

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

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## Introduction:

A number of UK Repair Cafés kindly supplied their repair data for a research project undertaken as part of a Masters degree at the University of Surrey during 2018. For those Repair Cafés and others interested in the results, the key findings together with some examples of how an estimation of greenhouse gas (carbon dioxide equivalent CO<sub>2e</sub>) savings might be made are presented here. It is important to note that the CO<sub>2e</sub> figures presented are intended to be indicative and give a general picture of how different products and activities associated with Repair Cafés impact overall GHG emissions - these figures should not be taken too literally.

**Please note that your feedback and comments on the research and findings are very welcome, even if you are outside the UK.**

If you have any feedback, questions or would like a copy of the full report (dissertation) please contact: [steve.privett@googlemail.com](mailto:steve.privett@googlemail.com)

## General methodology:

The approach developed was to estimate potential greenhouse gas (GHG) emission savings by considering the total sum of embodied greenhouse gases (GHGs) contained within the products successfully repaired by UK Repair Cafés. This was quantified by estimating the GHG emissions that would have been created had the successfully repaired products instead been replaced by newly manufactured like for like replacements. To this was added the landfill GHG emissions that were displaced by not having to dispose of the successfully repaired products.

Subtracted from the potential GHG emission savings was an estimation of the total GHG emissions from the transportation, spare parts used, and additional goods consumed (as a result of the rebound effect), irrespective of whether products were successfully repaired or not, resulting from Repair Café activities. A deduction was also made for post completed repair failure and product owners who buy a new replacement following a successful repair of the original product – this information being estimated directly from the visitor questionnaire feedback received.

## Findings:

Repair data was utilised from 13 different (UK) Repair Cafés. The total number of product repairs analysed was 2852. The online questionnaire received a total of 222 responses from visitors and volunteers to 20 different (UK) Repair Cafés.

- 1) Looking at the combined data from UK Repair Cafés found that on average each successfully completed repair has the potential to save an estimated -24 kgCO<sub>2e</sub><sup>1</sup> in GHG emissions. This calculates as an average of **-10 kgCO<sub>2e</sub> saved for every 1 kg of**

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<sup>1</sup> This figure is after deductions have been made for average transportation GHG emissions, spare parts use etc. For a full list of assumption used in arriving at this estimate please request a copy of the full report.

**product successfully repaired<sup>2</sup>**, since the average weight of a repaired product was found to be 2.4 kg.

- 2) **Repair rates at the time of repair average 67%** (see Figure 1), with the Clothing and Textiles category having the highest success rate at 89%, and the Computing, IT and Mobile products category the lowest at 37% (see Table 1).
- 3) Following a successful repair **91.5% of questionnaire respondents reported that they were still actively using the repaired product**. It should be noted that 60% of respondents' repairs had taken place within the previous 6 months.
- 4) The most common product type seen for repair in the UK are **Bicycles** representing 8.7% of product repairs, followed by **Portable Radios** at 6.3% and **Trousers** at 5%.

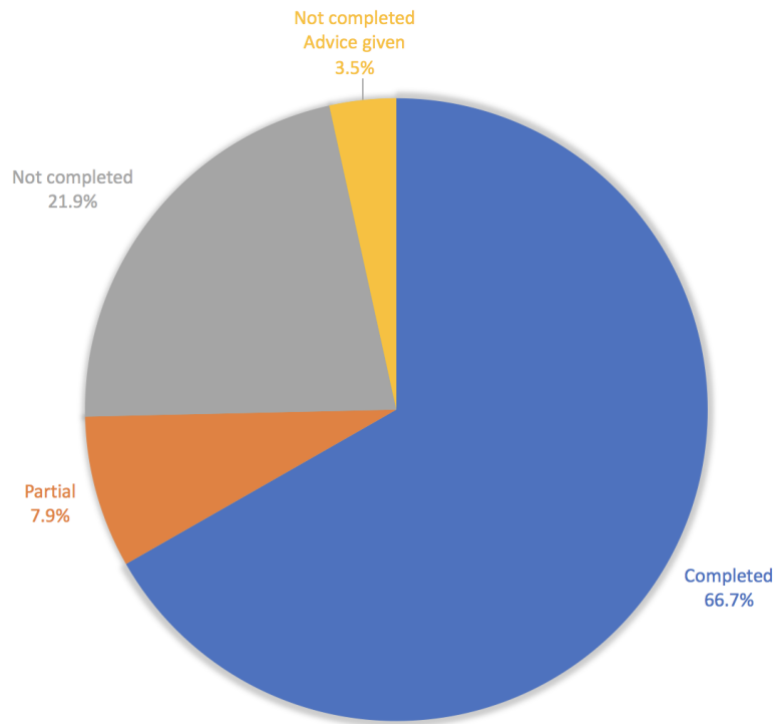


Figure 1. Repair outcomes for commonly seen products

- 5) The most common repairs in terms of a product category are **Household Appliances** at 32.3% with products such as vacuum cleaners, kettles, sewing machines and food mixers, followed by **Clothing and Textiles** at 17% with products such as trousers, shirts, skirts and jackets. **Audio and AV/photo** at 15% follows closely behind, with electronic products such as DAB/FM Radios, CD/DVD players and Hi-Fi music systems.

<sup>2</sup> The calculation methodology for this figure excludes bicycles since it is assumed that an unsuccessful repair at a Repair Café is unlikely to result in the purchase of a new replacement. If bicycles ARE included, then this figure drops to **8.8 kgCO<sub>2</sub>e/kg**

General product category	Completed repair success rate % (category average)
Clothing & textiles	88.7
Bicycles	83.2
Tools (non elec.)	78.4
Jewellery	77.8
Garden & DIY power tools	70.1
Furniture	68.7
Household appliances	61.9
Other household	61.8
Audio and AV/Photo	51.3
Computing, IT and mobiles	36.9
ALL Products	66.7

Table 1. Completed repair success rates by product category

### Repairs analysis:

- 1) Over half of all completed product repairs (52%) required the use of **no spare parts**. The most common repair undertaken was the **Re-stitching** of clothing and textiles at 28% followed by the repair of **Faulty Electrical Connections** at 14% (see Figure 2).

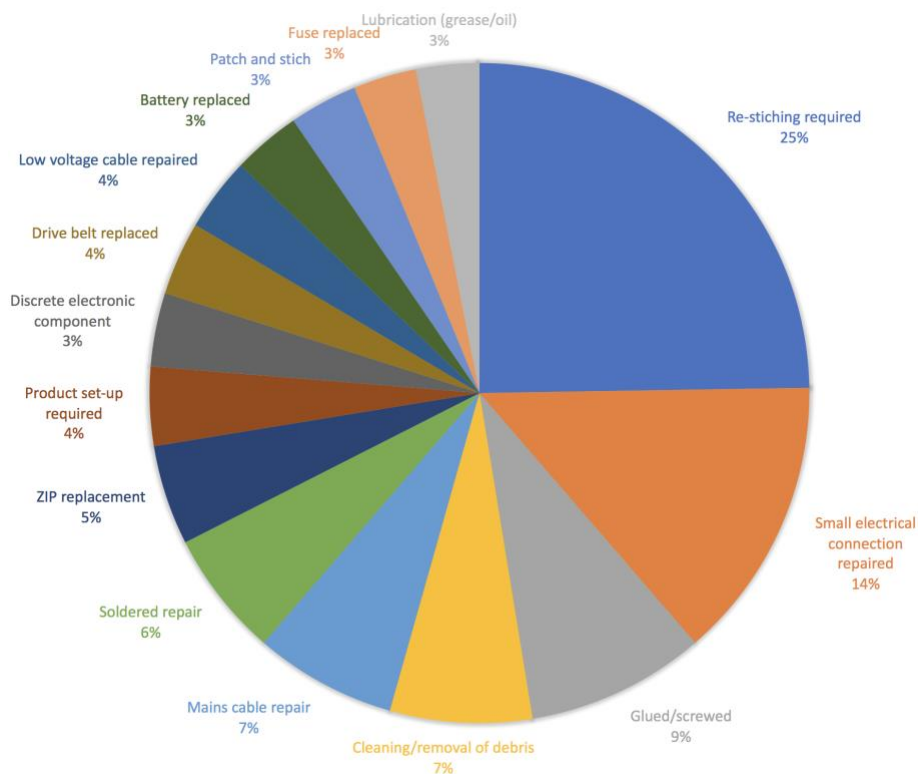


Figure 2. Breakdown of most common repair faults where repair details recorded

- 2) 17% of all repairs could be classified as **not being directly due to product failure**, but an issue of general product maintenance, such as; cleaning/debris removal, battery replacement, lubrication and product set-up issues.
- 3) Due to the low use of replacement manufacturer parts needed to complete repairs, **very low associated GHG emissions arise from Repair Cafés use of spare parts**. 74% of ALL attempted repairs used spare parts with no significant embodied GHGs (< 10 g CO<sub>2</sub>e). On average spare parts use accounted for GHG emissions of just 0.2 kgCO<sub>2</sub>e per completed repair.

### Visitor and volunteer transportation use:

- 1) The majority (69%) of **visitors and volunteers travelled to and from Repair Cafés using cars** with walking and cycling accounting for 28% of the overall transportation mix. For all forms of transport, the average **return journey distance was 9.5 km**.
- 2) Overall, **transport related GHG emissions are estimated at 1.8 kgCO<sub>2</sub>e per visit or 1.3 kgCO<sub>2</sub>e per repair** when taking into account that 1.4 products are typically taken for each Repair Café visit. Figure 3 shows a breakdown of transport emissions.

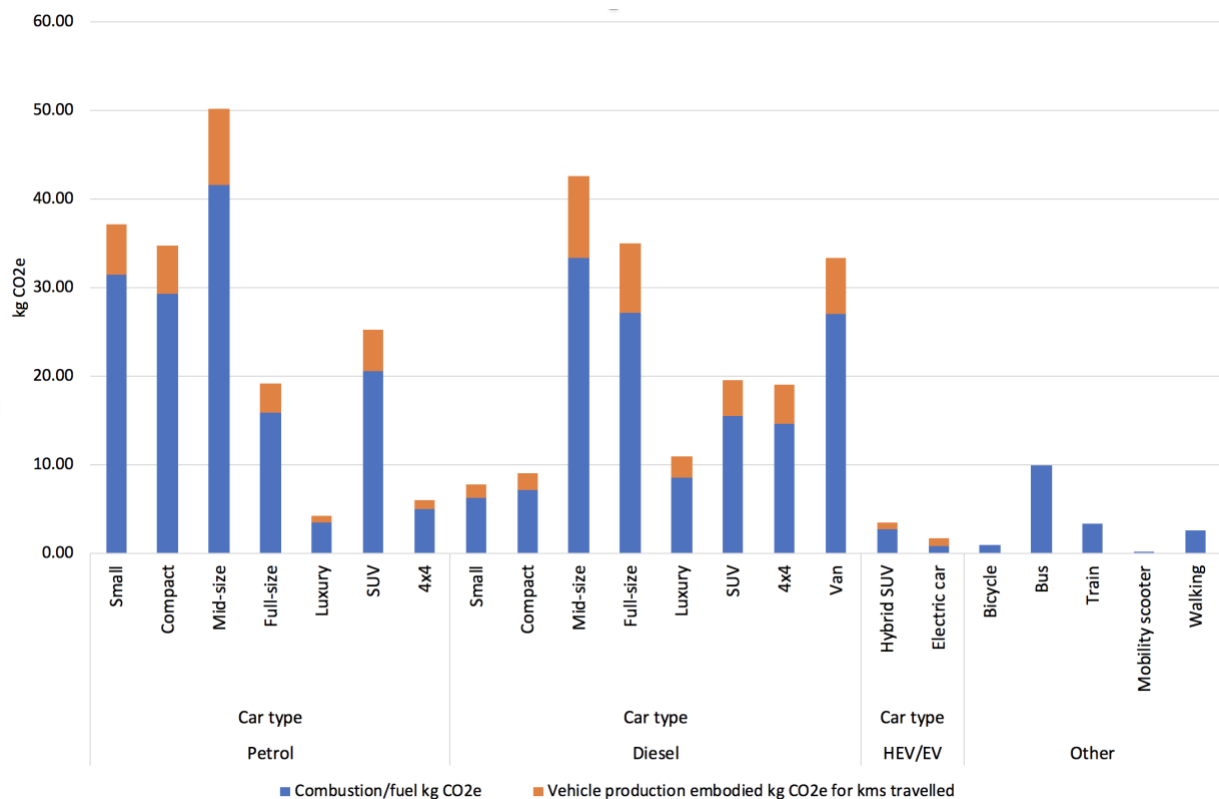


Figure 3. Transport related GHG emissions by vehicle type (for 222 return journeys)

## Repair effect on preventing (displacing) a new product purchase:

- 1) Of those who experienced a successful repair, **88.4%** reported that the repair had prevented the need to purchase a new replacement product (see Figure 4). This was a significant finding since it is central to the premise that repair can displace the purchase of new products thereby reducing GHG emissions.

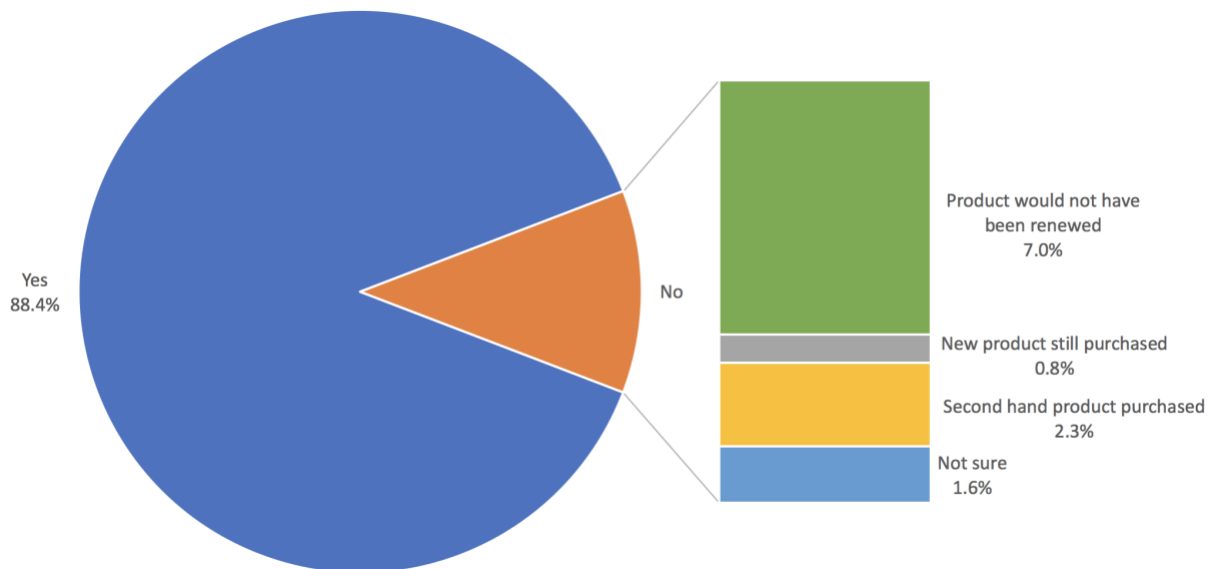


Figure 4. Did successful repair prevent a new replacement product purchase?

## Rebound consumption as a result of a free or near free repair:

- 1) Of those who visited a Repair Café, **87%** felt they had or maybe had saved money<sup>3</sup>. This figure also includes visitors who did not experience a successful repair but felt they had saved money.
- 2) Rebound consumption of goods and services is estimated to **create additional GHG emissions of 4.4 kgCO<sub>2</sub>e** per completed repair<sup>4</sup>.

An important finding was the sensitivity of any saving in GHG emissions to rebound 'spending' consumption. That is how little additional retail consumption needs to take place to cancel the potential reduction in GHG emissions that repairing rather than replacing a product can bring. For example, if a visitor has a toaster successfully repaired and then spends £10 on food and beverages to celebrate, the resulting GHG emissions of this additional consumption are likely to exceed those that would have been caused by the purchase of a new toaster.

<sup>3</sup> In practice it is acknowledged that nearly all types of additional spending (and saving) will increase economic activity and therefore GHG emissions.

<sup>4</sup> This figure uses a carbon intensity of 1.23 kgCO<sub>2</sub>e/£ and is based on an average donation of £3.72.

## Summary estimation of repair related GHG emissions:

- 1) For each completed repair **5.9 kgCO<sub>2</sub>e of additional** GHG emissions are created. These GHG emissions breakdown per completed repair as:

- i) Vehicle tailpipe GHG emissions at 1.1 kgCO<sub>2</sub>e
- ii) Embodied GHG emissions of vehicle at 0.2 kgCO<sub>2</sub>e
- iii) Spare part GHG emissions at 0.2 kgCO<sub>2</sub>e
- iv) Rebound consumption GHG emissions at 4.4 kgCO<sub>2</sub>e

## Repair 'payback' period:

- 1) On average a repaired product at a UK Repair Café begins to produce a **net GHG emissions reduction** once the product continues to be used **beyond a period of 12 months (1yr)<sup>5</sup>**, the break-even point.

This is why GHG emission savings are described as 'potential', since at the point of repair NO reduction in GHG emissions have been made. In fact, additional GHG emissions have been created by the use of transport to and from the Repair Café by volunteers and visitors, spare parts purchased and 'rebound' consumption created by the availability of a free or nearly free repair for ALL visitors.

To calculate a point in time following a successful repair at which the repair is providing a GHG emissions reduction, over replacing the faulty product with a new one, it is necessary to consider the level of embodied GHGs contained within the product type and importantly its life expectancy. Table 2 shows each product category, its average embodied GHGs, life expectancy and payback period calculated specifically for the product profile of completed repairs seen at UK Repair Cafés.

General product category	Category product average embodied GHGs (kgCO <sub>2</sub> e)	Average life expectancy (yrs)	Payback period following repair (yrs)
Computing, IT and mobiles	201.7	2.7	0.1
Household appliances	25.5	5.5	1.3
Audio and AV/Photo	66.1	7.0	0.6
Clothing & textiles	17.8	3.3	1.1
Garden & DIY power tools	36.2	5.5	0.9
Furniture	15.6	10.0	3.8
Jewellery	2.8	12.0	25.1
Other household	5.3	5.5	6.1
Tools (non elec.)	4.6	12.0	15.6
ALL categories (ex. Bicycles)	33.3	5.9	1.0
Bicycles	149.6	15.0	0.6

Table 2. Typical 'payback' period for repairs falling into different product categories

<sup>5</sup> If replaced before this point in time it would have been more beneficial from the standpoint of reducing GHG emissions to have replaced the faulty product immediately with a new one.

This indicates that for a household appliance repair the product would need to be used for a period of 1.3 years following repair to have paid-back the average emissions of 5.9 kgCO<sub>2</sub>e that occurred as a result of its repair. For every year following the initial 1.3 years, continuing to use the repaired product would then accrue -4.6 kgCO<sub>2</sub>e (-25.5/5.5) of GHG emission savings.

**Example of a simple GHG emissions saving calculation** (based on average product embodied GHG emissions for successful repairs at UK Repair Cafés)

For Repair Café organisers wanting to make an estimate of the potential GHG emissions savings that their repairs are making (based on the methodology and assumptions used for the study) the following approach can be used:

If we assume that 20 products are booked in for repair, and at the end of the session 12 products have been successfully repaired<sup>6</sup> and returned to full working order, to calculate the potential GHG emissions saving:

$$\begin{aligned}\text{Potential GHG emission saving (kgCO}_2\text{e)} &= \text{number of products successfully repaired} \times -24 \\ &= 12 \times -24 \\ &= -288 \text{ kgCO}_2\text{e}\end{aligned}$$

Alternatively, if the weight (kg) of individual products booked in for repair is known then:

$$\text{Potential GHG emission saving (kgCO}_2\text{e)} = \text{total weight of products successfully repaired} \times -10$$

The above calculations use the study result of -10 kgCO<sub>2</sub>e for every 1 kg of product successfully repaired product<sup>7</sup>. This equates to -24 kgCO<sub>2</sub>e on average since the average repaired product weight was found to be 2.4 kg.

**If just 1 kg of product is successfully repaired per capita in the UK, then based on the average (-10 kgCO<sub>2</sub>e/kg) GHG estimate found in the study, 650,000t kgCO<sub>2</sub>e of GHG emissions could be prevented.**

*Note: A more precise (but complex) estimation is possible by considering the individual product category GHG embodied emissions of repaired products or individual product type embodied emissions and then factoring in deductions for transportation, product failure, rebound consumption, number of products taken per Repair Café visit and repair life extension factor<sup>8</sup> etc. Embodied GHG emission estimates for the most common product types seen for repair at UK Repair Cafés can be found in the full report.*

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<sup>6</sup> Partial repairs are NOT included only fully completed repairs.

<sup>7</sup> This figure excludes bicycle repairs.

<sup>8</sup> For this study products were assumed to have a repair life extension factor of 1.



## Discussion and conclusions:

- From the data analysed and methodology used UK Repair Cafés offer a successful and efficient repair service to local communities, and in the process provide the potential to mitigate an average of -24 kgCO<sub>2</sub>e of GHG emissions per completed repair.
- GHG emissions are created as a result of the repair service, and these emissions need to be 'paid-back' by successfully extending the life of products past the break-even point (just over 1 year) after which net GHG emission reductions begin to accumulate.
- Not all product categories offer the same potential to mitigate GHG emissions. Where the embodied GHGs are low, often when the product weight is particularly low, such as for Jewellery, the GHG emissions created by transportation to the Repair Café and rebound consumption may exceed those of a new product purchase.
- Products with low embodied GHGs and long-life expectancies require far longer time periods to recoup repair related GHG emissions. Adopting 'green lifestyle' principles such as travelling by train, cycling or walking where possible to visit a Repair Café, and reducing unnecessary 'rebound' spending post repair has a significant influence on increasing the rate at which a successful repair starts to mitigate GHG emissions. Taking multiple items for repair per visit also further reduces the 'payback' period.
- The product categories identified with the highest embodied GHG emissions are also those requiring the shortest post repair use period before reaching their break-even time, and therefore offer the greatest potential to mitigate GHG emissions. Focusing on improving repair success rates, by just a few percent for Computing/IT and Mobile products offers a significant opportunity for Repair Cafés to increase their effectiveness in decreasing GHG emissions even further.
- The sensitivity analysis highlights the need to minimise rebound spending and utilise the repaired product for as long a period as possible post repair, and not replacing it prematurely to avoid creating additional GHG emissions beyond those created by simply replacing the faulty product with a new replacement at the time of failure. Promoting donations at the point of repair towards projects providing reductions in GHG emissions could help reduce this rebound effect.
- The high completed repair rate and low reported use of manufacturer (and potentially costly) spare parts also indicates that many household products in the UK are being disposed of and replaced prematurely. This indicates that a significant barrier to repair is often the general experience and knowledge of householders to diagnose and rectify faults, rather than limited availability of manufacturer spares. This is further

supported by 17% (1 in 6) of all product repairs not being due to a specific component failure but general product care and maintenance issues.

- The high level of repair success and prevention of new product purchases reported by visitors following repair, coupled with the extremely low embodied emissions of spare parts used (or not used in over 50% of repairs undertaken) re-enforces the value of Repair Cafés in reducing waste, minimizing consumption and helping communities attain a more circular economy.

End.