

# Science for Environment Policy

## Ecodesign for a circular economy: methodology for circular product design

**Researchers have developed a methodology that allows the analysis of how an existing product design meets design guidelines required for the circular-economy perspective, and which guidelines would need to be incorporated to create a better circular-design product.** The results, based on a case study of small electrical equipment in Spain, indicate that the most urgent priority is to incorporate circular-design guidelines related to extending life span and to product/components re-use, while there is a moderate need to include guidelines related to the use of simple removable connections or a modular product structure.

**Product designers play a crucial role in the circular economy. The durability of a product and the ability to repair, recycle, and re-use it and its components and materials largely depend on the product's initial design.** Ecodesign was thus highlighted in a [2017 Communication](#) from the European Commission as important in implementing the [Circular Economy Action Plan](#)<sup>1</sup>. Ecodesign has traditionally tended to focus on product energy efficiency, but the Commission is already working on expanding this design approach to include circular economy considerations such as reparability, durability, upgradability or recyclability, among other factors.

There is a need to define which design features are most desirable for a circular economy; as these may vary by individual product, this study developed a methodology to guide designers on the most important circular-economy design features for specific types of products.

The method gives designers 33 possible circular-economy design guidelines to work with. The researchers identified these by analysing existing research on eco-design principles, and then categorising guidelines into five groups:

1. **Extending lifespan.** These promote the longer life and durability of products through adaptability, upgradeability, and 'timelessness'. These guidelines could be met by using features such as modular design and standardised components.
2. **Disassembling.** These relate to connection and enabling easy access to parts.
3. **Product re-use.** These promote easy maintenance and cleaning of products and their parts to encourage re-use.
4. **Component re-use.** These suggest design features such as standardised parts and minimal variation in product design.
5. **Material recycling.** These promote features that enable materials to be easily identified, separated, and recycled, such as labels or avoiding complex mixtures of materials.

*Continued on next page.*

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1. [The implementation of the Circular Economy Action Plan](#) 2017

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To help designers decide which features to introduce to a product, the methodology scores each guideline (between 1 and 9) based upon its relevance to the product and the impact it will have on improving its circularity. 'Relevance' is assessed by using a checklist: for example, features that fall under the 'extending lifespan' guidelines will be more relevant if the product's lifespan is very short; 'impact' is assessed according to how well a product already meets circular-economy design criteria — the impact will be greater if current compliance is low. Designers are urged to focus on product features promoted by guidelines with a high score, which indicates high relevance and high impact.

To illustrate the methodology in action, the researchers applied it to the case of small household appliances. They dismantled and studied 127 individual appliances gathered as part of a local waste electrical and electronic equipment collection campaign in Spain.

According to the results obtained, there seems to be an urgent and immediate need to integrate circular-economy design guidelines related to extending life span. This recommendation is especially relevant to vacuum cleaners, hand blenders, irons and coffee makers (as opposed to heaters, juicers and toasters, which already incorporate the guidance). Additionally, there is a need to integrate components re-use guidance into hand blenders and irons, and guidance related to product re-use into blenders and toasters.

The researchers conclude that they have developed a useful general methodology that can begin to address circularity in product design. They recommend testing the method on other types of products to improve its robustness.

