Social footprint of a packaging waste deposit-refund system in Spain

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1. Introduction

A deposit-refund system (DRS) applied to packaging can be defined as a system in which consumers pay a certain amount in concept of "packaging deposit" added to the price of a product and receive the refund back when they return the used packaging. Such systems are currently in place in some European countries such as Finland, Denmark and Germany, whereas other countries like the UK, France and Belgium refused to apply it. In Spain, especially in the Eastern regions of Balearic Islands, Catalonia, and Valencia, there is an ongoing debate on the suitability of implementing such a system in order to increase recycling rates for household waste. Two key aspects of such a system, as intended in Spain, are first that the goal is not to reuse the packaging, but to recycle the materials, and second that since not all types of packaging waste would be affected by this new system, it would inevitably coexist with the green dot kerb-side collection scheme currently in place in the country, managed by Ecoembes and Ecovidrio. We present a social footprint assessment of implementing this new system, carried out as part of a wider project assessing environmental (through LCA), economic and social aspects of the DRS implementation in Spain [1].

2. Materials and methods

2.1. The social footprint

The social footprint developed by Weidema [2] constitutes a monetary summary measure of income redistribution and the sum of all productivity-reducing externalities related to a specific product or activity. The social footprint is calculated by a top-down approach using input-output data. This method can be understood as a 'streamlined' social LCA. We applied the two general components of the social footprint:

- The income redistribution impact (IR): calculated as the increase (or loss, if negative) in utility caused by the transfer of money from one societal group to another.
- The productivity impact (loss) from missing governance (PI): calculated as the difference between the actual purchasing-power corrected value added and the potential value added when all productivity impacts are internalised.

The resulting social footprint of a product or activity can be defined as SF = IR + PI, where typically PI is of a higher magnitude than IR.

2.2. Scope of the study and data sources

The study compared two scenarios, namely the current situation for household packaging waste management in Spain with data from 2014 (system A), and a hypothetical scenario (system B) where a DRS is implemented for beverage containers (water, soft drinks, juices, beers, wines, cava and alcoholic drinks) made of either PET, HDPE, steel, aluminum, beverage carton or glass. It is assumed that the DRS achieves a 90% collection rate for the targeted containers and that it coexists with the current green dot system, collecting the materials not targeted by the DRS. The functional unit was defined as the total amount of packaging waste to be managed annually, 2.5 million tonnes in 2014. In system B, overall 57% of this waste mass is channeled through the DRS, while the remainder is managed through the green dot system.

Primary data for the two scenarios were obtained from the environmental and economic studies performed as part of this project [1]. This included, among others, the overall mass balance for packaging waste in the two scenarios, operational data from the current kerb-side waste collection, as well as the dimensioning and operational aspects of the DRS (manual/automatic collection, type and size of commercial establishments involved in collection, transport modes, number of container processing plants, etc.). Rebound effects on the current perfomance of the green dot system (collection planning and sorting efficiencies) due to the coexistance with the DRS were also considered.

Data to quantify the social footprint of the activities involved and their supply chains were obtained from the database Exiobase v.3.3.10. Exiobase [3] is a global, detailed Multi-regional Environmentally Extended Supply and Use/Input Output (MR EE SUT/IOT) database. In the present study, Exiobase was implemented in the SimaPro software, where the model calculations were carried out.

3. Results and discussion

Table 1 shows the total social footprint results for system A (current) and system B (hypothetical DRS implementation). It can be seen that both systems present a negative sign, which is interpreted as a net social benefit of the management systems. However system B reduces this benefit by 50% compared to system A.

Table 1. Social footprint results, million Euro$_{2011}$ PPP, utility-weighted.

Indicator	System A (current)	System B (DRS implementation)
1. Income redistribution	181	-100
2. Productivity impact	-5,247	-2,413
Social footprint (1+2)	-5,067	-2,013

Figure 1 shows the results of the social footprint, where the differences between system B and system A are plotted, disaggregated by foreground activities. This figure shows, for each of these activities, when the change from system A to system B involves a social benefit (with negative sign, in green) or a social cost (with positive sign, in red).

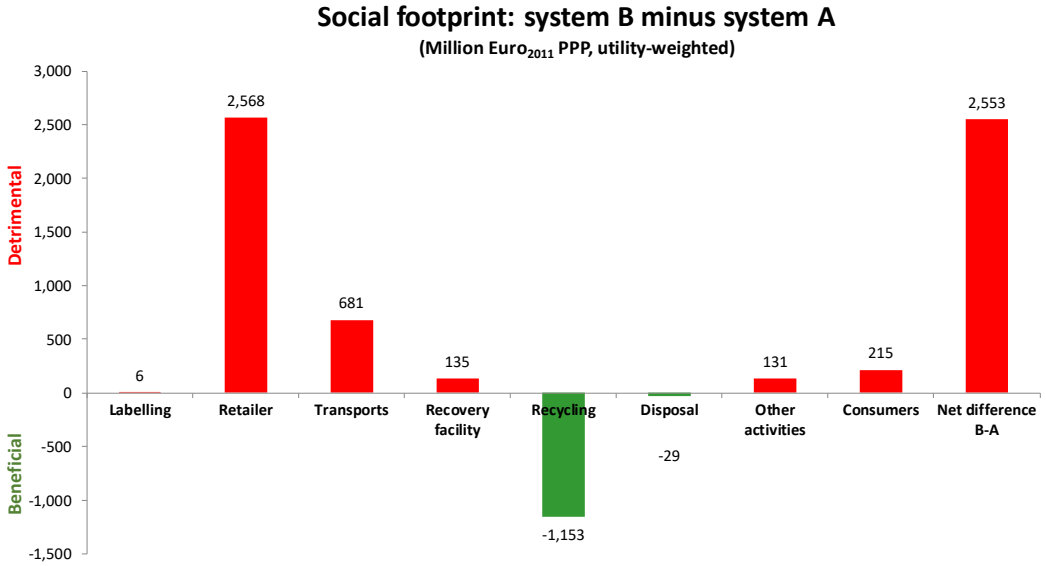

Figure 1. Social footprint results, difference between system B and A.

The results in figure 1 show that introducing this DRS system in Spain is expected to lead to a net loss in social benefit compared to the existing system. The benefit of the increased recycling (less production of virgin raw materials in several countries) are more than outweighted by the social costs induced by the activities required to achieve these higher recycling rates. The graph shows that the higher social impact falls particularly within transports and retailer activities (collection either manually or automatically of packaging waste in shops and supermarkets).

This study is an example of how the concept of social footprint, together with a powerful tool like Exiobase, can pave the way for an operational approach to social LCA, avoiding excessive data requirements and the long lists of impact indicators currently proposed for bottom-up approaches.

4. References

[1] Fullana P et al. (coord.) (2017) ARIADNA - Estudio de sostenibilidad sobre la introducción de un SDDR obligatorio para envases en España: análisis ambiental, social y económico comparativo con la situación actual. http://unescochair.esci.upf.edu/es/contratos-de-investigacion/526-ariadna (accessed 17/11/2017)

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