# Quantification of the environmental benefits associated with a reuse centre in Italy

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In the context of the circular economy and waste prevention activities, this paper analyses the "Panta Rei" reuse centre in Vimercate (Lombardy region), a structure where collection and subsequent sale of reusable used goods are carried out. The aim of the analysis is to examine whether and to what extent this activity can actually contribute to provide environmental benefits. This assessment is performed through the development of an ad-hoc model based on the Life Cycle Assessment (LCA) methodology. This is applied to 10 product categories selected as significant among those involved in the activities of the reuse centre during the year 2022 (Table 1).

Table 1. Product categories analysed and related average mass values, number of products sold (source: Mani Tese Onlus, 2022) and substitution rate (source: Ebli, 2023).

| Product category | Average mass of items sold by the reuse centre in 2022 [kg] | Number of items sold by the reuse centre in 2022 | Substitution rate |
|---|---|---|---|
| **T-shirt** | 1,26 | 2063 | 0,2 |
| **Glass** | 1,26 | 2063 | 0,2 |
| **Book** | 0,24 | 5026 | 0,08 |
| **Television** | 4,45 | 57 | 1 |
| **Computer** | 2,98 | 24 | 1 |
| **Bicycle** | 7,71 | 24 | 1 |
| **Bed** | 9,6 | 5 | 0,75 |
| **Shoes** | 0,56 | 2043 | 0,07 |
| **Pram** | 0,29 | 1370 | 0,22 |
| **Hairdryer** | 8,79 | 129 | 0,57 |

The model takes into account that for each product category the system is composed of two main parts: the first life of the good (production, packaging, transport from industry to the first user's home, use, collection and transport of waste to the final treatment plant, end of life) and the second life of the good (transport from the first user's home to the reuse centre, transport from the reuse centre to the second user's home, reuse). The impacts allocated to the first life constitute avoided environmental impacts thanks to the reuse activity, while those related to the second life are considered as additional environmental impacts. Consequently, from the combination of these two parts of the system, the quantification of the net environmental impacts generated by the reuse of 1 item is obtained and then, by integrating the information on the weight and number of items sold in 2022 (Table 1), the total net environmental impacts associated to the entire activity of the centre is obtained. The analysis investigated 16 environmental impact categories by applying the Environmental Footprint 3.0 characterization method (Fazio *et al.*, 2018).

The results show that the activity of the Panta Rei reuse centre in Vimercate in 2022 allowed for environmental benefits in only 6 impact categories out of the 16 examined. In fact, the environmental performance of the reuse activity depends on numerous factors, such as the substitution rate (it indicates if the purchase at the reuse centre really replaces a purchase of a new product – Table 1), the quality rate (it indicates the expected average life of the used good compared to that of a new good), the energy performance rate (it indicates the energy performance of the used good compared to that of a new good), the distance between the reuse centre and the second user's home, and the actual time of utilisation of the good. The results would change if other values of the factors listed above were considered: if, for example, a 100% substitution between new and used goods was considered for all 10 product categories, there would be environmental benefits in all 16 impact categories (Figure 1).

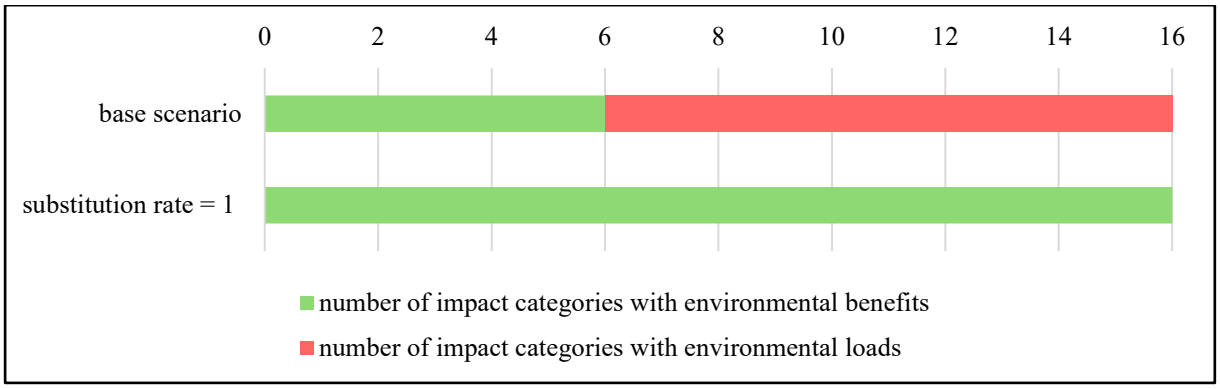

Figure 1. Results of the sensitivity analysis on the substitution rate.

Based on the LCA results, three key actions have been identified to improve the environmental performance of a reuse centre: promoting citizens' awareness of the impacts of their actions, encouraging sustainable mobility when going back and forth to the reuse centre, and reducing distances between reuse centre and consumers. The research confirms, as already underlined in other studies (e.g. Biganzoli *et al.*, 2019), that the role of the consumer is fundamental to ensure that a waste prevention activity really brings also environmental benefits.

**References**

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