for household dishwashers (7 years for some parts for which access can be restricted to professional repairers)⁶⁵.

Our research found that there is little understanding from consumers on methods of recycling or repairing electronics. The lack of awareness and product support directed to consumers can negatively impact disposal rates and premature obsolescence of ErPs.

Product obsolescence happens for many reasons such as consumer convenience desire to upgrade to the latest models. Other reasons may include the lack of accessibility and knowledge to repair products, the inability to repair, design failures and lack of upgradability (e.g., outdated software).

This calls for increased responsibilities from the manufacturer to ensure the correct information and access to resources for consumers are made available to prolong product lifespans. For example, Extended Producer Responsibility (EPR) makes a producer liable for continuing support and provision of repair services. EPR schemes also cater for incentives and encouragement of resource efficiency.

⁶³ [Circular by design: Products in the circular economy](#)

⁶⁴ In Winter 2018/2019, updated Ecodesign requirements were agreed at EU level for a package of products “the November Package”, which included resource efficiency measures.

⁶⁵ [The new Ecodesign measures explained \(europa.eu\)](#)

Through EPR, producers establish end-of-life management processes for their products, which may also encourage them to design products that are easier to repair, dismantle, reuse and recycle⁶⁶. In addition, EPR ensures that the manufacturer has an increased responsibility for the waste management of their products. EPR can also drive better design choices for products by ensuring environmental impacts are reflected in the costs producers must pay⁶⁷.

Product support can also include offering accessible product care information to consumers, such as continuing software and firmware updates, technical support, and the use of remote or automated diagnostic tools to identify faults. This means providing resource efficiency with end-to-end digital services and interactive product repair information to consumers.

4.3 Coverage

This horizontal measure could apply to all product groups assessed as part of Task 3 and 4 of the ErP Products Policy Study.

From 1st March 2021, the European Commission implemented 10 ecodesign implementing regulations known as the November Package⁶⁸, which include circular economy measures for the first time under ecodesign to support the reparability and recyclability of products. These measures are under consideration for the GB Draft Ecodesign and Energy Labelling Regulations 2021. The following list identifies the products from the Task 3 shortlist already covered by these product support requirements:

- Electronic displays (including televisions)
- External power suppliers
- Refrigerators with a direct sales function (e.g., refrigerators in supermarkets, vending machines for cold drinks)

Annex 2 presents the Task 3 assessment results on the potential coverage of the horizontal measures, per shortlisted product.

4.4 Key enablers and stakeholders

The enablers for implementation of this horizontal measure cover the whole value chain of consumers, manufacturers, and distributors. As defined by the Ellen McArthur foundation, enablers for driving circular economy measures can be categorised by the following: Strategy and Planning, Innovation, People and Skills,

⁶⁶ [new_circular_economy_action_plan.pdf \(europa.eu\)](#)

⁶⁷ Extended Producer Responsibility – Zero Waste Scotland

⁶⁸ In Winter 2018/2019, updated Ecodesign requirements were agreed at EU level for a package of products, “the November Package”, which included resource efficiency measures.

Operations and External Engagements. Table 4.1 uses these categories to identify the relative enablers for Product Support measures.

Table 4.1 Products Support enablers for implementation

Enabler	Description
Strategy & planning	<ul style="list-style-type: none"> • Development of quality protocols and processes, such as recertification of specific components. • Market Incentives - Increased product support offers manufacturers an opportunity to gain a competitive advantage by seeking heightened customer awareness and higher product repairability expectations.
Innovation	<ul style="list-style-type: none"> • Market demand - Second-hand markets for resale and reuse. • Optimising manufacturing methods/logistics, designing and producing products with the intention for minimal waste and resource-efficient systems with longevity. The need to provide consumers with durable goods. • Ensuring the availability of spare parts and consumables, whilst also reducing the dependency on consumables, digitisation/ internet of things.
People and skills	<ul style="list-style-type: none"> • Development of training, educational and awareness-raising programmes for consumers, designers, producers, and distributors of products on repair, reuse, and recyclability. • Product support services should be designed to ensure that customers obtain the most value from the product after the sale.
Operations	<ul style="list-style-type: none"> • Reverse logistics - returning a product to the manufacturer or distributor or forwarding it on for servicing, repair, or recycling.
External engagements	<ul style="list-style-type: none"> • Rental and leasing of products and repair tools. • Enhanced voluntary collaboration schemes - encouraging value chain and cross-sectoral initiatives and information sharing; the integration of circular economy aspects in public procurement schemes⁶⁹.

The key stakeholders and supply chain actors that will either enable or be impacted by the implementation of Product Support includes the following:

- Product designers – will have an increased responsibility to provide accessible spare parts to consumers and incorporate resource efficient design. This may result in increased costs to maintain such services and support new adaptable design features.
- Manufacturers of ErP – who design and produce these products must ensure provision of spare parts and professional maintenance information for consumers long after product purchase.
- Distributors and dealers – might have to supply spare parts and professional maintenance information for consumers/users and will have responsibilities in

⁶⁹ [Summa CE Policy Research Centre: Indicators for a circular Economy](#)

providing customers alternative options for disposal facilities for their old household WEEE e.g., via take-back schemes, repair services, reverse logistics.

- Consumers/users – will anticipate having greater accessibility to a range of product support services offered by manufacturers/distributors.
- Professional repairers – would have increased demand for labour on a range of ErPs.

4.5 Key initiatives and best practices

This section presents a set of key initiatives and best practices representative of the Product Support horizontal measure.

- **EU Ecodesign and Energy Labelling** recently updated eight implementing measures and passed two new regulations. Some of these included resource efficiency measures. These measures require the availability of spare parts over a long period of time beyond product purchase for certain products, listed below.
 - 7 years for refrigerating appliances (10 years for door gaskets)
 - 10 years for household washing-machines and household washer-dryers
 - 10 years for dishwashers
 - Spare parts must be delivered within 15 working days during this period.
 - Manufacturers must ensure availability of repair and maintenance information for professional repairers.
- **Remote and/or automated diagnostic tools to identify faults:** Smart Platforms/CRM software provides on-demand Customer Relationship Management (CRM) e.g., Fujitsu's Product Related Support. This system offers online instant query and feedback for consumers for instant product support via the manufacturer's website (e.g., via a chatbot function).
- Under the UK WEEE regulations, retailers or distributors must offer free take-back services in-store to customers or enable a designated collection facility by approved exporters or an approved authorised treatment facility. An example scheme is the take-back of electronic equipment and batteries⁷⁰.
- Product support can also be provided by manufacturers and procurement policies, extended product guarantees and post-purchase information to

⁷⁰ [Electrical waste: retailer and distributor responsibilities](#)

ensure longer-lasting products. For example, EU Green Public procurement⁷¹ (GPP) forms part of the wider Sustainable Product Policy Framework to increase demand for more sustainable goods and services. This provides an incentive for manufacturers to innovate and promote resource efficiency. The European Commission has just published new voluntary EU GPP criteria specific for computers, monitors, tablets, and smartphones, with a key criterion placed on product lifespan extension. Moreover, the GPP acts as a useful channel for raising environmental awareness by identifying the environmental impacts of a particular product/service throughout its life cycle and providing information on the benefits of greener alternatives.

4.6 Relevant policies, legislation, and standards

This section maps out the policies, legislation and standards currently in place, or being considered which relate to the product support horizontal measure. This allows visibility of which policy levers have been used, which have not, and which can be expanded upon. This has been done for policies in the UK, in the EU and for the rest of the world.

4.6.1 UK

Table 4.2 presents policies, legislation, and standards in place in the UK.

⁷¹ [European Commission \(2020\). Development of the EU Green Public Procurement \(GPP\) Criteria for Data Centres, Server Rooms and Cloud Services](#). Final Technical Report. JRC Science for Policy Report. Available online at [accessed 07.04.2020]

Table 4.2 Relevant policies, legislation, and standards in the United Kingdom for horizontal measure: Product Support

Title	Existing/ Proposal/ Working Plan (Date)	Description	Relevance
BS EN 45554:2020	Existing standard, 2020	General methods for the assessment of the ability to repair, reuse and upgrade ErPs.	Technical standard that specifies the assessment procedures for the repair and reuse of ErPs.
BS EN 45555:2019	Existing standard, 2019	General methods for assessing the recyclability and recoverability of ErPs.	Technical standard that specifies the assessment procedures for the recyclability and recoverability of ErPs.
BS EN 45553:2020	Existing standard, 2020	General methods for the assessment of the ability to remanufacture ErPs.	Technical standard that specifies the assessment procedures for the remanufacturing of ErPs.
PAS 141:2011	Existing standard, 2011	PAS 141 sets out the requirements to successfully manage the process of preparing used and WEEE for reuse.	Technical standard that specifies the requirements for processing WEEE for reuse.
Resources and waste strategy for England, DEFRA	Existing legislation, 2018	This legislative strategy sets out how Defra will preserve material resources by minimising waste, promoting resource efficiency and moving towards a circular economy in England. Inclusive strategies are: zero avoidable waste by 2050, double resource efficiency by 2050.	Presents the ambition for achieving zero avoidable waste by 2050, and double resource efficiency by 2050 across England – applicable to all ErPs.
25 Year Environment Plan	Existing legislation, 2018	Inclusive to increasing resource efficiency and reducing pollution and waste. Work towards eliminating all avoidable waste by 2050.	Promotes resource efficiency and minimising disposal by targeting zero avoidable waste by 2050 - applicable across all ErPs.
The Circular Economy Package (CEP)	Existing legislation, 2020	The Circular Economy Package introduces a revised legislative framework, identifying steps for the reduction of waste and establishing an ambitious and credible long-term path for waste management and recycling. Led jointly by Defra, the Welsh Government and the Scottish Government.	Presents criteria and requirements for waste management, recycling, and minimising disposal.
Waste from Electrical and Electronic Equipment (WEEE)	Existing regulation, 2012	UK regulations on the management and treatment of electrical and electronic waste. Contributes to sustainable production and consumption methods. Other objectives emphasise the retrieval of secondary raw materials through reuse, recycling, and other forms of recovery.	Promotes the management and treatment of electrical and electronic waste via standardising take-back services offered by distributors, as well as encouraging reuse, recycling,

Title	Existing/ Proposal/ Working Plan (Date)	Description	Relevance
		It standardises take-back services offered by distributors via providing a free, in-store, take back service to customers.	and other forms of recovery/product support.
Distributor Takeback Scheme (UK Gov.)	Existing regulation, 2012	<p>This scheme is regulated under the WEEE framework (see above). There is the opportunity for retailers and distributors without a take-back service to apply to the Distributor Takeback Scheme (DTS), providing the business either:</p> <ul style="list-style-type: none"> • sells less than £100,000 of electrical and electronic equipment (EEE) per year, • or sells only online. <p>The scheme operates via a fee that is covered by the seller, to contribute to the WEEE obligations, supporting recycling centres run by local authorities.</p>	Promotes the standardisation of take-back services offered by distributors, by encouraging incentives to producers and distributors.
Waste prevention programme for England, Defra	Working Plan/legislation, 2020	The programme sets out the roles and actions for the government and others to reduce the amount of waste produced in England.	Encourages commitments towards various forms of product support including enhanced EPR, incentivising recycling, and encouraging innovation in design.

4.6.2 Europe

Table 4.3 presents policies, legislation and standards which should be read to apply to all legal entities established in the European Union and the other Member States of the European Economic Area as of 2021, (e.g., Norway, Iceland, and Liechtenstein), unless stated otherwise.

Table 4.3 Relevant policies, legislation, and standards in Europe for horizontal measure: Product Support

Title	Existing/ Proposal/ Working Plan (Date)	Description	Relevance
EU Right to Repair	Existing legislation, 2019	This EU legislation sets minimum design requirements to ensure easy disassembly and replacement of key components – starting with smartphones, laptops and other IT products.	Presents minimum design requirements for the disassembly and replacement of key components, relevant to electronics and IT products, and insuring the availability of spare parts.
The Waste Framework Directive /EU waste legislation – 2018 revision	Existing legislation, 2018	<p>The Waste Framework Directive is the EU’s legal framework for treating and managing waste in the EU. It introduces an order of preference for waste management called the “waste hierarchy”. The revised EU Waste legislation promotes the reuse of products and packaging and emphasises the importance of waste prevention.</p> <p>It requires Member States to promote sustainable production and consumption models via resource-efficient product design; reuse of products. It also promoted product repair activity via the availability of spare parts, product support information among others.</p>	Presents the procedures for waste management and waste prevention of all ErPs, establishing criteria for refurbished/remanufactured equipment.
Unfair Commercial Practices Directive 2005/29/EC and the Consumer Rights Directive 2011/83/EU.	Existing legislation, 2011	The 2016 Commission guidance on the Unfair Commercial Practices Directive (UCPD) specifies that "planned obsolescence, or built-in obsolescence in industrial design, is a commercial policy involving deliberately planning or designing a product with a limited useful life so that it will become obsolete or non-functional after a certain time". EU Consumer Legislation offers consumer protection in the case of faulty products:	Presents the requirements for manufacturers in establishing an acceptable planned obsolescence, and further delivers requirements on consumer protection in the case of faulty products.

Title	Existing/ Proposal/ Working Plan (Date)	Description	Relevance
Green Public Procurement (GPP)	Existing standard, 2020	<p>The European Commission has just published new voluntary EU GPP criteria for computers, monitors, tablets and smartphones.</p> <p>The criteria address the main environmental impacts of these devices and are divided into four main sections:</p> <ol style="list-style-type: none"> 1. product lifetime extension 2. energy consumption 3. hazardous substances 4. end of life management. 	Presents measures for tracing and managing the environmental impact of electronics and IT equipment, inclusive to product lifetime extension and end of life management.
Integrated Product Policy (IPP)	Existing standard, 2001	Integrated Product Policy (IPP) seeks to minimise and assess environmental degradation from products by looking at all phases of a products' life-cycle and taking action where it is most effective, through their design, manufacture, assembly, marketing, distribution, sale and use to their eventual disposal as waste.	Presents the procedure, content, and requirements for assessing environmental degradation from all ErPs, via LCA.
EU Circular Economy Action Plan & The Roadmap to a resource efficient Europe	Proposal of new regulation, (Working Plan 2020)	Promotes a fundamental transition in the EU, away from a linear economy where resources are not simply extracted, used and thrown away, but are put back in the loop so they can stay in use for longer. It sets out measures driving more efficient use of resources and waste minimisation.	This proposed regulation sets out measures for driving more efficient use of resources and promoting waste minimisation.
EU's Sustainable Consumption and Production / Sustainable Industries Action Plan (July 2008)	Proposed regulation, 2020	<p>The Sustainable Consumption and Production Action Plan Proposals that will contribute to improving the environmental performance of products and increase the demand for more sustainable goods and production technologies.</p> <p>The proposals are part of the European Union's renewed Sustainable Development Strategy (EU SDS).</p>	Contributes to improving the environmental performance of products and increase the demand for more sustainable goods and production technologies.
Revision of the EU Green Public Procurement (GPP) Criteria for Computers and Monitors (and	Proposed regulation, 2020	<p>Technical Report v2.0: Second draft criteria proposals – Jun 2020. Take back schemes - Improving the collection and treatment of WEEE including by exploring options for an EU-wide take-back scheme to return or sell back old mobile phones, tablets, and chargers.</p>	Promotes the implementation of take back schemes and the enhanced management of WEEE across the EU, – with a new extension to Smartphones.

Title	Existing/ Proposal/ Working Plan (Date)	Description	Relevance
extension to Smartphones)			
Development of the EU Green Public Procurement (GPP) Criteria for Data Centres, Server Rooms and Cloud Services	Proposed regulation, 2020	Final Technical Report 2020 End of life management, secure computer collection, sanitisation, reuse, and recycling. Reusable parts are harvested and tested before reaching recycling facilities	Encourages the end-of-life management of WEEE across the EU, – with an extension to Data Centres, Server Rooms and Cloud Services
Product Environmental Footprint Category Rules (PEFCRs) and draft Organisation Environmental Footprint Sector Rules (OEFSRs) are based on existing work.	Proposed regulation, 2020	Each PEFCR contains a set of rules on how to measure the life cycle environmental performance of the product in scope, key criteria are set for auditing and providing Life Cycle Inventory (LCI) datasets.	Presents criteria for assessing the lifecycle environmental performance of products, supported by enhanced LCI data tracking and data management.
EU Ecodesign and Ecolabelling Preparatory study for the Ecodesign and Energy Labelling	Proposal for new regulation (Working Plan 2020)	This preparatory study outlines the demand for the European Commission in preparing the 'Ecodesign and energy labelling working plan 2020-2024'. It will be the first 5-year plan to combine formally the future priorities for the implementation of the Ecodesign Directive 2009/125/EC and Energy Labelling Regulation (EU) 2017/1369. It provides incentives for enhanced regulation that complies with enhanced product support information for both consumers and producers.	Supports the future priorities of the existing Ecodesign Directive and Energy Labelling regulation, via promoting enhanced product support information for both consumers and producer.
Sustainable Products in a Circular Economy - Towards an EU Product Policy	Proposal for new regulation (Commission Staff Working Document 2019)	The European Commission is assessing whether and how a tracking system could contribute to improving the workability of information requirements for substances of very high concern (SVHC).	Supports the requirements for the traceability and declaration of SVHC, by encouraging the use of digital product passports for consumers and tagging.

Title	Existing/ Proposal/ Working Plan (Date)	Description	Relevance
Framework contributing to the Circular Economy.		Introduce the potential of digitalisation of product information, including solutions such as digital passports and tagging.	

4.6.3 Rest of the World

The relevant policies, legislation and standards in the rest of the world are present in Table 4.4.

Table 4.4 Relevant policies, legislation, and standards globally with exception to the UK and Europe, for horizontal measure: Product Support

Title	Existing/Proposal/Working Plan (Date)	Description	Relevance
The Global E-waste Monitor 2020	Existing standard, 2020	The Global E-waste Monitor 2020 is a collaborative product of the Global E-waste Statistics Partnership (GESP), formed by UN University (UNU), the International Telecommunication Union (ITU), and the International Solid Waste Association (ISWA), in close collaboration with the UN Environment Programme (UNEP).	Presents an extensive database which reviews the challenges and demand for overcoming short product life cycles, and product repair across the electronic sector.
Singapore electronics recycling scheme	Proposed regulation, 2020	Singapore’s Zero Waste Masterplan, Singapore National Environment Agency (NEA)/Alba Group – proposes two regulated schemes: 1) Extended Producer Responsibility scheme - designed to ensure that producers and importers of certain regulated electronic items are required to support the scheme financially in promoting regulation recycled electronic waste, or e-waste.	This regulation discloses Singapore’s national targets to address Zero Waste by 2050, inclusive to establishing product support measures such as an Extended Producer Responsibility scheme.

Title	Existing/Proposal/Working Plan (Date)	Description	Relevance
		2) Producer Responsibility Scheme - which involves collecting e-waste and ensuring it is properly recycled and treated.	

4.7 Opportunities for alignment with other UK strategies

The UK is committed to embracing circular economy measures into different policies and several strategies are being developed to achieve it. This case study focuses on the potential of this horizontal measure to be implemented for a group of ErPs, but there should be wider alignment with other initiatives. A holistic approach will reinforce and promote successful implementation of the horizontal measure presented in this case study, and a further mapping/cross-referencing exercise should be considered. Table 4.5 below summarises the alignment opportunities and potential benefits that could be achieved.

Table 4.5 Alignment opportunities of Product Support with key existing policy and regulatory measures.

Alignment with 25 Year Environment Plan ⁷²	Alignment with Resources and Waste Strategy for England ⁷³	Alignment with Waste Prevention Programme for England ⁷⁴	Expected benefits from Product Support
<ul style="list-style-type: none"> • Ensure products are resource-efficient so that they have a longer lifetime, minimise waste and reduce its environmental impacts by promoting reuse, remanufacturing and recycling. • Be resource-efficient and working towards the commitments of zero avoidable waste by 2050 by promoting the move towards a regenerative, circular economy. 	<p>Help consumers take more considered actions and address barriers to reuse by:</p> <ul style="list-style-type: none"> • Support the market for remanufactured goods. • Encourage appropriate disposal of used products. • Provide consumer guidance for recycling, resale, reuse (inclusive to smart devices). • Address information barriers to the use of secondary materials. • Quality assurance schemes. <p>Resource-efficient business models & product life extension from manufacturers, extended producer responsibilities:</p> <ul style="list-style-type: none"> • Extend product life, conserve resources, and prevent materials from becoming waste. • Develop product-service systems that provide 	<ul style="list-style-type: none"> • Use extended producer responsibility schemes to ensure producers cover the cost of recovery for reuse and recycling. Introduce product requirements for durability e.g., through take-back schemes and funding for the management of waste. • Meet demand in “the right to repair” and ensuring spare parts are readily available. • Manage waste, using infrastructures such as energy from waste and landfill comes with costs that could be reduced or deferred by 	<ul style="list-style-type: none"> • Ensure access to certified reused and recycled materials to provide cost and carbon savings. • Improve the rate of recycling at the end of life/waste management stage. • Reduce the rate of product disposal and landfill waste. • Accessible monitoring and reporting on waste activity. ■ Accessible information for consumers on product care, repair and reuse.

⁷² [25 Year Environment Plan](#)

⁷³ [Our Waste, Our Resources: a strategy for England](#)

⁷⁴ [Waste Prevention Programme for England](#) – Consultation Version

Alignment with 25 Year Environment Plan ⁷²	Alignment with Resources and Waste Strategy for England ⁷³	Alignment with Waste Prevention Programme for England ⁷⁴	Expected benefits from Product Support
	<p>monitoring, servicing, repair,</p> <ul style="list-style-type: none"> • remanufacture, and replacement services. • Develop incentivised returns hire and leasing, reuse programmes. • Develop product life extension insurance via guarantees and extended warranties. ■ Encourage company reporting on reuse, repair, and recycling. <p>Reduce landfill to a maximum of 10% of municipal waste by 2035</p> <p>At least double resource productivity by 2050</p> <p>Zero avoidable waste by 2050</p>	<p>keeping products in use for longer.</p>	

4.8 Options of interactions with other horizontal measures

This section reviews the interactions of the product support measure with other horizontal measures.

Interaction with Requirements for Material Content and Declaration

Requirements for material content and declaration are a form of product support as it provides accessible information on product components and potential for repair. Such information can be delivered via material declaration e.g., product passports.

Interaction with Repairability Measures: Modular Design

Resource-efficient products/systems are durable, repairable, reusable, upgradeable, and recyclable, all of which contribute to extending lifespan. Modular design relates to this as product modules can be included in future product support requirements.

Interaction with Extended Warranty/Guarantee

There is close alignment between product support and the extended guarantee measure, since extended warranties/guarantees are a form of product support and spare parts and repairs are typically included in provisions of warranties/guarantees.

4.9 Assessment

4.9.1 Measuring the impact

No measurable impacts with reference to costs and benefits or carbon savings were found in the literature. The reference documents stressed the importance of implementing these types of measures, but the impacts have not yet been assessed, probably by being in the initial implementation stage.

Given that product support is inclusive to both tangible and intangible services, measuring its relative impact on prolonging product lifespan, the environment and circularity are difficult. However, the impact can be assessed based on the potential costs savings for new products purchases versus that for product repair services and second-hand items (e.g., not inclusive to VAT).

The reduced cost of second-hand items compared to brand new items can be attractive to consumers. Based on research by Euromonitor International, consumers are increasingly opting for more sustainable solutions such as sharing/leasing products, or the purchase of recycled, or second-hand products, due to the considerable cost savings⁷⁵. This implies future increases in the demand of product support services to support this growing market. For example, O₂ the mobile phone provider, retails 'like new' second-hand mobile phones at lower cost compared to a brand-new device.

Providing product support for accessible repair and reuse services (e.g., product passports, tailored customer services for repair, repair cafes) reduces the demand for product returns and lowers the need for associated transportation, storage and disposal, which are costly and carbon intensive. Carbon savings and product cost can be analysed at each step of the lifecycle to demonstrate this⁷⁶.

A study by Farnham Repair Café shows the impact on reducing greenhouse gas (GHG) emissions from use of repair cafés across the UK. Key findings indicate that across 13 different repair cafés in the UK, a total of 2,852 products were repaired as of 2018. Household appliances were the most commonly repaired items. The average carbon saving for each product repaired was assessed by its relative carbon footprint (relative to weight of product) being on average an estimated savings of 24 kgCO_{2e}, (the average weight of a repaired product was found to be 2.4 kg)⁷⁷.

Table 4.6 presents a brief analysis of cost and benefits undertaken in Task 3 of the ErP Products Policy Study. The potential costs and benefits criteria scores were based on the potential impact that the implementation of the horizontal measures might have across the supply chain. Evaluating actual costs of implementation of horizontal measures will require a whole-system approach that would be more

⁷⁵ [Sustainability is Big Business \(euromonitor.com\)](https://www.euromonitor.com/sustainability-is-big-business)

⁷⁶ [Ease of disassembly of products to support circular economy strategies](#)

⁷⁷ [Summary findings of research into UK Repair Cafés](#) impact on reducing greenhouse gas (GHG) emissions

complex and would include a wider range of stakeholders and therefore, this analysis was based on existing references and studies, per measure and product group, supported by previous experience from the research team by engaging with different stakeholders and policy related studies.

Table 4.6 Typical distribution of costs and benefits (extracted from the Task 3 ErP Policy Study report).

Energy related policy lever & horizontal measures	Costs						Benefits			
	Government	Manufacturers	Retailers	Energy suppliers	End-users	Society	Manufacturers	Government	End users/ Society	Repairs/
Product support		X			X			X	X	X

4.9.2 Challenges and Opportunities

Since product support measures are still a growing area, there are challenges and opportunities for innovation and development which are outlined in this section.

Marketing, data, and incurred costs

A rapid rate of new technology development requires updating product support information for consumers. Enabling digital services to provide product support could be an effective and cost efficient way to update information but could increase costs for maintaining or upgrading the software for digital infrastructure that caters for such services e.g., smart Platforms/customers software/forums/chat box.

However, by enhancing product support measures, there is an opportunity to reduce product returns and provides potential cost savings for the manufacturer/distributor. Support services can also enhance customer loyalty.

Future business models could adopt more circular initiatives that encourage product leasing and repairs, as well as the sharing/leasing of tools. In addition, smart marketing acts as a form of product support to improve customer satisfaction where repair services and information are provided.

Future policies can encourage prolonged product lifespan across the market. For example, product support offered by regulations such as Ecodesign and Energy Labelling and the BEIS Energy Technology List offer greater understanding of the best available technologies in the market and the key factors which impact this.

Although customer support will always be essential, encouraging resource efficient design across industry and manufacturers could reduce the requirement for product support in the long term. By extending the access and scope of platforms such as the BEIS ETL to consumers and to include product support information, this could provide a method for comparative and competitive market reviews, which can further the uptake of ErPs backed by extensive product support.

Third Party Product Support

Product support services can also be delivered by independent service providers and third-party support/maintenance providers, (e.g., break/fix technical support for hardware and/or software products). Although not typically aligned with a product manufacturer, third party repairers may have a specific partnerships or agreements with manufacturers to offer such services⁷⁸. Mobile phone manufacturers who sell their products via distributors which also have their own internal product support team (e.g., Carphone warehouse product support services) are a well-known example of this.

Other examples include companies offering cloud software support services or server management (e.g., salesforce). Although this may, in some cases, reduce demand for first-hand repair services offered directly by the producer, this is seen as a viable solution for smaller manufacturers. Third party product support can assist smaller manufacturers of ErPs with limited resources and capacity to undertake maintenance and product support independently.

Consumer perceptions on the lack of existing product support & feasibility for repair

The lifespan of a product has the potential to be reduced because of wear and tear. When purchasing new products, consumers are not informed how long products should last if used and maintained properly. Consumers also lack crucial information about reparability of goods and availability of spare parts⁷⁹. For example, a washing machine tested under factory conditions, may, on average, be expected to be reliable for a certain number of washes, but this is different for each consumer⁸⁰. In addition to repair services and product information, manufacturers must ensure the continuing provision of consumables that the product requires, (e.g., coffee pods, batteries in an electronic device).

Studies indicate that many consumers feel products do not last as long as reasonably expected⁸¹. In addition, consumers are often confronted with key concerns related to the reduced access to and high cost of spare parts made available by manufacturers. The costs for repair are also expensive, given that complete modules are more readily available instead of single, cheaper spare parts⁸².

On average, the repair cost for a failed asset is typically 50% higher than if the problem had been addressed before failure⁸³. This increasing of costs creates a

⁷⁸ <https://www.gartner.com/en/information-technology/glossary/product-support-services>

⁷⁹ [Durable goods: More sustainable products, better consumer rights](#)

⁸⁰ DEFRA (2011). Public understanding of product lifetimes and durability. A research report completed for the Department for Environment, Food and Rural Affairs by Brook Lyndhurst.

⁸¹ [Durable goods: More sustainable products, better consumer rights](#)

⁸² [Preparatory study for the Ecodesign and Energy Labelling Working Plan 2020-2024 - Task 3 Preliminary analyses final draft](#)

⁸³ MTTR is the total corrective maintenance time for failures divided by the total number of corrective maintenance actions for failures during a given period of time.

barrier to drive reparability and underlines the importance of alignment between product support measures for both to work effectively.

This is in addition to providing technical knowledge for repair services to consumers like increasing training and learning and development for a range of product categories. In some cases, there is greater requirement for delivering enhanced technical knowledge and product support to consumers for repair. For example, the upgrade of TVs normally implies replacement due to the complexity involved with the repair. The main barriers encountered for upgrade are the lack of processing capacity of the TV and/or the insufficient pre-installed memory necessary to support newer versions of software and to store them⁸⁴. Overall, this indicates that for certain product categories, greater technical development and knowledge sharing with consumers are required to encourage repair and reuse.

Other challenges and opportunities:

It is important to note that product support measures are currently a separate consideration to the whole-lifecycle assessment of products and often limited to the post-consumer services offered by manufacturers. However, to achieve optimum circular economy potential there needs to be an integrated approach. This involves overseeing product support that aligns with product design, reparability measures, modular design, and requirements for material content and declaration.

As identified by DG Environment of the European Commission, the circular economy requires labour-intensive business models, such as repair, R&D, and recycling, and notes the current tax system is a barrier for a circular economy to emerge. A tax shift which decreases the costs of labour and increases the cost of natural resources is a pre-condition for the circular economy⁸⁵.

Opportunities for taxing certain waste management streams can influence the market towards repair and reuse. It can provide financial incentives to businesses and consumers, encouraging circular business models and driving sustainable production processes. One example is the Environmental Fiscal Reform established by the OECD, that provides regulations on green taxes, emissions trading, reform of harmful subsidies, green public procurement, border tax adjustments, and deposit-refund schemes⁸⁶.

4.9.3 Evidence gap

During the research for this study, the following evidence gaps were identified:

- **Limited data and research on environmental impacts across manufacturing processes and whole supply chain.** There is limited evidence related to the design stage and manufacturing process of products.

⁸⁴ [Methods for the Assessment of the Reparability and Upgradability of Energy-related Products: Application to TVs | EU Science Hub \(europa.eu\)](#)

⁸⁵ Parker & Meulman (2014). What is the business case? Circular economy and the European Semester. Session report Green Week 2014 session 5.4. Available online at: [\(europa.eu\)](#).

⁸⁶ [GBE-Circular-Economy-policy-briefing-.pdf \(green-budget.eu\)](#)

In most of the cases where data exists, it had been commissioned by the manufacturers and is not always publicly available.

- **Lack of measurement and assessment of impacts related with product support**
- **Lack of information on costs and benefits and carbon savings**
- **Lack of standardisation and no industry definition, standard or agreed measurement of the expected lifespan of ErPs.**
- **Lack of measurement and assessment on existing regulation** – Limited information related with the EU Ecodesign and Energy Labelling measures updated as of November 2019, extending energy efficiency requirements to more products and circular economy objectives are also included in the requirements for the first time.

4.10 Recommendations and proposed next steps

The key recommendations proposed for this measure are listed below.

Consumer incentives for extending product lifespan:

- Uptake of product support measures can be incentivised or required via tax and procurement policies, extended product guarantees and post-purchase information to ensure longer-lasting products. E.g., reduced or omitted VAT for spare parts, recycled products and related reuse and repair activities.
- Promotion of the November Package initiatives will educate and inform consumers, manufacturers, and retailers on repair, reuse, and manufacturing. This could help improve repair rates.

Integrating digital solutions:

- Expand the scope of coverage and context of digital platforms such as Ecodesign and the Energy Technology List to increase understanding of best available technology and resource efficient systems. This can drive manufacturing of resource efficient systems and can reduce the need for product support services.
- New circular business models should integrate product support services (e.g., product as a service and reverse logistics). Offering digital solutions and smart market surveillance provides an advantage for accessible consumer information on product repair and reuse. This includes the use of smart technologies to monitor usage and manage remote/automate use of resources (e.g., water, energy, consumables, cycles of operation, etc.).
- Product Passports – information for consumers. Enabling readily available information for consumers like product specifications, environmental footprint,

spare parts and availability, recyclability. QR codes and tagging are examples of ways to present information to consumers.

Enhanced accessibility of spare parts, repair, and reuse:

- Integrate product support throughout whole life cycle processes, enabling close alignment with measures for declaration and repairability e.g., disclosure information on the material content of products, product passports, smart reporting and QR tagging, access to spare parts and repair services.
- Larger household appliances (e.g., TV's, refrigerators) often require specialist product support services and repair as opposed to laptops, PC's, or mobile phones. As a result, it is recommended that product support measures align closely with repairability index measures and offering piloting across 'trial' product groups, standards, or initiatives.
- The new EU Ecodesign and Energy labelling regulations offer opportunities for further market penetration of resource-efficient products whilst instilling product support measures. The availability of spare parts is a key action for product support to align with repairability measures – modular design, to be effective in optimising circularity potential across ErPs.

Further market research:

- Few stakeholders responded to the Task 3 and Task 4 questions related to this horizontal measure. Detailed studies involving primary research with industry and stakeholders will be needed to understand better how product support can impact energy and material consumption, savings potential, and carbon emissions for shortlisted products that are focused on in the future. Greater market insight is required, especially from consumers, on the uptake of existing product support services. This will help ensure efficient optimisation of any actions undertaken under this measure.

5 Mandatory minimum warranty/guarantee

5.1 Case study objective

This chapter presents the case study on the horizontal measure requirements for a Mandatory Minimum Warranty/Guarantee, and forms part of the wider research project commissioned by BEIS and Defra to help inform the future Energy-Related Product standards in the UK. This study has identified the product groups and horizontal measures that can provide a high potential for savings (energy, emissions, resources).

In this study, horizontal measures were defined as requirements that could be applied to many or all Energy-related Products. The horizontal measures also apply to products where specific Ecodesign requirements do not yet exist. Horizontal measures may relate to energy efficiency or to resource efficiency.

This case study will provide descriptions, coverage, a summary of key stakeholders, alignment with UK policies, our analysis on impacts, and recommendations and next steps.

The case study outlined in this chapter will look at the possibility of limiting environmental footprint of products by setting an expectation that products should work properly for a minimum period. One way of achieving this might be to mandate a minimum standard guarantee period for specified products. This can be linked to labels or markings.

The case study also provides evidence related with the horizontal measures to inform future decision making. Recommendations are made for candidate measures requiring further investigation for future policy intervention.

5.2 Horizontal measure description

Current legislation⁸⁷ defines guarantee as 'undertaking to the consumer given without extra charge by a person acting in the course of the person's business (the "guarantor") that, if the goods do not meet the specifications set out in the guarantee statement or in any associated advertising

- (a) the consumer will be reimbursed for the price paid for the goods, or
- (b) the goods will be repaired, replaced or handled in any way.'

⁸⁷ [Consumer Rights Act 2015](#)

Retailers and manufactures often use the name guarantee and warranty interchangeably, however there are differences. Guarantees are free and offered by the manufacturer and warranties are likened to an insurance policy and are not free⁸⁸. For this study, and to simplify the description of the measure, the term guarantee will be used. Therefore, this case study reviews the effects of guarantees and the options for further imposing or extending these.

Under the consumer protection rules, a trader must repair, replace, reduce the price or provide a refund if goods turn out to be faulty or do not look or work as advertised at the time the goods are delivered. If a product was bought online or outside of a shop (by telephone, mail order, from door-to-door salesperson), a consumer has the right to cancel and return the order within 14 days for any reason and without justification. However, this only applies to goods whose defects become apparent within a pre-stated legal guarantee period, on average ranging between 12 months to 2 years. Guarantees are governed by the Consumer Sales and Guarantee Directive (CSD)⁸⁹, which regulates the contractual relationship between the consumer and the seller.

Shops, dealers and/or manufacturers often offer an additional commercial guarantee (also called a “warranty”) either included in the price of the product or at an extra cost⁹⁰. It is defined by the Consumer Right Directive⁹¹ as any undertaking by the trader or a producer (the guarantor) to the consumer, in addition to his legal obligation relating to the guarantee of conformity, to reimburse the price paid or to replace, repair or service goods in any way if they do not meet the specifications or any other requirements not related to conformity set out in the guarantee statement or in the relevant advertising available at the time of, or before the conclusion of the contract.

For second-hand goods that are bought from a trader, they are also covered by the by the Consumer Contracts Regulations. However, for products bought from private individuals the Consumer Rights Act says that the goods must be as they were described by the seller and there is no obligation on the seller to disclose any faults.

Several recent studies highlight the inadequacy of the two-year legal guarantee period and suggest that for durable goods it should be extended to match their expected lifespan more closely⁹². They noted that, the reversed burden of proof⁹³ should be extended, to motivate the producers/manufacturers to improve both the durability and reparability of their products, whilst making spare parts more available.

Another study on the EU lifespan guarantee model recommended that manufacturers issue a commercial guarantee that includes information on the minimum lifespan of the product (which they would determine), or if there is no guarantee that the product

⁸⁸ [When can I use a manufacturer's warranty or guarantee?](#) – Which? May 2021

⁸⁹ [Consumer Sales and Guarantee Directive](#)

⁹⁰ [Guarantees, cancelling and returning your purchases - Your Europe \(europa.eu\)](#)

⁹¹ [Consumer Right Directive](#)

⁹² [A longer lifetime for Products: Benefits for Consumers and Companies](#)

⁹³ Burden of proof: a party's duty to produce sufficient evidence to support an allegation or argument.

would function until the end of its designed lifespan⁹⁴. Another suggested alternative is for manufacturers to be required to provide a commercial lifespan guarantee, with the lifespan defined by product-specific standards, for instance in Ecodesign legislation⁹⁵.

Due to requests from consumer organisations, minimum durability criteria for lighting and vacuum cleaners have been included as mandatory requirements in the respective Ecodesign legislation. These European regulations set a precedent for introducing minimum durability requirements⁹⁶. For vacuum cleaners, the motor must have a minimum operational lifespan of 500 hours, the hose must have a minimum durability of 40,000 oscillations under strain. Also, the European Parliament has called for extending the EU Ecodesign and Energy labelling requirements to non-energy related products and extending the duration of legal guarantees (future Sustainable Products Initiative). There are also EC plans to extend the six-month guarantee following a repair to five years, but these have yet to be confirmed.

5.3 Coverage

This horizontal measure could apply to all product groups assessed as part of Task 3 and 4. For example, there are some product manufacturers that already offer an extended commercial guarantee, to assure products longevity. Annex 2 presents Task 3 assessment results on potential coverage of the horizontal measures, per shortlisted product.

5.4 Key enablers and stakeholders

The key enablers for implementation of this horizontal measure are dependent on the drivers of the stakeholders in the supply chain. Guarantees are a key focus on distributors, dealers and retailers. Some of these enablers cross over with those indicated in the Product Support horizontal measure section.

As defined by the Ellen McArthur Foundation, enablers for driving circular measures can be categorised by the following: Strategy and Planning, Innovation, People and skills, Operations and External Engagements. Table 5.1 below identifies the relative enablers for Mandatory Minimum Warranty/Guarantee for products under these categories.

Table 5.1 Minimum warranty/guarantee enablers for implementation

Enabler	Description
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⁹⁴ [How an EU Lifespan Guarantee Model Could Be Implemented Across the European Union](#)

⁹⁵ [Introduction of a lifespan guarantee in the proposed online sales and digital content directives](#)

⁹⁶ [Durable goods: More sustainable products, better consumer rights](#)

Strategy & planning	<ul style="list-style-type: none"> ▪ Development of quality protocols and processes, such as recertification of specific components.
Innovation	<ul style="list-style-type: none"> ▪ Smart reporting and enhanced market surveillance to encourage data transparency and disclosure on waste management and LCA. ▪ Communication – encouraging increased direct/digital communication between producer, distributor and consumer to minimise risks on product faults and maximizing the benefits of a Minimum warranty/guarantee. Thus, encouraging product care and support from consumers.
People and skills	<ul style="list-style-type: none"> ▪ Education - Encouraging the market for repair services can benefit from extended guarantees, generating incentives for both producer and consumer. This minimises the burden on take-back schemes, cost, and labour from product support services.
Operations	<ul style="list-style-type: none"> ▪ Extended producer responsibility via extended guarantee. Extending the standard product guarantee period from 2 to 5 years.
External engagements	<ul style="list-style-type: none"> ▪ Policies - The integration of circular aspects in public procurement schemes⁹⁷. Tax and procurement policies to further influence a repair culture and aid circular business models by minimising the burden on labour and product support services.

The key stakeholders and supply chain for Minimum Warranty/Guarantee includes the following:

- Product designers – will design products to prevent obsolescence and for an extended lifespan.
- The manufacturers of ErP – will design and produce these products, have responsibilities to protect natural resources and manage electrical and electronic equipment (EEE) and need to provide extended support.
- Distributors and dealers – will supply the product to consumers/users, but also have responsibilities on providing support for an extended period of time.
- Consumers/users – will anticipate having greater accessibility to a range of product support services offered by manufacturers/distributors, which enable them to prolong the use of their products and minimise disposal.
- Professional repairers – would have increased demand for labour, skill force and engagement with consumers on conducting feasible repairs on a range of ErPs. .
- Waste recycling centres/ waste management companies – will have greater demand for the collection and either recovery or disposal of waste.
- Recyclers – will have greater demand to accept waste from waste recycling centres and/or waste management companies; some of these are in partnership with the manufacturers.

⁹⁷ [Summa CE Policy Research Centre: Indicators for a circular Economy](#)

5.5 Key initiatives and best practices

This section presents the current best initiatives and practices representative of the horizontal measure Mandatory Minimum Warranty/Guarantee.

- The **Danish Consumers Council** repeatedly raised the issue to **extend the consumer guarantee** from two to five years for large consumer goods such as washing machines⁹⁸. According to the trade association, it will only lead to more expensive products because of the need to stock large inventories of repair material as well as it requires a change in product design. Clearly, a requirement of a five-year lifespan will be easier for some manufacturers than others, and there will be a change in the set-up of the market.
- Selling products with a five-year warranty may require not only products with improved quality and lifespan but also an organisation where there is an increased need of competencies to service products and maintain customer relationships. These competencies are far from the core business model of domestic appliance outlets that dominate the market today. France and Portugal have **extended the period for the reversal of the burden of proof** from 6 months to two years, but little information was found to understand the impacts of this measure.

5.6 Relevant policies, legislation, and standards

This section maps out the policies, legislation and standards currently in place, or being considered which relate to the minimum warranty/guarantee horizontal measure. This allows visibility of which policy levers have been used, which have not, and which can be expanded upon. This has been done for policies in the UK, in the EU and for the rest of the world.

5.6.1 UK

Table 5.2 presents policies, legislation, and standards in place in the UK.

⁹⁸ Lauridsen, E.H. and Jørgensen M.S. (2015). Transitions in waste treatment as a driver for product life extension. Product Lifetimes and the Environment (PLATE) [Conference paper](#). Nottingham, UK: Nottingham Trent University, p. 187-193

Table 5.2 Relevant policies, legislation, and standards in the United Kingdom for horizontal measure: Mandatory minimum warranty/guarantee

Title	Existing/ Proposal/ Working Plan (Date)	Description	Relevance
Consumer Rights Act 2015	Existing legislation, 2015.	<p>Defines guarantee as an undertaking to the consumer given without extra charge by a person acting in the course of the person's business (the "guarantor") that, if the goods do not meet the specifications set out in the guarantee statement or any associated advertising:</p> <ul style="list-style-type: none"> – the consumer will be reimbursed for the price paid for the goods, or – the goods will be repaired, replaced or handled in any way. 	Regulates and defines guarantees for the UK.

5.6.2 Europe

Table 5.3 presents policies, legislation and standards which should be read to apply to all legal entities established in the European Union and the other Member States of the European Economic Area as of 2021, (e.g., Norway, Iceland, and Liechtenstein), unless stated otherwise.

Table 5.3 Relevant policies, legislation, and standards in Europe for horizontal measure: Mandatory Minimum Warranty/Guarantee

Title	Existing/ Proposal/ Working Plan (Date)	Description	Relevance
Directive 2011/83/EU on consumers rights	Existing regulation, 2011	Establishes consumer protection measure in EU law. The directive aim to help consumers to be better informed and better protected when they buy goods and services from business sellers.	Regulates and defines commercial guarantees.

Title	Existing/ Proposal/ Working Plan (Date)	Description	Relevance
		The Directive has been amended by Directive (EU) 2019/2161 ⁹⁹ of 27 November 2019 on better enforcement and modernisation of Union consumer protection rules, part of the Review of EU consumer law - New Deal for Consumers ¹⁰⁰	
Directive 1999/44/EC Consumer Sales and Guarantees	Existing regulation, 1999	Establishes the legal guarantee for consumer goods and regulates commercial guarantees. Sellers of consumer goods have to guarantee that the goods conform with the contract for a minimum period of two years after the delivery of the goods. From 1 January 2022, the Consumer Sales and Guarantees Directive 1999/44/EC will be repealed and replaced by Directive (EU) 2019/771 ¹⁰¹ on certain aspects concerning contracts for the sale of goods.	Regulates and defines guarantees for the EU.
BS EN 45552:2020	Existing standard, 2020	General method for the assessment of the durability of Energy-related Products. Defines a framework comprising of parameters and methods for assessing the reliability and durability of ErPs.	Defines the methodology to assess durability of ErPs.

5.6.3 Rest of the World

Product guarantees are specific to national regulations and relative to specific local, regional product markets and producers. For this reason, the wider, global measures have not been noted in this section.

⁹⁹ [EUR-Lex - 32019L2161 - EN - EUR-Lex \(europa.eu\)](#)

¹⁰⁰ [Review of EU consumer law - New Deal for Consumers | European Commission \(europa.eu\)](#)

¹⁰¹ [EUR-Lex - 32019L0771 - EN - EUR-Lex \(europa.eu\)](#)

5.7 Opportunities for alignment with other UK strategies

The UK is committed to embracing circular economy measures into different policies and several strategies are being developed to achieve it. This case study focuses on the potential of this horizontal measure to be implemented for a group of energy-related products, but there should be wider alignment with other initiatives.

A holistic approach will reinforce and promote successful implementation of the horizontal measure presented in this case study, and a mapping/cross-referencing exercise should be considered. Table 5.4 below summarises the likely benefits that would be achieved through the implementation of this horizontal measure and alignment with key strategies.

Table 5.4 Alignment opportunities of Mandatory Minimum Warranty/Guarantee with key strategies.

Alignment with 25 Year Environment Plan ¹⁰²	Alignment with Resources and Waste Strategy for England ¹⁰³	Alignment with Waste Prevention Programme for England ¹⁰⁴	Expected benefits from Minimum Warranty/Guarantee
<ul style="list-style-type: none"> ■ Use resources from nature more sustainably and efficiently. ■ Minimise waste. 	<ul style="list-style-type: none"> ■ Help consumers take more considered action by addressing barriers to reuse. ■ Extend product lifetimes through warranties and disclosure. 	<ul style="list-style-type: none"> ■ The government will set up product requirements where this is a necessary step in tackling premature obsolescence 	<ul style="list-style-type: none"> ■ Keep resources from being thrown away and prolonging the lifespan of products. ■ Reduce the rate of product disposal and landfill waste. ■ Accessible information for consumers on product care, repair and reuse.

5.8 Options of interactions with other horizontal measures

Mandatory minimum warranty/guarantee as a measure will only have an impact as a result of the implementation of other horizontal measures like repairability and product support that will help increase the lifespan of the product.

The following criteria listed indicates the interactions of this HM with other measures detailed below:

Interaction with Repairability Measures: Modular Design

¹⁰² [25 Year Environment Plan](#)

¹⁰³ [Our Waste, Our Resources: a strategy for England](#)

¹⁰⁴ [Waste Prevention Programme for England](#) – Consultation Version

There is close alignment between repairability and extended warranty measures, since extended warranties/guarantees raise the importance of repairability to prolong consumer use of products and extend producer responsibility to products.

Key areas of alignment among criteria are listed below:

- Extend use – durability.
- Extend use – reparability / upgradeability.
- End of use – recyclability
- End of use – remanufacture / refurbishment.

Interaction with Product Support

There is close alignment between product support and minimum guarantees, since extended warranties/guarantees can be considered as a form of product support. Other key areas of alignment among criteria are listed below:

- Expected lifespan.
- Information for consumers.
- Information for repairers / remanufacturers / refurbishments / recyclers.
- Extend use – durability, address premature obsolescence, reparability / upgradeability.

5.9 Assessment

5.9.1 Measuring the impact

This measure has the potential to ensure stated lifespans are met, reducing resource use through reduced production volumes. This section assesses the potential impact of implementing minimum warranty/guarantees and relative carbon and cost savings. The challenges are also presented concerning relative costs and extended product commercial guarantee.

Replacing products vs. exploring product lifespan extension (vacuum cleaners and laptops)?

A review of Life Cycle Assessment (LCA) studies was conducted on the optimal replacement cycles of seven use-intensive product categories (washing machines, refrigerators, TVs, mobile phones, laptops, clothing and vacuum cleaners). The results shown that washing machines and refrigerators should be used for at least 10 years before replacement with a more energy-efficient model¹⁰⁵. Vacuum cleaners, clothing, mobile phones, and laptops are usually replaced 'before their time' and should be used for longer (although pinpointing an exact replacement moment is very difficult)¹⁰⁶. Product lifespan extension leads to environmental benefits. The optimal replacement cycle for laptops was calculated to be (at

¹⁰⁵ There is a bias towards European data. Data from developing economies is missing.

¹⁰⁶ [The Long View: Exploring Product Lifetime Extension](#)

least) 7 years. In practice, laptops are used for 4 years on average. Vacuum cleaners are often replaced within 5 years, which is less than the expected lifespan and product lifespan extension is recommended in most cases.

The effect of carbon and cost savings on ErPs, as a result of implementing mandatory minimum warranty/guarantee

Considering both the use and non-use phases, the EU washing machine stock has an overall climate impact of 17.62 MtCO_{2e}. 25% of these emissions (or 4.41MtCO_{2e}) occur during manufacturing, distribution and disposal. These products have an expected lifespan of 11.5 years. EU measures to improve repairability, and hence lifespan of washing machines estimate that in five years it could save about 1MtCO_{2e}. The analysis shows that washing machines would have to be used for between 17 and 23 years to compensate for the greenhouse gas emissions of production, distribution, and disposal¹⁰⁷.

Table 5.5 presents a brief analysis of cost and benefits undertaken in Task 3. The potential costs and benefits criteria scores (from the shortlisted exercise) were based on the potential impact that the implementation of the horizontal measures might have across the supply chain. Evaluating actual costs of implementation of horizontal measures would require a whole-system approach that would be more complex and would include consultation with a wide range of stakeholders. Therefore this analysis was based on existing references and studies, per measure and product group, supported by previous experience from the research team by engaging with different stakeholders and policy related studies.

Table 5.5 Typical distribution of costs and benefits (extracted from the Task 3 ErP Policy Study report).

Energy related policy lever & horizontal measures	Costs						Benefits			
	Government	Manufacturers	Retailers	Energy suppliers	End-users	Society	Manufacturers	Government	End users/ Society	Repairs/
Mandatory minimum warranty/guarantee		x			x			x	x	x

5.9.2 Challenges and Opportunities

Existing regulation in the UK already provides consumers with guarantee periods and rights to choose between repair or replace, free of charge, in case a product is faulty when bought. For some products, manufacturers offer commercial guarantees that enable consumers to repair or replace the products following any damage caused for an additional cost. Nevertheless, the implementation of this horizontal measure might vary depending on the different types of products (e.g., small vs large devices and their lifespan).

Some legal concerns might also arise with the implementation of this measure as it impacts consumers rights act and consumers sales.

¹⁰⁷ [Cool Products don't cost the Earth – report briefing](#)

Very little information, initiatives and best practices were found on implementation of similar measures across Europe and in the RoW, which might be an opportunity to take the lead as well as a challenge to understand how to implement the measure and potential impacts.

Circular Business models – addressing repairability, durability and market surveillance.

Guarantees provide an incentive for driving market demand and consumer perceptions towards prolonging product lifespan. However, one of the major challenges identified with driving the circular potential of products is in integrating product repairability and extending product lifespan, both of which impact the demand for setting mandatory minimum warranty/guarantees.

The extension of the EU Ecodesign and Energy labelling sets a minimum durability criterion as a mandatory requirement for vacuum cleaners and lighting. There is an opportunity to extend the regulation to address premature obsolescence of products as well as set a criterion for minimum product lifespans. However, the recent measurable test standards and verification methods for resource efficiency and durability need to become standardised within circular business models, manufacturing processes and procedures. In addition, this needs to be assessed on a product-specific level by understanding the relative barriers for enhancing sustainable production and market surveillance. Certain products require greater technical knowledge or length of time for sufficient repairs than others, as also discussed in the product support section.

Commercial guarantee service plans are used competitively between manufacturers, both to extend the period of coverage or the scope (e.g., accidental damage, loss). A group of stakeholders estimated that an extension of the legal protection period from two to five years would increase, on average, the cost of goods by 29.4%. However, there is no guarantee that a minimum guarantee will result in manufacturers designing more durable products. In some cases, it may still be cheaper to replace than repair as discussed in the repairability and modular design and product support measures.

5.9.3 Evidence gap

During the research for this study, the following evidence gaps were identified:

- Lack of measurement and assessment of impacts from extended commercial guarantee versus free guarantee period
- Limited data and research on environmental impacts across manufacturing processes and whole supply chain. There is limited evidence related to the design stage and manufacturing process of products. In most of the cases where data exists, it had been commissioned by the manufacturers and is not always publicly available.
- Lack of standardisation and no industry definition, standard or agreed measurement of the expected lifespan of ErPs.
- Lack of insight and review on the burden of proof for breach of guarantees.
- Limited monitoring, recording and tracking data on product lifespan and environmental impact.

5.10 Recommendations and proposed next steps

The key recommendations for this measure, that have been explained and discussed throughout this chapter, are listed below.

Extending minimum guarantees or commercial guarantees:

- Can only be effective as a measure, if industry, designers, consumers, and policymakers join efforts to establish a clear cause-effect relationship when discussing decreasing product lifespan.
- A stakeholder underlined that extended guarantee service (commercial guarantees) contracts are already available for consumers that seek additional protection. However, most consumers choose not to, as it leads to an increase in product cost.
- A few sectors from the industry have seen the introduction of commercial guarantees, extended service plans and plans covering accidental damage from handling. This provides consumers with the choice of extra levels of protection. These service plans are used competitively between manufacturers, both to extend the period of coverage or the scope (e.g., accidental damage, loss).
- Primary research with manufacturers and trade associations should be conducted to gather more information about commercial guarantees such as level of engagement from consumers, cost and potential increase of lifespan of products.

Standardising the definition of the ‘expected lifespan’ of ErPs:

- There is a need for the industry to define and develop standards or agree measurement of the expected lifespan of ErPs. At the time of writing, there is no known method or standard to measure lifespan. The industry is assessing durability (proxies) by implementing the standard EN 45552:2020: General method for the assessment of the durability of Energy-related Products.
- Minimum durability criteria are already part of the EU’s Ecodesign directive for light bulbs and vacuum cleaners, so there is an opportunity to extend measurement standards, test standards and verification methods for durability and resource efficiency for a range of other products.

Greater review on the burden of proof for breach of warranties:

- France and Portugal have extended the period for the reversal of the burden of proof from 6 months to two years, but very little information was found to understand the impacts of this measure. It is recommended to evaluate the French and Portuguese measures in more detail to analyse the cons and pros of this measure.

Monitoring trends on product lifespan and environmental impact:

- There is limited evidence that the lifespan of a range of products has been decreasing over the past decades, and so more research needs to be done to support the evidence base. It is recommended to develop further research (e.g., primary research) to gather more information on product lifespans and develop some meta-analysis.

- Monitoring and recording trends on product lifespan is recommended. This will be useful to track the impact from different generations of products, provided up-to-date suggestions for lifespan extension. Only a few stakeholders responded to Task 3 and 4 questions related to this horizontal measure. Detailed studies involving primary research with industry and stakeholders will be needed to understand better energy and material consumption, savings potential, and the impact on carbon emissions for shortlisted products that are focused on in the future.

Annex 1 List of shortlisted products

Sub-sector	Product group
Commercial/Industrial	Low pressure air compressors
Commercial/Industrial	Oil free air compressors
Commercial/Industrial	Standard air compressors
Commercial/Industrial	Refrigeration compressors
Consumer electronics	Electronic displays and TVs
Cooking	Non-domestic electric and gas hobs
Generation, conversion, supply, storage	Rechargeable batteries
Generation, conversion, supply, storage	External power supplies
Heating, Ventilation, Cooling	Building automated control systems (BACS)
Heating, Ventilation, Cooling	Electric and gas patio heaters
Heating, Ventilation, Cooling	Space heaters
Heating, Ventilation, Cooling	Water heaters
Heating, Ventilation, Cooling	Split system air conditioners
Heating, Ventilation, Cooling	Heat emitters
ICT	Servers
ICT	Smart phones
ICT	Computers and laptops
Lighting	LED and luminaires
Materials	Ink and toner cartridges
Materials	Taps and showers
Motor driven	Water pumps
Refrigeration	Refrigerating appliances with a direct sales function
Refrigeration	Refrigerated containers
Small appliances	Vacuum cleaners
White goods	Professional dishwashers

Annex 2 Task 3 Horizontal Measures coverage and shortlist of product groups

Product group \ Horizontal Measure	Product passport - information for industry	Product passport - information for consumers	Modular design and ease of disassembly	Product support	Minimum expected lifespan and minimum warranty	Premature Obsolescence	Suitability for remanufacture or refurbishment	Requirements on material content	Suitability for recycling	Universalised power supplies, batteries and chargers	Standby and off modes	Energy smart reporting and functionality	Servitisation and sharing or pooling	Reverse logistics and take-back schemes
Low pressure air compressors	Y	Y	Y	Y	Y	N	Y	Y	Y	N	N	N	Y	Y
Oil free air compressors	Y	Y	Y	Y	Y	N	Y	Y	Y	N	N	N	Y	Y
Curtains, blinds, doors and covers for refrigerated display cabinets	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	N	Y
Refrigeration compressors	Y	Y	Y	Y	Y	N	Y	Y	Y	N	N	Y	N	Y
Electronic displays and televisions	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Hobs (all technologies)	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y
External power supplies	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y
Rechargeable batteries	Y	Y	Y	Y	Y	Y	N	Y	Y	N	N	Y	Y	Y
Air conditioners	Y	Y	Y	Y	Y	N	Y	Y	Y	N	Y	Y	Y	Y
Space heaters	Y	Y	Y	Y	Y	N	Y	Y	Y	N	Y	Y	Y	Y
Water heaters, hot water storage tanks and packages of water heater and solar devices	Y	Y	Y	Y	Y	N	Y	Y	Y	N	Y	Y	Y	Y
Building automated control systems (BACS)	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	N	Y
Patio heaters	Y	Y	Y	Y	Y	N	Y	Y	Y	N	Y	Y	Y	Y
Computers and laptops	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y
Servers	Y	Y	Y	Y	Y	Y	N	Y	Y	N	N	Y	N	Y
Mobile phones (smart phones)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y
Electrical lamps and luminaires	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	Y	Y	Y
Printer cartridges	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	Y	Y
Water pumps	Y	Y	Y	Y	Y	N	Y	Y	Y	N	Y	Y	Y	Y

Product group \ Horizontal Measure	Product passport - information for industry	Product passport - Information for consumers	Modular design and ease of disassembly	Product support	Minimum expected lifespan and minimum warranty	Premature Obsolescence	Suitability for remanufacture or refurbishment	Requirements on material content	Suitability for recycling	Universalised power supplies, batteries and chargers	Standby and off modes	Energy smart reporting and functionality	Servitisation and sharing or pooling	Reverse logistics and take-back schemes
Refrigerating appliances with a direct sales function	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y
Refrigerated containers	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y
Vacuum cleaners	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y	Y
Professional dishwashers	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y
Building automated control systems (BACS)	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	N	Y
Heat emitters/low temperature heat emitters	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y

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