

Big Repair Project: Making appliance repair easier for everyone October 2026



Based on research
funded by Material Focus
Circular Electricals Fund

Project background

About the Research

UCL was awarded funding for this project through the Material Focus Circular Electricals Fund [1] which supports innovation in product design, materials use and recovery, and business models. Expanding the work of UCL's Big Repair Project [2], the research aims to understand how to grow the repair economy of large household appliances to meet the needs of both users and businesses. Taking a collaborative approach and engaging directly with industry partners and users between Autumn 2025 and Summer 2026, the project brings together behavioural science with business modelling to elucidate routes to a world where products are used much closer to their full lifespan potential.

About the Authors

The UCL Plastic Waste Innovation Hub is an interdisciplinary team of researchers, designers and practitioners, taking a systems approach to growing the UK repair economy. Its work is underpinned by citizen-science and stakeholder engagement. The research team contributing to this project includes [Mark Miodownik](#) Professor of Materials and Society UCL, [Polina Pencheva](#) Senior Fellow Sustainability UCL, Dr. Federica Stabulum Research Fellow in Behavioural Psychology, Dr. Graham Anderson Research Fellow in Product and Business Development, Dr [Ayse Allison](#) Research Fellow in Behavioural Psychology, Dr. Rosalilla Hewlett Research Fellow in Circular Metals and Society, and Danielle Purkiss Head of Research at the Institute of Making.

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Executive Summary

This study combined behavioural research, systems modelling, and industry engagement to assess the potential for growing the UK repair economy of large household appliances, using washing machines as a representative case study. A key element of the work was the development of a systems-based modelling approach that links individual customer decisions with long-term economic and environmental outcomes, providing a tool to assess the impacts of behavioural, business and policy interventions at scale. Data were collected through 22 semi-structured interviews, a UK-representative survey of 1,486 adults, stakeholder workshops and 1:1 meetings, site visits, and analysis of repair operations across manufacturers, retailers, repair providers and social enterprises. Behavioural drivers were analysed using the COM-B framework, inductive thematic analysis and statistical modelling, while long-term economic and environmental impacts were assessed through a dynamic stock-flow model incorporating appliance ageing, fault rates, repair behaviour, replacement decisions, costs, waste generation and carbon emissions.

Survey results indicate strong latent demand for repair, with **65% of respondents stating a preference for repair over replacement** following appliance failure. However, a clear intention–action gap remains, with replacement often becoming the default outcome when a fault occurs. Respondents were **willing to pay**, on average, approximately **£100** for repair and were generally willing to wait **up to seven days** for a repair to be completed. However, current repair outcomes remain low due to barriers associated with uncertainty, perceived repair costs and lack of confidence in repaired products. **Previous repair experience** emerged as one of the **strongest predictors of repair behaviour**.

Economic modelling used an average machine purchase price of **£370**, repair costs of **£100–140**, and a mean time between faults of **6.1 years**. Increasing repair propensity was shown to extend average product lifetimes by approximately **4 years**, reducing lifetime costs for customers and creating viable service-based revenue opportunities for manufacturers and repair providers. Sensitivity analysis identified a product value threshold of approximately **£300**, above which repair becomes consistently more cost-effective than replacement for customers.

Environmental modelling demonstrates that **repair remains preferable** to replacement across both current and future scenarios. As appliance efficiency improves and the UK electricity grid continues to decarbonise, the relative contribution of manufacturing and end-of-life impacts increases, strengthening the environmental case for lifetime extension. Higher repair rates were associated with reductions in WEEE generation and lifecycle greenhouse gas emissions. Scenario modelling suggests that fiscal measures that increase repair uptake, such as reduced VAT on repair services, could reduce annual WEEE arisings by approximately **10%** while maintaining manufacturer profitability.

The results demonstrate that repair is technically, economically and environmentally viable at scale. The principal constraints are not technological but behavioural and systemic, particularly trust, quality assurance, access to repair services, spare parts accessibility and limited visibility of repair costs, timescales and likely outcomes. These barriers cannot be addressed by a single stakeholder alone and thus the findings of this report should be considered within the context of each individual stakeholder's capacity and ability to implement different interventions at different scales. Overall, the research shows that if we address barriers and succeed in increasing repair rates this can deliver significant opportunity to reduce costs for both users and businesses, reduce waste and environmental impacts, support skilled employment and deliver economic growth.

Key takeaways

1. A triple win!

The research shows that higher repair rates can simultaneously **reduce costs** for consumers, create **profitable** service-led revenue opportunities for businesses and **reduce environmental impacts** through lower waste generation, reduced material consumption, and avoided carbon emissions.

2. Local skills, jobs and economic growth

Manufacturer and retailer-led repair networks and independent local repairers all play vital roles in the repair ecosystem. A diverse repair market improves consumer choice, competition, resilience and geographical access to repair services. Protecting and growing local repair capacity will be essential to scaling repair in the future while supporting **skilled employment** and **regional economic growth**.

3. Better metrics, information and trust

Too many repair decisions are made under conditions of uncertainty. **Better access** to diagnostics, expected product lifetimes and repair cost metrics and information would help users make informed decisions with confidence. Greater **information sharing** and collaboration between manufacturers, retailers and repair providers, supported by legislative frameworks, **accreditation** and **certification** where appropriate, could help rebuild trust across the repair ecosystem.

Foreward from Material Focus

Washing machines are a workhorse in many homes, but we often only think about them when they stop working. With dirty clothes piling up and uncertainty about how much a repair might cost or how long it will take, replacement can feel easier than repair.

But is a panic buy to replace an appliance always the best choice? That is the question Material Focus commissioned University College London to explore through independent research.

The findings show a clear gap between intention and action. While 65% of people would prefer to repair a faulty washing machine, 40% have previously replaced one without considering repair.

Higher repair rates offer a triple win: lower costs for households, opportunity for business and local economy, and reduced waste and environmental impact. Growing repair could also support skilled local jobs and strengthen national resilience.

To realise these benefits, we need to make repair easier and more trusted. People can

struggle to find a repairer, access spare parts and technical information, and understand the likely cost and outcome.

Work is already underway. Manufacturers and retailers are investing in repair facilities and engineer training and AMDEA, the UK home appliance association, is developing a repair accreditation scheme to build consumer confidence.

At Material Focus, we work with partners to help build a future where electricals are designed to be used, reused, repaired and recycled. This research shows us why repair is an important part of that future.

I'd like to thank the UCL research team and everyone who contributed their time and experience. I hope this report helps make repair a practical first choice for more people.

Scott Butler, Executive Director, Material Focus



Circular Electricals

Keeping electricals – and their materials – in use for longer.

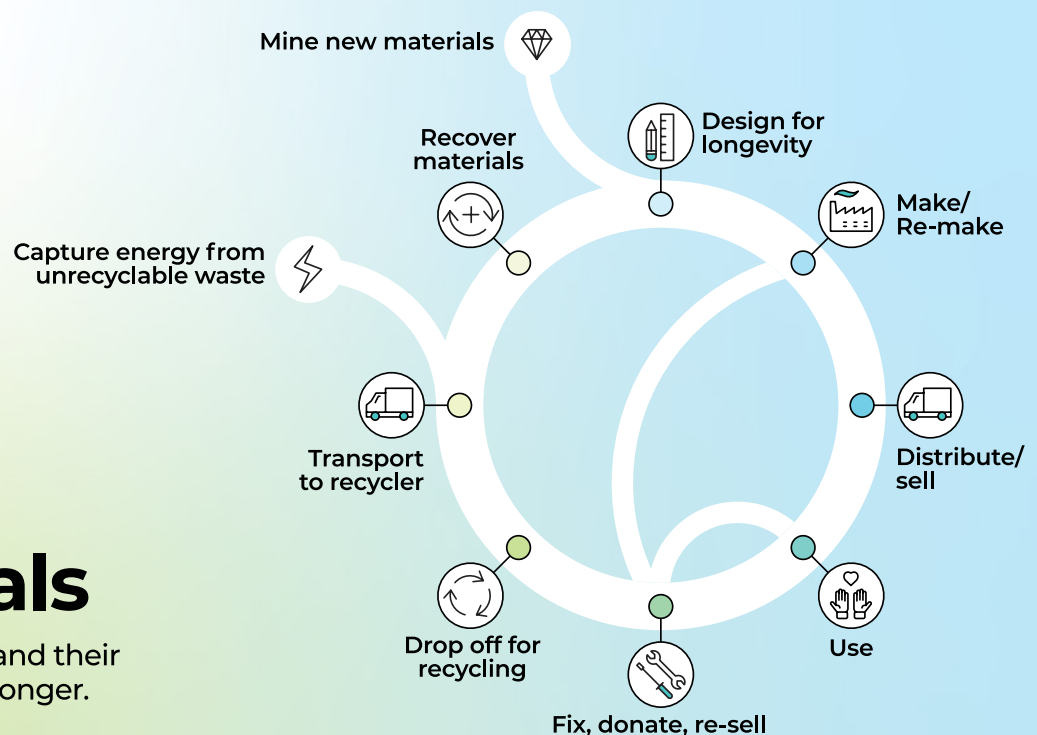


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Introduction

Globally the consumption of electrical and electronic equipment (EEE) is growing rapidly, and its growth directly drives the rise in global e-waste (62 million kg) [3] which is one of the fastest growing solid waste stream in the world. The UK is the second highest producer of e-waste per person in the world (24.5kg/capita [3]) and a large fraction (over a third [4]) of that waste is attributed to large household appliances. This waste is associated with significant negative environmental, social and human-health impacts. In addition, improper disposal or recycling practices lead to the loss of billions worth of valuable materials including rare earth elements. Formal recycling is growing 5-times slower than waste generation and on its own is inadequate to deal with the volume of waste. Alongside rapid technological advancements, limited repair options have also contributed to accelerated consumption and waste generation.

While recycling remains an essential part of resource recovery, extending product lifetimes through repair offers a major opportunity to reduce waste, lower carbon emissions, conserve valuable materials, reduce costs for households, and create new economic opportunities through the growth of the repair economy. This study builds upon earlier work by the UCL Plastic Waste Innovation Hub examining the policy, regulatory and wider system factors influencing electrical and electronic equipment (EEE) repair in the UK, providing an important foundation for the present research [5].

Washing machines have been selected as an illustrative case study for this project as a representative of the electricals - large household appliances category. They are present in approximately 98% of households and are frequently discarded due to faults, with 69% of disposals attributed to functional failures [6]. Notably, many of these faults are technically repairable. Economic considerations “it’s cheaper to buy new than repair” and customer uncertainty “it might break again” are often cited as the reasons for low repair rates. The aim of this project was to move beyond anecdotal evidence and instead conduct a systematic study of the economics and user behaviours concerning repair. We also set out to better understand the wide range of repair services offered to customers in the UK. This included visits to manufacturer repair centres, spare-part warehouses, high street retailers, independent repairers and social enterprises. The visits combined with discussions with staff and follow-up questions gave us a full picture of the state of play with respect to the system of repair of washing machines present in the UK. Combining insights gained through these visits, together with research to understand the fundamental drivers of repair has allowed us to correct some persistent theories about the causes of low repair rates. It has also provided an evidence base for developing strategies that enhance repair, reduce WEEE waste, and unlock profitable sustainable business models for customers, washing machine brands and retailers.

Behavioural Science

Methods (Data Collection and Approach)

The behavioural research was conducted in accordance with UCL's research ethics and data protection requirements, including compliance with UK GDPR. Ethical approval was granted by the UCL Research Ethics Committee (HAS REC Reference: 2025-1737).

To understand how people make decisions about repairing or replacing their washing machine, we combined two complementary approaches. First, we conducted in-depth interviews with 22 UK adults, selected to represent a range of ages, incomes, locations, and repair experiences. These conversations explored how people respond when an appliance breaks down, what influences their decision to repair or replace, and what would make repair feel like a more realistic option. The interviews were analysed using the COM-B methodology [7], an established behavioural framework that breaks down any behaviour into three components: Capability (whether someone has the knowledge and skills to act), Opportunity (whether their circumstances allow it), and Motivation (whether they want to). Using this framework allowed us to systematically map the full range of factors shaping repair decisions.

Building on these findings, we ran a large-scale online survey with 1,486 UK adults, recruited to be broadly representative of the population in terms of age, gender, income, and geography. Participants were asked about their most recent washing machine, including how old it was, whether it was still under warranty, and whether they had ever experienced a fault and how they had dealt with it. They were then asked what they would do if their machine broke down today: whether they would prefer to repair or replace it, how much they would be willing to spend on a repair, and how long they would be willing to wait. The survey also explored attitudes toward washing machine manufacturers and the factors that would make repair a more attractive option. Finally, we used statistical modelling to identify which factors most strongly and independently predict whether someone is likely to choose repair.

Results

The interviews and survey together tell a consistent story: most people want to repair, but a set of practical and motivational barriers prevent them from doing so. The interviews helped us understand what those barriers feel like from the user's perspective; the survey confirmed how widespread they are and identified which ones matter most.

Stated preference for repair or replacement

Most respondents (65%) said they would probably prefer or definitely prefer to repair their washing machine rather than replace it if it broke down today, and 60% reported they would act on this preference (see **Figure 1**). Those willing to consider repair, reported willingness to pay averaged £100, and most were willing to wait up to seven days (see **Figure 2**). The preference figures should be interpreted with some caution, however: even participants who preferred repair in principle often ended up replacing when faced with cost uncertainty, difficulty finding a trusted repairer, or the emotional pressure of needing a working machine quickly. As one interviewee put it: *"If you've got to invest money in repairing a machine you're not particularly happy with, and the repair shop says 'you may as well replace it'... I was fully in agreement."* This gap between stated preference and anticipated action points to structural barriers that good intentions alone cannot overcome.

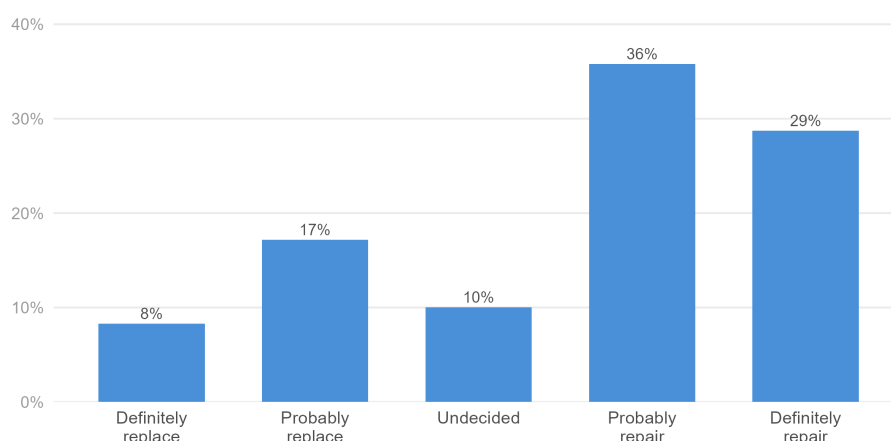


Figure 1. Stated repair preference for repair or replace at appliance breakdown

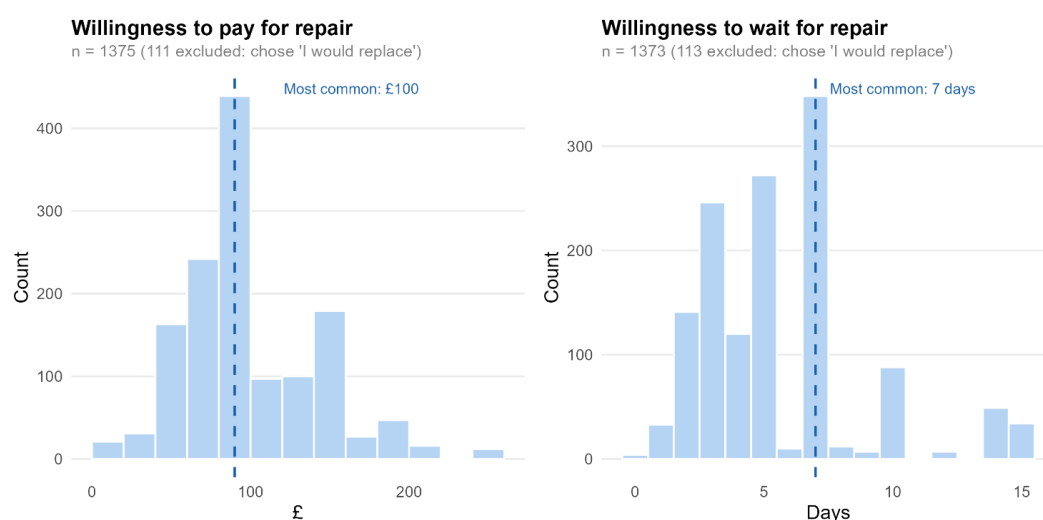


Figure 2. Reported willingness to pay and willingness to wait for repair.

Attitudes toward manufacturers

Our survey reveals a complicated relationship between customers and manufacturers/retailers, the views of the owners of washing machines are summarised in **Figure 3**. Only around 29% of respondents trust manufacturers generally, and fewer than 40% trust them to make products built to last. At the same time, large majorities agree that repair services are overpriced (68%) and that manufacturers should do more to support customers after the warranty expires (85%). The interviews gave texture to these numbers: participants described difficulty finding product documentation, spare parts becoming unavailable for models only a few years old, and product designs that made independent repair impractical. As one participant noted: *“Quite often websites will deprecate their products, so you can’t find the manual or support because it’s now five years old.”* Since most manufacturers do offer some form of post-warranty care, these findings point to a significant gap between what exists and what owners perceive and/or expect (owners expect large appliances to be supported to last ten years [2]. Critically, their experience has reputational consequences: participants overwhelmingly reported that their experience with a machine shaped their trust in that brand for future purchases.

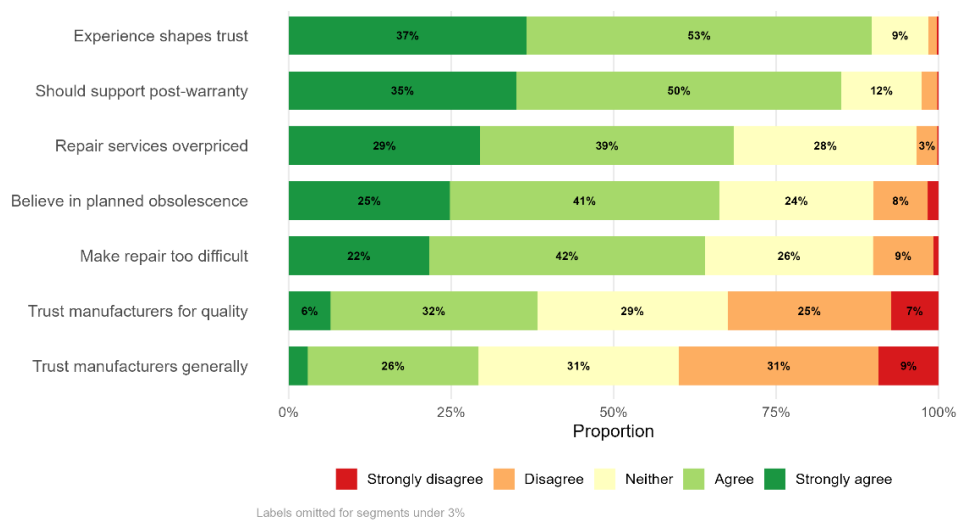


Figure 3. Participants' attitudes towards washing machine manufacturers.

The role of information and appliance design

When a fault occurred, participants typically turned to online searches, YouTube, and occasionally appliance manuals to understand what had gone wrong. Whether this information was clear and model-specific or generic and jargon-heavy directly shaped whether they considered repair or moved straight to replacement. In the survey, difficulty diagnosing faults and difficulty finding reliable repair information were both endorsed as barriers, while fault diagnosis information, lifespan guidance, and step-by-step repair instructions all received high acceptability as interventions.

Appliance design also played a role. Error codes helped some participants narrow down problems, but others found them unclear. One visually impaired participant noted that flat touch-panel interfaces made even basic interaction difficult. More broadly, proprietary parts, lack of accessible schematics, and designs that assumed professional-only servicing reduced both the ability and motivation to pursue repair. Several survey respondents independently raised modular design and design-for-repairability as changes that would shift their behaviour.

Barriers and drivers

Several factors shape whether someone is likely to choose repair over replacement (see [Figure 4](#)). From the COM-B framework, five factors independently and negatively predicted repair intention. Three were motivational: perceived cost was the strongest barrier (people who saw repair as too expensive were significantly less likely to choose it), followed by a preference for quick replacement and low emotional attachment to the appliance. This suggests that for many people the decision to replace is as much about convenience and indifference as it is about money.

In terms of positively predicting repair intention, being under warranty more than doubled the likelihood of choosing repair, pointing to the powerful role that financial protection and clear accountability play in making repair feel like a viable option. The warranty effect was not limited to repair preference, but it also shaped where people turned for help: out-of-warranty participants' first contact was most often an independent local repairer (59%), while in-warranty participants overwhelmingly favoured the manufacturer or warranty provider (76% combined). This finding suggests that warranty status functions as a primary decision heuristic by structuring not just whether someone repairs, but how they navigate the whole service pathway. Perhaps most encouragingly, people who had repaired an appliance before were significantly more likely to choose repair again, suggesting that positive repair experiences build lasting confidence.

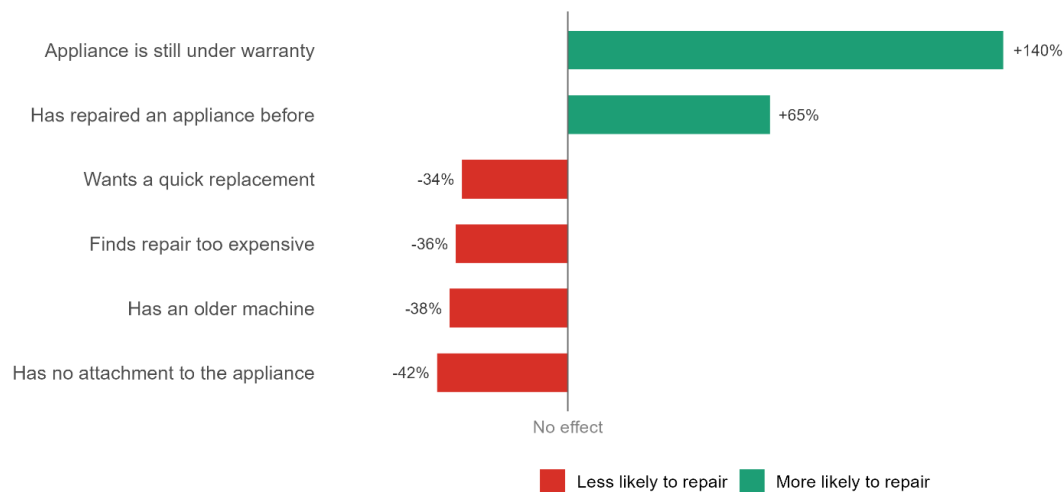


Figure 4. Significant predictors of repair intentions.

Analysis

Four themes cut across the behavioural findings and connect most directly to where intervention is possible: cost, time and uncertainty, access and trust.

Cost is the most consistently cited barrier. Around two thirds of respondents stated that repair services are too expensive, and perceived cost was one of the strongest independent predictors of lower repair intention in the survey. Critically, these perceptions are often not based on actual quotes: many replacement decisions are made on estimated rather than verified repair costs, reinforced by a lack of upfront pricing transparency in most repair offers. Higher-value machines attract stronger repair intent, suggesting that the cost-relative-to-value calculation matters as much as the absolute price. Transparent pricing, fixed-fee offers, and extended warranty coverage would address these barriers to repair.

Time and uncertainty are closely linked. The urgency of needing a working washing machine makes the unknown duration and outcome of repair feel risky to many. In contrast replacement is certain in its outcome, cost and timescale. The interviews showed that access to a laundrette or a flexible schedule meaningfully changed how calmly people approached the decision. People with young children, no alternative laundry access, or inflexible routines have the least risk appetite. Uncertainty also extends to outcome quality: not trusting the appliance after repair was a significant barrier in the survey, and where spare parts are hard to source, the likelihood of a failed or delayed outcome increases the risk further. For most households the barrier is not unwillingness to wait, since people willing to consider repair said they would wait up to a week, but that the wait feels uncertain without a guaranteed outcome and cost.

Access refers to whether a viable repair pathway exists once a fault occurs. Warranty status is the clearest example: in-warranty consumers are more than twice as likely to repair, because there is a clear, accountable route to resolution. Out-of-warranty consumers face cost and higher uncertainty simultaneously which they navigate very differently, turning primarily to independent local repairers (59%) rather than the manufacturers, retailers or warranty provider. This is despite the manufacturers providing call centres and easily accessible contact information on their repair services and online. Nevertheless, the majority seem to ignore these, preferring to contact an independent repairer.

Building trust with existing customers will require manufacturers to persuade customers that they are as passionate in keeping appliances operating for at least 10 years or more as the owners. Our visits to manufacturers' repair operations convinced us that this is true at the level of operations, but the offer to customers at present is not convincing them. Opportunities to address this include providing owners with access to machine usage (expected remaining service life) and improved diagnostic information so that owners can instantly view the expected life of the machine, fault diagnosis and estimate the cost of repair much more easily.

In other words, 'repair' and 'buying new' should be easy to compare and have the same level of convenience and quality assurance. Of course, manufacturers may worry that this would reduce their profits, however in Section 3 we present our business model analysis of different scenarios and show that repair can be a profitable business.

Table 1 summarises the key factors identified across the interviews and survey, maps each onto the COM-B framework, and indicates the types of intervention most likely to address them.

Finally, the data points to an opportunity that the sector has not yet fully exploited. People who have repaired before are more than twice as likely to repair again, meaning every successful repair increases the probability of future repair and builds familiarity with the process. Given that poor reliability also shapes long-term brand decisions, manufacturers who invest in making repair accessible stand to benefit beyond the immediate transaction. Growing the repair economy depends as much on the quality of individual repair experiences as on the structural conditions that make repair possible.

Factor	COM-B barrier type	What it points to
Perceived repair cost	Motivation (reflective)	Transparent pricing; fixed-fee repair offers; VAT reduction on repair services;
Cost uncertainty without quotes	Motivation (reflective)	Upfront pricing tools; diagnostic services with no-obligation quotes;
Preference for quick replacement	Motivation (automatic)	Provide services where booking repairs is quick, predictable, and low-effort for users;
Low appliance attachment	Motivation (automatic)	Marketing campaigns to promote emotional durability (building functional, personal, narrative and future value); customer communication celebrating the product and its life;
Not trusting appliance after repair	Motivation (automatic)	Repair guarantees; quality standards for repair services;
No prior repair experience	Capability (psychological)	First-repair incentives; making initial repair experience low-risk and satisfying;
Machine age	Context	Extended care plans targeted at mid-life appliances;
Spare parts hard to obtain	Opportunity (physical)	Manufacturer obligations on parts; commonality in component design;
Out-of-warranty status	Opportunity (physical)	Extended or post-warranty care plans; manufacturer post-warranty support offers;
Difficulty finding trusted repairer	Opportunity (physical)	Vetted repairer directories; certification and accreditation schemes;

Table 1. Summary of factors identified in the interviews and survey, mapped to the COM-B model and corresponding intervention strategies.

Business Modelling

Methods and Approach

To understand the economic and environmental potential of repair, and to integrate findings from the behavioural science work package, we adopted a mixed-methods approach. First, we undertook desktop research, including literature reviews and analysis of data relating to the financial and environmental landscape of white goods over the last two decades. This was complemented by 1:1 meetings with stakeholders from across the repair ecosystem visits to repair centres, and a stakeholder workshop held in March 2025 [8]. The visits and interviews allowed us to synthesise a systems map of the repair ecosystem and how OEMs, retailers, WEEE waste processors and customers interact, see **Figure 5**.

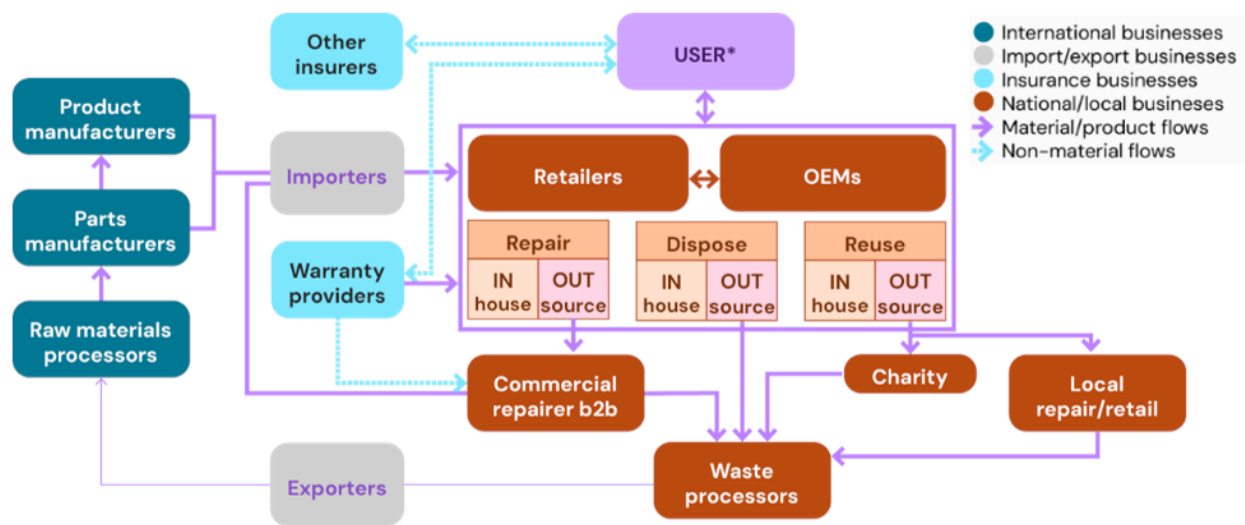


Figure 5. A system map of the repair ecosystem in the UK.

Alongside, we developed the business modelling approach which links consumer repair and replacement decisions with long-term economic and environmental consequences within a dynamic stock-flow framework [9]. The model integrates behavioural findings from this project with available data on product lifetimes, failure rates, repair activity and replacement patterns, allowing us to explore the potential impacts of increasing repair uptake and to quantify the resulting impacts for consumers, businesses and the environment at a population scale. The model also allows for testing changes in parameter values across one or multiple parameters (discussed in analysis). A simplified summary table of the key input parameters and output metrics is provided below:

Input Parameter	Baseline Value	Outputs
Assessment Time	20 years	User Costs £/user
Product Original Purchase Cost	£370	
Warranty Length	2 years	OEM Financial Outcomes £/year
Mean Time Between Faults	6.1 years	
Extended Warranty	0 years	Repair Activity repairs/year
Fixed Price Repair Cost	£140	
Non-fixed Repair Cost (Average)	£100	Environmental impact no. waste units & kgCO ₂ e
Repair Success Rate (In warranty)	0.85	
Repair Success Rate (Out of warranty)	0.68	
Fixed Price Repair Share	10%	
Willingness to Repair	15%	

Table 2. Summary of the key model input parameters and the tracked modelling outputs.

Assessment Time: Our modelling approach assumes that households require continuous access to a functioning washing machine. Consequently, impacts are assessed over a 20-year period which is considered representative of a generation. During this period, when a fault occurs, users must either repair or replace the appliance. If a repair attempt is unsuccessful, replacement becomes necessary. All costs associated with these decision pathways are incorporated into the model.

Product Original Purchase Cost: In the model the purchase of a new washing machine incurs an upfront cost which is set as £370 [10] with additional costs of £30 for delivery and £25 for removal of the old unit¹.

Only direct costs associated with the acquisition of new units and repair activities are included in the model. Operational costs (such as energy, water, and detergent) are not factored into the output metric for user costs. This is because although they are variable depending on the age/efficiency of the appliance, the variation that this creates can be shown to be close to insignificant using historical data.

Mean Time Between Faults: Behavioural change impacts were modelled using a mean time between faults (MTBF) of 6.1 years, based on Which? consumer reliability data [11]. This study focuses on faults rather than product failure, as faults create opportunities for repair and lifetime extension. Fault rates were modelled using UK consumer reliability data and supported by evidence from the literature. Because there is uncertainty around how faults develop over time, sensitivity analysis was used to test the robustness of the results.² Published estimates suggest washing machine lifetimes typically range from around 8 to 13 years, with UK market data indicating an average lifespan of approximately 9–10 years³.

¹ Typical costs chosen from large retailer.

² For more detailed information on the data review and sensitivity analysis undertaken refer to [9].

³ Estimates of lifespan vary across studies. Reported averages for washing machines include, 8.3 years from an Austrian survey reported in 2015 [27], 12.6 years from an Austrian survey reported in 2019 [26], 12.0 years from a German survey reported in 2016 [28], and 11.8 year from a Netherlands survey reported in 2013 [25]. A simple consistency check based on UK market data approximately 28 million households [29], annual sales of around 2.8

Repair Costs: The model incorporates both standard servicing and call-out charges, including cases where faults are unrepairable. For modelling purposes, 10% of repairs are assumed to be undertaken by the OEM at a fixed price of £140⁴ per repair attempt. The remaining 90% of repairs are carried out by independent repairers at an average cost of approximately £100, in line with reported data [12]. The goal of this is to evaluate realistic scenarios that do not require the OEM to dominate the repair market.

Willingness to repair: A user's willingness to repair is influenced by a range of factors, as discussed in the Behavioural Science section. In this modelling, the purpose of this variable is to assess its impact on outcomes such as user costs, OEM revenues, and waste generation. Based on the survey data, a baseline value of approximately 15% can be interpolated using the relationship between repair price and product cost.

User Costs: User costs output is calculated cumulatively over the 20-year period, including the initial purchase and any subsequent repair or replacement costs. Rather than producing step changes typical of deterministic failure modelling, the model generates smoothed outputs that represent average behaviour over time. As a result, the findings should be interpreted as representative of a large population rather than individual household experiences.

million units [22], and high ownership levels (~90% [30]), suggests an implied average lifespan of roughly 9–10 years under steady-state conditions (i.e. a saturated market with replacement-driven sales).

⁴ Representative one-off repair cost for Currys, Beko etc. The cost to the repairer is modelled using data supplied by an OEM, which includes data for the range of repair costs that occur within one year. This data is for in-warranty repairs so is likely an underestimate.

Results

Financial Landscape

Over the last 30 years, using UK government consumer price index (CPI) data [13], sustained reductions in production costs have led to a substantial decline in the real price of domestic appliances in the UK (see **Figure 6**), thereby significantly expanding access. However, these gains have come with unintended consequences. While manufacturing costs have fallen through globalised production, design optimisation and reduced per-item profit margins, repair costs (black line), driven by domestic labour and increasingly complex product architectures, have increased in line with inflation (green line). This imbalance has weakened the economic viability of repair for many users.

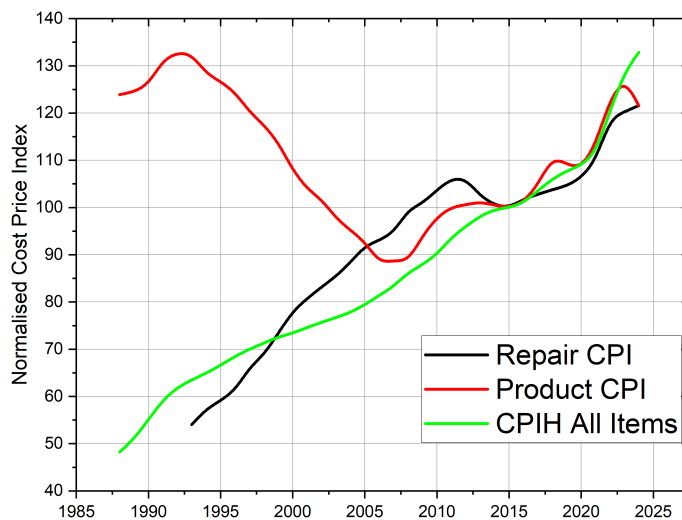


Figure 6. CPI and CPIHs indices with time.

This study focuses specifically on washing machines. Over the past two decades, significant improvements in appliance efficiency have reduced both water and electricity consumption for products placed on the EU market [6]. These improvements have been driven in part by the introduction of ecolabelling schemes and have helped reduce operating costs for consumers, despite fluctuations in electricity and water prices over the same period [7]–[10].

Environmental Landscape

A policy focus on waste materials is increasingly critical because the environmental impact of washing machines is shifting. Historically, the majority of lifecycle emissions came from the use phase (electricity, water, and detergent consumption) accounting for 80-90% of total impact on a cradle-to-grave [14] [15]. However, improvements in appliance efficiency [6] and the continued decarbonisation of the UK electricity grid are reducing these use-phase impacts [16], [17].⁵

While the environmental impacts of manufacturing and disposal are also expected to fall as energy systems globally (note production is often global) decarbonise and recycled materials are used more extensively, the available evidence is insufficient to confidently quantify these future improvements.

Consequently, for the UK upstream impacts (materials extraction and manufacturing [18]) and downstream impacts (end-of-life treatment and waste management, WEEE processing [19]) are becoming more consequential within the overall lifecycle. This heightens the importance of lifetime extension through high-priority circular economy activities such as repair and reuse instead of linear models of consumption and waste generation.

The overall impact of these shifts is shown in **Figure 7** below.

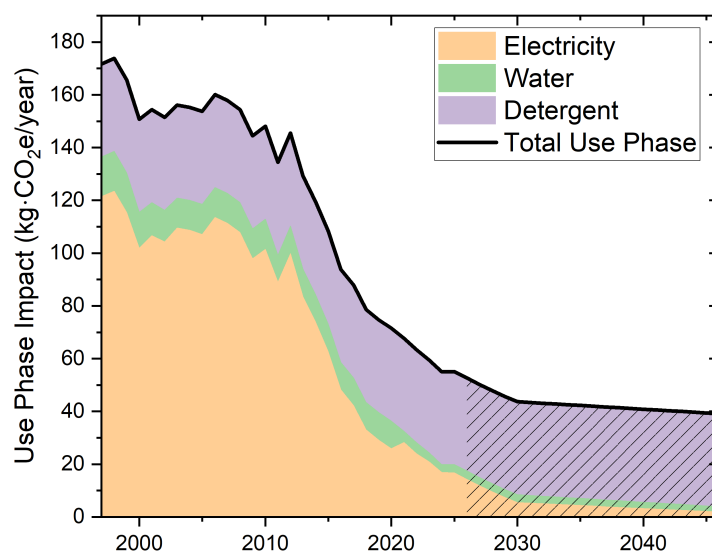


Figure 7. Use phase impacts modelled for the UK, based on washing machines purchased in the assessment year. Data after 2025 is hashed and estimated using linear extrapolation or assumed to remain constant, depending on the variable.

The implications of these findings indicate that future policy frameworks and product strategies should place greater emphasis on the environmental impacts associated with material extraction, manufacturing, and end-of-life disposal than is currently the case. Although projections beyond the available data are subject to uncertainty, there is a clear indication that the life cycle environmental burden is shifting from energy consumption during the use phase towards impacts associated with material production and processing. This analysis focuses on greenhouse gas emissions (kgCO₂e) and waste generation (kg, where a washing machine weight is assumed at 70kg) which provide a useful indication of the environmental impacts of production, use and disposal. However, a more comprehensive life cycle assessment (LCA) would be needed to capture a wider range of environmental

⁵ There are two different electricity carbon indicators published on behalf of the UK government. The GHG UK government factors [26] are generally slightly higher than the NESO [14] due to upstream emissions. This work uses the GHG values to be more representative of the full impact.

impacts (acidification, eutrophication, resource depletion, and ecotoxicity, etc.) and provide a fuller understanding of the benefits of repair and product lifetime extension. Consideration of these broader impacts would likely reinforce the conclusion that the continued production, replacement, and disposal of products can impose environmental burdens that extend well beyond their carbon footprint alone.

Another important consideration when thinking of material extraction and recovery is that critical raw materials (CRMs) are becoming increasingly prevalent in white goods as products incorporate greater connectivity and electronic hardware, including communications modules, security components, sensors, and more powerful processors. However, tracking the quantities of CRMs embedded within these products, and understanding the extent to which they are lost at end of life, remains challenging.

A review published in 2021 highlighted that the types and quantities of critical raw materials contained within many household appliances are still not well understood [20]. Consequently, the estimates presented in this report are based on the best currently available data [21] [22], as shown in **Figure 8** and should be regarded as indicative rather than definitive.

To date, CRM recovery efforts have been concentrated primarily on mobile phones and ICT equipment, where the value of recovered materials is high relative to overall product mass, making recovery processes more economically attractive [22]. Evidence from a UK washing machine recycler suggests that, while CRMs contained within printed circuit boards can technically be recovered, the commercial viability of doing so remains uncertain and is not currently a core part of many appliance recycling business models.

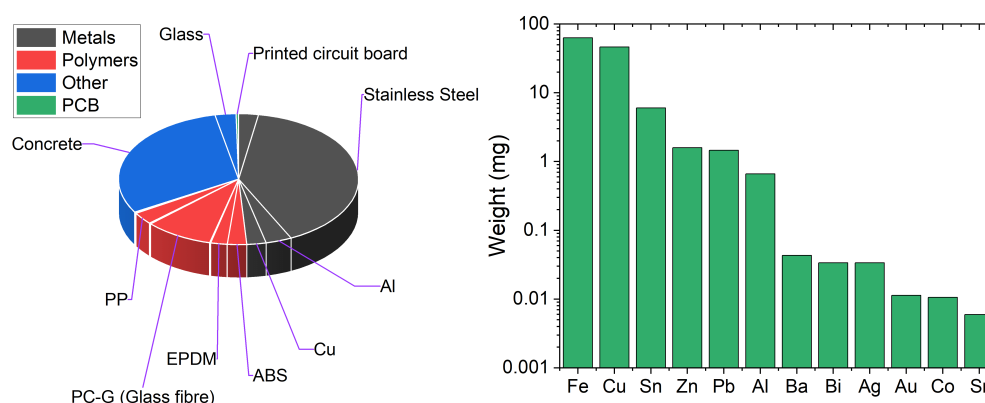


Figure 8 The overall material make-up of a washing machine and a rough indication of the types and quantities of metals that may be found in the printed circuit board for a **typical** washing machine.

Nevertheless, developments in recovery technologies may improve the economics of CRM recycling in the future. For example, The Royal Mint has recently established a dedicated precious metals recovery facility in South Wales, using a novel chemical process to extract gold and other valuable metals from waste printed circuit boards [23]. Regardless, recovery at the end of life of appliances does not negate the positive overall gains associated with lifetime extension.

Business (Stock-Flow) Modelling

The key question of the modelling is whether increased repair of washing machines (via improving users' willingness to repair) at scale can deliver positive outcomes for users, businesses and the environment. The modelling results demonstrate that increasing repair uptake (without changing any other parameters) shifts expenditure away from the purchase of new products and towards repair services, while also reducing overall costs to users (**Figure 9**). As the probability of choosing repair increases, annual spending on new products declines, while spending on repairs rises.

As shown in **Figure 9**, expenditure does not transition entirely from new product purchases to repairs, even when users always choose repair where possible. A proportion of faults remain technically unrepairable and therefore still require product replacement.

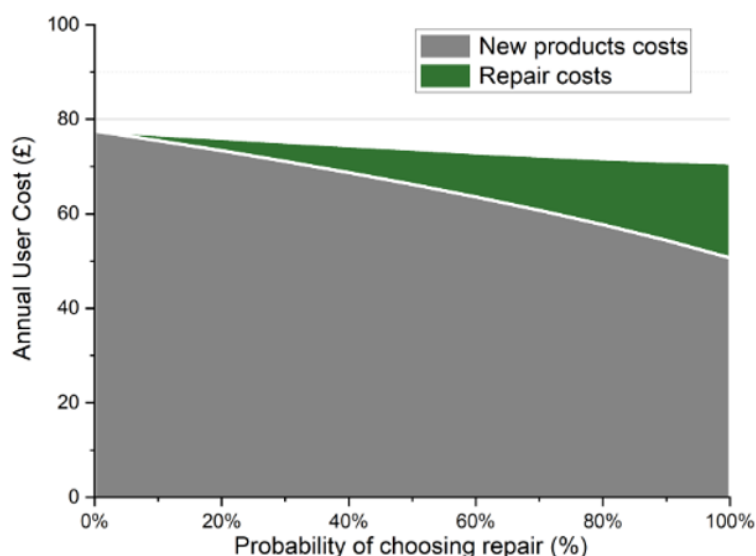


Figure 9. Higher repair adoption shifts spending from new product purchases to repair activities, reducing overall annual user costs while some replacement costs remain for products that cannot be repaired.

The wider implications of increasing repair uptake are illustrated in **Figure 10** (upper), which shows the effects on OEM profitability and product waste generation. Annual OEM profit increases steadily with repair adoption, suggesting that manufacturers can benefit financially from repair-oriented business models, rather than relying solely on revenues from new product sales. The increase in profitability reflects revenue generated through repair services and replacement parts over a longer product lifetime.

At the same time, greater repair uptake reduces the number of products discarded by households (**Figure 10** (lower)). Annual discards fall from approximately 2.7 units per household to around 1.6 units, representing a reduction of more than 40%. By extending product lifetimes and preventing premature replacement, repair reduces material throughput and waste generation. Although the results in **Figure 10** are reported on a per-household basis, the implications at market scale are substantially larger. When aggregated across millions of households, the increase in OEM revenues and the reduction in discarded products would translate into significant economic benefits and considerable reductions in waste, resource consumption, and associated environmental impacts.

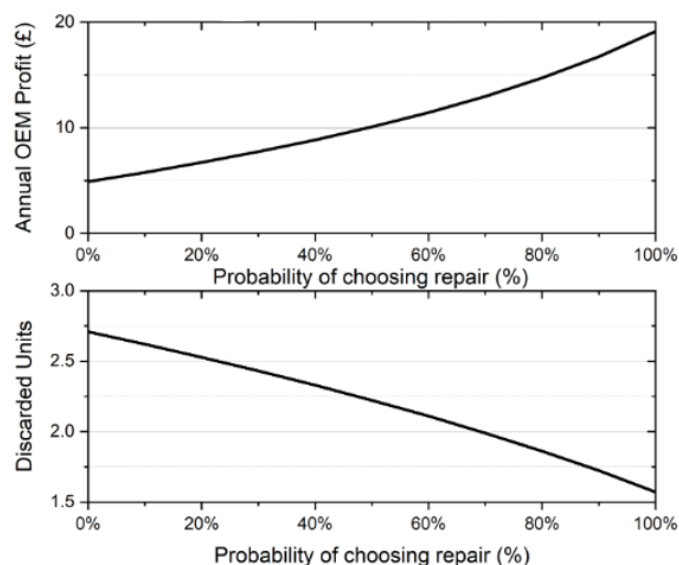


Figure 10. Increasing repair adoption raises OEM profit through repair revenues and reduces household product discards by extending product lifetimes. While results are shown for a single household, much larger impacts would be extrapolated at market scale.

Waste generation in the model is driven primarily by the replacement of end-of-life appliances. Repair-related waste is set to account for 5% of total waste per intervention [10], reflecting component replacement and transport. Under the behavioural change scenario, increased repair uptake extends the effective product lifetime by approximately 4 years⁶, resulting in lower replacement rates, reduced lifecycle costs, and a corresponding reduction in material waste. The carbon cost of two different scenarios was calculated, repair and replace, for two different starting years, 2006 and 2026. This was achieved by assuming that the functional unit is defined as providing washing machine functionality for 20 years.

Despite continued improvements in the performance efficiency of washing machines, repair remains the most environmentally favourable option, as shown in **Figure 11**.

This holds true both when considering known performance gains for study start date in 2006 and 2026, based on reasonable assumptions derived from historical trends⁷. While there will always be edge cases, such as very old appliances with substantially poorer performance, where replacement may appear justified, these instances do not materially affect the overall conclusion. When assessed across a population, the environmental benefits of repair consistently outweigh those of replacement.

⁶ Lifetime taken as average unit utilisation rate in second half of study once system has reached steady state.

⁷ Linear extrapolation for water and electricity consumption improvements, linear extrapolation for grid greening until UK government target for 2030 [34], constant thereafter. Water supply and treatment assumed to have constant impact with an average taken from 2021-2025 [33], it's unclear if the grid greening will drive lower impact or environmental factors will create more energy required for pumping etc. Detergent assumed to be constant as no convincing data on trends available [15].

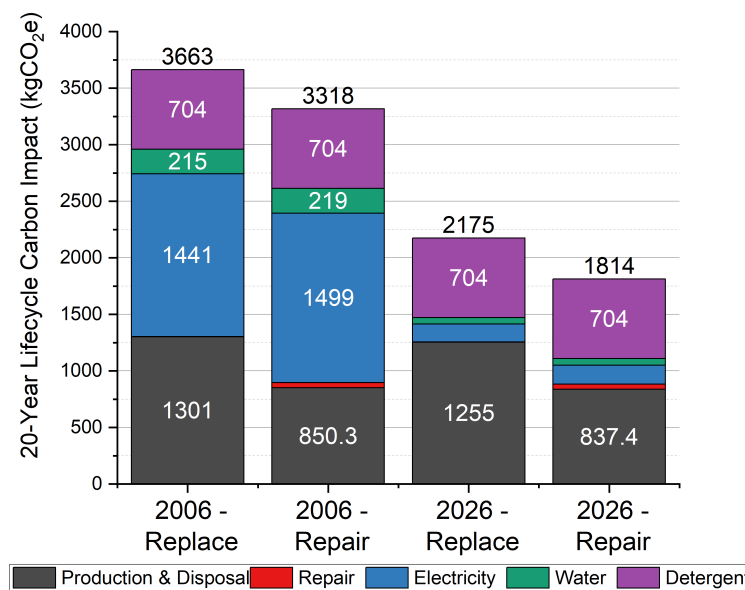


Figure 11. Twenty-year carbon impact of washing machine use, comparing repair and replacement scenarios for 2006 baseline and 2026 projections.

This holds true both when considering known performance gains for study start date in 2006 and 2026, based on reasonable assumptions derived from historical trends⁸. While there will always be edge cases, such as very old appliances with substantially poorer performance, where replacement may appear justified, these instances do not materially affect the overall conclusion. When assessed across a population, the environmental benefits of repair consistently outweigh those of replacement.

In summary, the modelling results show that repair delivers a triple win over the long term. If people were to choose repair first this will result in positive financial outcomes for them and for businesses offering repair services and will simultaneously reduce our impact on the environment.

⁸ Linear extrapolation for water and electricity consumption improvements, linear extrapolation for grid greening until UK government target for 2030 [34], constant thereafter. Water supply and treatment assumed to have constant impact with an average taken from 2021-2025 [33], it's unclear if the grid greening will drive lower impact or environmental factors will create more energy required for pumping etc. Detergent assumed to be constant as no convincing data on trends available [15].

Analysis

This section explains how changing some of the key parameters in the model such as the original purchase price or the time between faults impacts the overall findings. It also analyses two areas which have been quoted by stakeholders as potential levers for reducing costs of repairs in aid of driving higher repair uptake (note that this is only one of the factors uncovered in the behavioural work). The discussion section then considers this business-focused analysis alongside the findings from the behavioural work which set out capability, opportunity and motivation factors which can drive repair uptake (Table 1).

Purchase Price Sensitivity Assessment

The sensitivity analysis presented in **Figure 12** explores how varying the product price influences the financial case for repair. While the earlier analysis was based on the average UK washing machine price (£370), this additional modelling extends the assessment across a broader range of price points, including lower-cost products that may reflect budget⁹, or refurbished (albeit with the same fault probabilities as new) market segments. This approach ensures that conclusions are not limited to mid-range products but remain relevant across a wider spectrum.

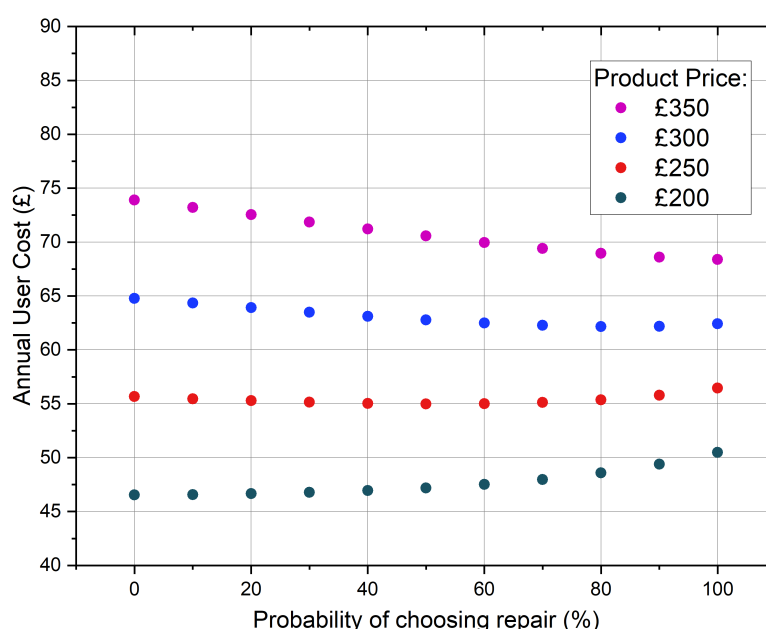


Figure 12. Impact of user repair behaviour on annual cost across varying product price points. Each series represents a different product cost. The results demonstrate a transition around £300, where repair shifts from increasing to reducing overall user costs, indicating a threshold above which repair becomes economically favourable.

The results indicate a clear relationship between product price and the economic viability of repair. For lower-cost products (e.g. £200-£250), increasing the probability of choosing repair leads to a gradual rise in annual user cost, suggesting that repair becomes less financially attractive relative to replacement. In contrast, for higher-cost products (e.g. £350), increasing engagement with repair reduces annual user

⁹ Currys has a lowest cost WM of £199, AO £199 also.

cost. Notably, an inflection point is observed around £300, above which repair begins to provide a consistent financial advantage to the user.

This analysis is particularly relevant given the emergence of online retailers such as JoyBuy in the UK market. Backed by JD.com, one of the world's largest retailers and logistics companies, JoyBuy is currently offering washing machines for less than £200, often including free delivery and a two-year warranty. The availability of large appliances at such low upfront prices may further reduce the economic attractiveness of repair relative to replacement. If these lower-cost products capture a significant share of the UK market, consumers may become increasingly likely to replace rather than repair faulty appliances. This could reinforce a linear "buy–use–replace" consumption model, leading to increased waste generation, greater demand for new products, and consequently higher environmental impacts across product life cycles.

Failure Distribution Sensitivity Assessment

We used the Weibull distribution [24] [25] to estimate how the chance of a washing machine developing a fault, changes as it gets older. The model has two key parameters: the shape parameter and the scale parameter. The shape parameter determines the pattern of failures over the appliance's lifetime. For example, it can represent products that are more likely to fail when they are new, products that fail randomly throughout their life, or products that become more likely to fail as they wear out with age. The scale parameter determines the typical lifetime of the appliance. A larger scale value means that failures tend to occur later, resulting in a longer expected lifespan. We tested a wide range of shape and scale values to see how sensitive the model is to these assumptions. The results, shown in **Figure 13**, indicate that while the timing and frequency of faults can change considerably, the overall findings about the effectiveness of different repair strategies remain largely unchanged.

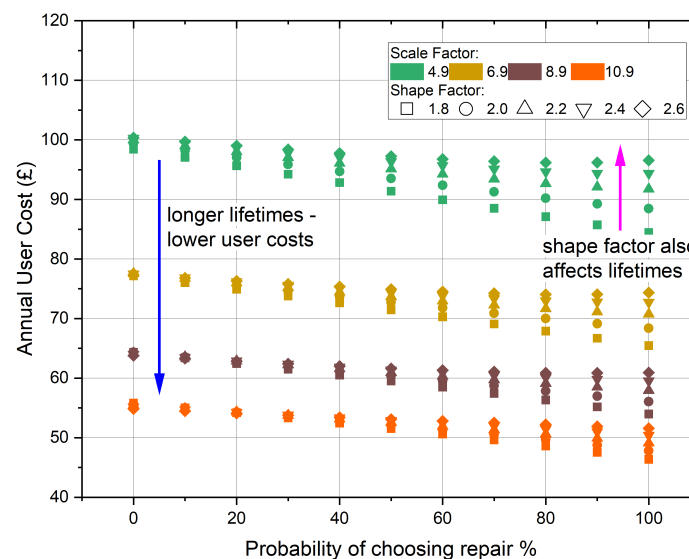


Figure 13 Sensitivity analysis for range of scale and shape factors, showing trends staying generally consistent.

VAT rate adjustment analysis

Our behavioural research shows that the cost of a repair is one of the main factors affecting whether people choose to repair or replace a broken appliance. At current repair prices, only about 29% of consumers choose repair. However, if repairs were made cheaper, this could increase to around 65%. The research also showed that customers are willing to pay on average £100 per repair, whereas some manufacturers currently offer a fixed price repair at a cost of around £140.

Thus, in this scenario we assume that repair prices need to fall below £140 to encourage this change in behaviour. The cheaper the repair, the more people are assumed to choose it. To keep the analysis simple, all repairs are assumed to be offered by the original manufacturer (OEM) at a fixed price. The study then asks an important business question: If manufacturers make repairs cheaper and more customers repair rather than replace their appliances, will they lose money because they sell fewer new products? The results suggest that this is not necessarily the case. **Figure 14** shows that manufacturers could charge lower repair prices and still make roughly the same profit as they do today if repair services were subject to a lower VAT rate. For example, repair prices of around £115 with 15% VAT or £105 with 10% VAT could deliver similar profits to the current situation of £140 with 20% VAT.

These lower-cost repair options would encourage more consumers to repair their appliances, reducing the number of products being discarded. This means less waste, fewer new appliances needing to be manufactured, and lower environmental impacts. The model therefore suggests that reducing both repair prices and VAT on repairs could create a "win-win" situation:

- Consumers would benefit from cheaper repairs.
- More appliances would be repaired rather than replaced.
- Waste generation would decrease.
- Manufacturers could maintain similar overall profits.

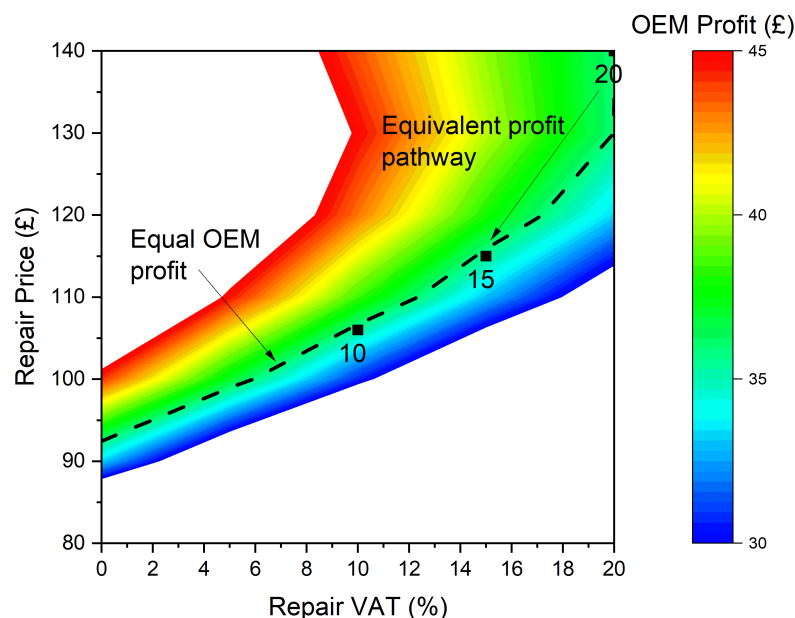


Figure 14 Contour map of OEM profit as a function of repair price and VAT level. The black contour line represents combinations of price and VAT that yield equivalent profit to the baseline scenario (£140, 20% VAT).

Figure 15 shows the environmental benefits of this approach. The results indicate that reducing VAT on repairs could lower annual electrical waste (WEEE) by about 10% compared with the current VAT rate.

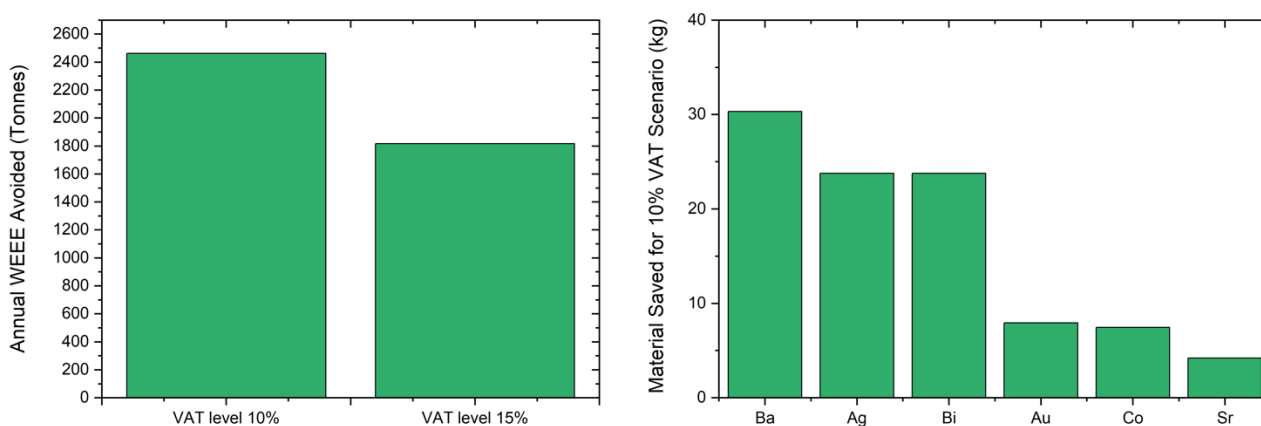


Figure 15. Left, reducing VAT from the standard 20% could cut annual WEEE substantially based on 2.8M units at 70 kg each. Right Example materials saving for the 10% VAT scenario.

However, these results are based on a simplified model. In reality, not all repairs are carried out by manufacturers, and manufacturers may only capture a small share of the repair market. More work is therefore needed to understand how these policies would affect repair businesses, jobs, competition, and the wider market.

Spare Parts Analysis

Cost

Spare parts, their cost and availability have proven to be a highly emotive subjects with all stakeholders. They provide a useful lens to examine the wider issues of the breakdowns in communications and trust between users, manufacturers, repairers and others in the supply chain. This section aims to take an even-handed approach to these issues and advise on steps that can be taken to start building relationships between stakeholders that can better foster repair. At face value, one could develop an unfavourable view on manufacturers and spare parts distributors based on parts costs to the user. For example, from a one-off study of a mid-market washing machine, the overall bill of materials of the spare parts required to assembly the finished product was a factor of five higher than the retail price. The origins of these differences are explored in [Table 3](#), but the grey area of profit margins for the OEM and distributors are not known and the spectre of presumed large profit margins looms darkly.

Cost Area	Spare Part	Washing Machine
Production	OEM factory, mass produced	OEM factory, mass produced
Transport	Sea, land freight	Sea, land freight
Wastage	~5% per year	
Warehousing	Long term ~ 10 years	Short term ~ weeks/months

Table 3. This comparison highlights how spare parts often incur additional long-term holding and distribution costs, which contribute to their higher relative price and impact the economics of repair services.

In addition to manufacturing and warranty repair operations, the spare parts market serves a diverse range of customers, including in-house repair teams, independent repair businesses, and consumers undertaking self-repair. The distribution of sales across these different channels is generally not publicly available, raising questions about the fairness and accessibility of parts supply. While some commonly used components, such as outlet hoses, are available from third-party manufacturers due to their standardised designs, most spare parts remain available only through manufacturer-controlled supply

chains. This concentration of production and distribution can create a perception of monopolistic practices, contributing to a lack of trust among repair stakeholders.

Manufacturers and parts distributors, however, argue that spare parts pricing reflects a range of additional costs beyond production alone (see **Table 3**), including inventory management, warehousing, logistics, technical support, wastage and the need to maintain parts availability over extended periods. In many organisations, spare parts operations function as distinct business units that are required to remain financially sustainable. From this perspective, pricing strategies are intended to support the long-term viability of parts supply rather than to restrict repair. Furthermore, manufacturers seeking to maximise product sales have little incentive to set spare parts prices unnecessarily high, particularly where this could negatively affect customer satisfaction and brand reputation.

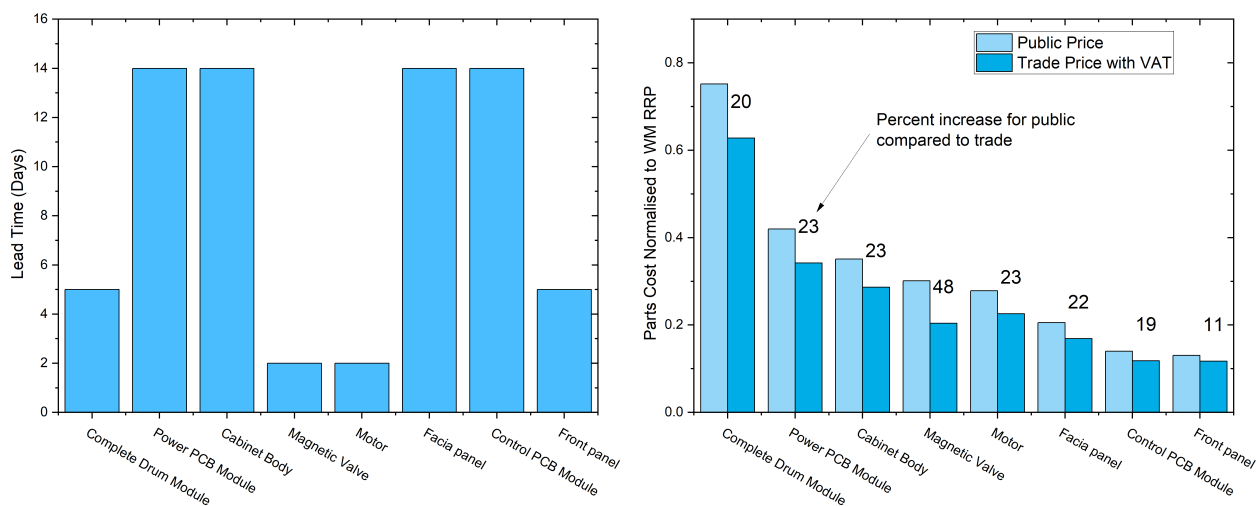


Figure 16. Example lead times on a range of parts and difference between public and trade prices.

Figure 16 shows the cost of replacement parts for a typical mid-range washing machine. Some components are very expensive; for example, the drum assembly costs almost 80% of the price of a new appliance. Looking at these high-cost parts alone could suggest that repairing the washing machine is poor value for money. However, this does not reflect the repairs that consumers are most likely to need. When the analysis considers the parts that most commonly fail,¹⁰ using the methodology of the French Durability Index and UK spare-part prices, the washing machine achieves a score of 9.0 out of 10¹¹, consistent with its official French rating. This places the product among the best-performing washing machines for spare-parts affordability. The results suggest that while a small number of components are costly to replace, the parts most frequently required for repairs are affordable. Therefore, focusing only on the most expensive spare parts can give a misleading impression of repair costs, whereas a more realistic assessment indicates that the appliance is generally economical to maintain and repair over its lifetime. Based on these findings, we recommend the development and adoption of a UK repair affordability index. Such an index would provide a more representative measure of the real costs faced by consumers by accounting for the price and likelihood of replacement of different parts, rather than focusing solely on the most expensive components. A harmonised approach would improve transparency for consumers.

¹⁰ Parts list: Door seal or gasket, door locking assembly, pumps, heat generators and/or heating elements and power electronic board (main control board).

¹¹ The French Durability Index spare parts rating is defined as: $Price\ Index = \frac{max\{C_1,C_2,C_3,C_4,C_5\}+ave\{C_1,C_2,C_3,C_4,C_5\}}{2P}$ where C_i is the individual spare parts price for each part in the list, and P is the product price.

Commonality

The spare parts analysis also examined how washing machine design influences repair practices and service outcomes, using a structured case study of a single brand's UK product range. The study selected twelve models and the first and last variants released, extracted spare and replacement part numbers from manufacture supplied data, and focused on high-failure components using categorisation informed by reliability data [26]. These were then combined into comparison tables and analysed through a commonality metric¹² to assess how widely parts are shared across models.

Findings show wide variation in parts commonality, as shown in **Figure 17**. Some core components, such as shock absorbers, are highly standardised across all models, while others, particularly interface elements like displays, are often unique to each model. This variation reflects deliberate design choices that maintain product differentiation but also fragment the spare parts landscape. It can additionally serve as a risk-mitigation strategy, with manufacturers reducing exposure to defective components by sourcing from multiple suppliers and employing different designs.

Manufacturers may also choose to source components closer to their production facilities, helping to reduce transportation-related emissions while strengthening local supply ecosystems. This approach can increase the number of unique parts used across product lines, particularly when similar models are manufactured in different regions. Furthermore, large multinational manufacturers often operate multiple factories producing the same appliance in different territories, which can result in legitimate variation in component specifications and types due to differences in local supply chains, regulations, or sourcing strategies.

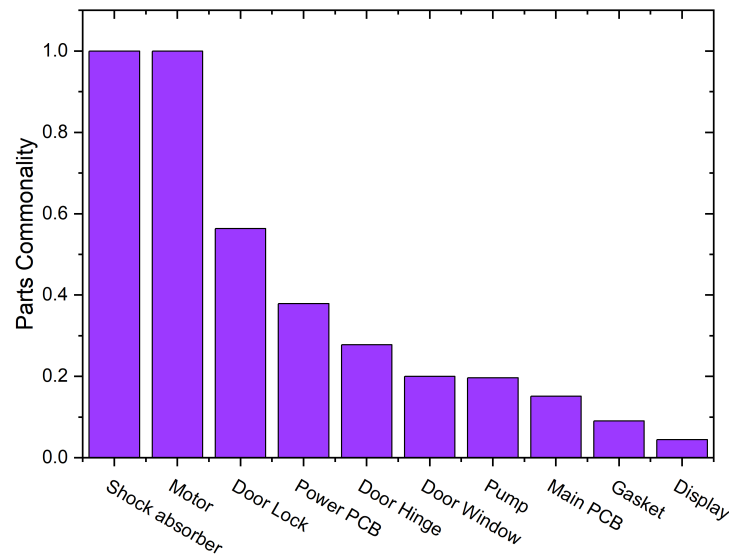


Figure 17. Parts commonality across a range of different washing machine parts.

¹² Commonality factor calculated as $I = \frac{\sum_i \sum_j \delta(\varphi_i - \varphi_j) - m}{m(m-1)}$, where I measures the average degree of shared components across a family of m products. The delta function $\delta(\varphi_i - \varphi_j)$ identifies whether the components (φ) of products i and j are common.

The analysis suggests that, although manufacturers maintain large inventories and long-term parts supply, the proliferation of unique part numbers reduces the practical accessibility of repairs, especially for smaller set ups and with the increased lead times that are being reported as some manufacturers reduce costs by moving from air freight to land transport. This contrasts with anecdotal evidence that earlier product generations achieved much higher standardisation, for example, only a small number of pump variants once covered most repairs.¹³

High-failure components could have the greatest potential for increased standardisation without affecting consumer-facing differentiation. Other components (e.g. displays, aesthetic elements) can remain differentiated to support market competition and design variety. Understanding why some parts (e.g. pumps) are not transferable between models is a key design research challenge. Improving commonality in strategic areas could reduce costs, improve repair efficiency, and support circularity, without constraining innovation.

¹³ This could be part of a follow-on study, a spot check was performed on drain pumps for a single manufacturer over 13 models released approximately 10 years ago and the same level of commonality was found as models available in 2025.

Discussion and conclusions

The triple win – benefits for users, businesses and the environment

This research set out to understand the impacts of increasing repair of large household appliances, thus extending their lifetime. By combining behavioural science, industry engagement, business modelling and environmental analysis, we explored user attitudes, repair services, spare-parts supply chains and the wider economics of repair to also consider what interventions can deliver increased repair rates. The findings indicate that repair represents a significant opportunity for users, businesses and the environment simultaneously.

A key finding is that people generally **prefer to repair rather than replace appliances**. The desire for a new machine, that washes better or more efficiently, was not frequently mentioned as a motivation. Instead, people consistently prioritised convenience - having a functioning appliance again as quickly as possible at an affordable price. Our analysis suggests that more people would be willing to repair appliances if the cost could be around £100 however this is not the only or the most important determining factor. The behaviour change analysis demonstrates that more people are likely to choose repair if they have had prior positive repair experience and/or have an attachment to the appliance. These factors can be addressed with interventions ranging from incentives for “first time repairers” to deploying design, communication and/or marketing campaigns that celebrate repair and promote emotional durability by showcasing functional, personal, narrative and future value.

From a business perspective, the modelling indicates that repair-led service models can offer profitable revenue streams for manufacturers and retailers. This suggests that repair should not be viewed as being in direct competition with product sales, but rather as a commercially viable service offering capable of generating long-term customer relationships and recurring revenue. Lowering repair prices can increase repair uptake without necessarily reducing overall profitability, particularly when supported by complementary measures such as reduced VAT rates on repair services.

The modelling demonstrates that repair can deliver measurable environmental gains while simultaneously benefiting people and businesses. As the balance of environmental impacts shifts decisively away from product use and towards manufacturing and disposal, extending product lifetimes through repair is emerging as one of the most powerful and cost-effective levers available for reducing the environmental footprint of large appliances.

However, current policy frameworks do not always align with these objectives. While the WEEE Regulations have improved waste management outcomes in recycling, there remains an inherent tension between recycling-focused targets and policies intended to extend product lifetimes. Greater consideration should be given to policy mechanisms that explicitly recognise and incentivise repair, reuse and refurbishment. Without such measures, there is a risk that systems designed to improve recycling performance could inadvertently undermine higher-priority circular economy activities.

Local skills, jobs and economic growth

Repair is not only an environmental opportunity but also a local economic one. A transition towards repair-led business models would create demand for skilled service, maintenance and technical roles that are often locally based, AI-proof and difficult to offshore.

Repair professionals are typically trained across multiple appliance categories rather than specialising in a single product type. Evidence from industry stakeholders suggests that growth in repair activity across the broader white goods sector could support a larger local workforce while creating valuable AI-proof, technical and engineering career pathways. These jobs contribute directly to regional economic activity and can help drive higher repair uptake by providing services close to local residents. However,

stakeholders repeatedly highlighted concerns about the long-term sustainability of the repair workforce. Many repair businesses face challenges associated with an ageing workforce and the absence of clear apprenticeship pathways. Without targeted support for training and skills development, repair capacity may struggle to meet demand if repair uptake is increased.

A diverse repair ecosystem is also essential. Manufacturers, retailers, national service providers and independent local repair businesses all have important roles to play. Diversity within the repair market improves customer choice, encourages competition, increases geographical access to services and strengthens resilience against supply-chain disruptions.

The reuse of spare parts presents an additional opportunity for economic growth. Reused components can improve the affordability and availability of repairs while creating new business opportunities in refurbishment, quality assurance, inventory management and logistics. Realising this opportunity will require investment in refurbishment processes, storage systems and supporting infrastructure, alongside clear standards on quality, safety, liability and warranty.

For global OEMs, transitioning to more circular business models may require significant structural and operational changes. As product lifetimes increase and repair rates rise, growth in new product sales is likely to slow, creating adjustment challenges for overseas manufacturing centres, supply chains and related employment. While this transition could generate skilled local jobs in repair, maintenance and refurbishment within the UK, it also highlights the need for stronger policy and governance to manage the trade-offs between domestic economic benefits and potential impacts on global manufacturing activity.

Notwithstanding, for the UK, supporting repair skills, training and business development represents an important opportunity to strengthen local economies while enabling the transition towards a more circular and resilient economy.

Better metrics, information and trust

Perhaps the most striking finding from this research is the importance of trust throughout the repair ecosystem. Despite appliance-owners expressing a strong preference for repair, many lack confidence in manufacturer-led repair services, particularly outside warranty periods. As a result, consumers frequently seek independent repair providers whom they perceive to be fairer. At the same time, manufacturers are often perceived as reluctant to share technical and repair information, contributing to mistrust among independent repairers. Many stakeholders also expressed concerns that consumers have become accustomed to low-cost replacement and are unwilling to invest in repair, eroding brand loyalty and discouraging longer-term service relationships.

Addressing this trust deficit is likely to be essential if repair rates are to increase. Better information, greater transparency and improved communication across the repair ecosystem could help rebuild confidence between manufacturers, repair providers and customers.

Access to spare parts is a particularly important issue. Repair professionals consistently identified spare-parts pricing as one of the greatest barriers to affordable repair. While manufacturers face legitimate challenges associated with storing, managing and supplying spare parts over long periods, consumers and repair businesses often perceive pricing structures to be opaque. Evolving market structures and the entry of businesses [29] with sophisticated logistics and distribution capabilities may improve the availability and accessibility of spare parts. Such developments could help address supply-chain constraints and support more competitive repair services across the sector.

Existing policy initiatives provide useful foundations. The French Durability Index [28], which includes metrics related to spare-parts affordability, represents a positive step towards increasing transparency and helping people make informed decisions. Similarly, the UK's Right to Repair regulations have

improved access to spare parts and repair information. However, these measures focus primarily on parts availability rather than affordability and therefore address only part of the problem.

Improved access to product diagnostics, expected lifetime information (number of cycles the machine has done), repair-cost metrics and repair history data could further support informed decision-making. People need confidence that repairs are likely to be successful, affordable and worthwhile before committing to them.

There is also scope for stronger certification and accreditation systems within the repair sector. Clear standards for repair providers could strengthen trust between consumers, manufacturers and independent repair businesses. Greater confidence in repair quality may encourage increased sharing of technical information, repair procedures, fault diagnostics and spare-parts access across the sector.

Ultimately, increasing repair rates depends on a complex set of behavioural factors (see Behavioural Science section) which cannot be addressed by a single stakeholder alone. Thus, each stakeholder should consider what they offer today against the findings of this report and target areas where they have most control (refer to the project's Guidance Document for suggested initial actions per stakeholder group).

Conclusions: key takeaways

1. A triple win!

The research shows that higher repair rates can simultaneously **reduce costs** for consumers, create **profitable** service-led revenue opportunities for businesses and **reduce environmental impacts** through lower waste generation, reduced material consumption, and avoided carbon emissions.

2. Local skills, jobs and economic growth

Manufacturer and retailer-led repair networks and independent local repairers all play vital roles in the repair ecosystem. A diverse repair market improves consumer choice, competition, resilience and geographical access to repair services. Protecting and growing local repair capacity will be essential to scaling repair in the future while supporting **skilled employment** and **regional economic growth**.

3. Better metrics, information and trust

Too many repair decisions are made under conditions of uncertainty. **Better access** to diagnostics, expected product lifetimes and repair cost metrics and information would help users make informed decisions with confidence. Greater **information sharing** and collaboration between manufacturers, retailers and repair providers, supported by legislative frameworks, **accreditation** and **certification** where appropriate, could help rebuild trust across the repair ecosystem.

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Glossary

Term	Definition (Policy-Oriented)
Commonality metric	The extent to which components are standardised across models, compares every product against every other product, counts how often they use the same part and is reported as a fraction of the total unique parts compared to the total number of individual products. The lower the figure, the more unique parts are used across a product range.
Cost-per-wash	A unit cost metric capturing total purchase and repair costs spread across the functional use of a washing machine. Assumes 220 washes per year as per EU Ecolabel.
Dynamic stock-flow model	A systems model tracking the number, age, and condition of appliances in use, including flows of purchase, repair, and disposal.
End-of-life (EoL)	The stage at which a product becomes waste and enters recycling, recovery, or disposal systems.
Functional unit	The defined service delivered (e.g. washing machine use over 20 years) used to compare environmental or economic outcomes.
Hazard function	A mathematical representation of the likelihood of failure at a given time, used in reliability modelling.
Lifecycle emissions	Total greenhouse gas emissions associated with a product across production, use, and end-of-life stages.
Mean Time Between Faults (MTBF)	The average period between failures of a repairable product, widely used in reliability and durability assessments.
Original Equipment Manufacturer (OEM)	The company responsible for product design, manufacture, and often authorised repair services and spare parts supply.
Probabilistic faults	Behavioural modelling approach where repair or replacement decisions are represented as probabilities rather than fixed outcomes.
Propensity to repair	The likelihood that a consumer chooses to repair rather than replace a faulty product.
Use-phase emissions	Environmental impacts arising during product use, including electricity, water, and consumables.
Weibull distribution	A statistical distribution used to model time-to-failure, characterised by shape and scale parameters.
Warranty period	A defined timeframe where repair or replacement costs are covered by the manufacturer.



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