How much material is needed for repairing electronics?

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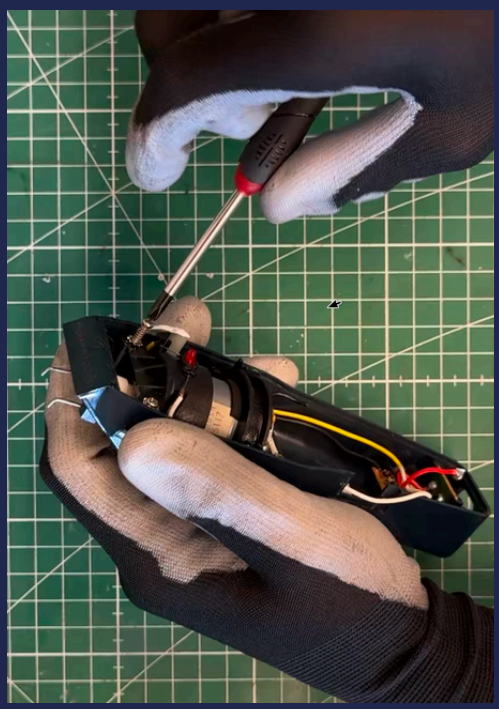
The consumption of electrical and electronic equipment per capita in Europe is increasing drastically (78% between 2015 and 2023) (Eurostat, 2025). This increase in consumption goes together with concerns on material security and an increase in environmental impacts from its production and waste treatment.



Circularity strategies such as repair and recycling address these issues by reducing the consumption of raw materials. While recycling is currently the main formal end-of-life pathway for e-waste, theoretical literature suggests that lifetime-extension strategies such as repair offer a significantly higher circularity (Potting et al., 2017). Current research, however, does not quantify the full circular potential of repair, and the data to do achieve this, such as lifetime extension and material input, is not publicly available.

Findings & Recommendations

This study aims to contribute to this data gap by presenting a methodology that empirically measures the materials needed for repairing consumer electronics. A method is demonstrated to create bills of materials without the need for advanced equipment, and a 5-step fault diagnosis protocol is proposed to support future research. This gathered data is then combined to calculate the materials needed to repair the nine products.

The results suggest that for the studied products, repairing required 4-17% of the total product mass. This number is lower when only looking at high-CRM materials (4-8%). The latter indicates an advantage of repair over recycling for CRM retention. While these findings are based on a small sample size (9), they provide direction for further research.

Besides the materials needed, the net circularity of repair is dependent on the lifetime extension of the repair; a variable that needs more research.

Read the full thesis on the Repair Lab