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

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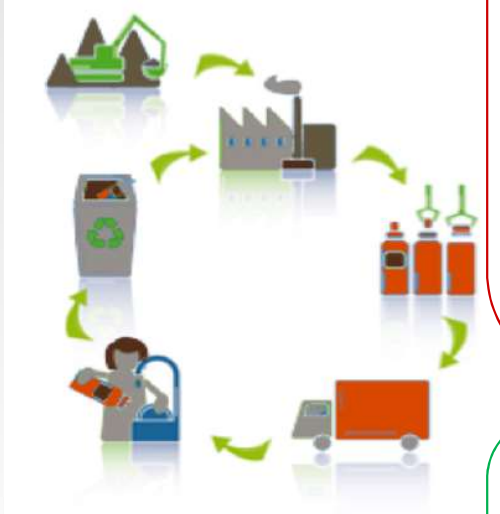
- The social footprint
- Introduction of a DSR in Spain
- Case study results
- Conclusions

The social footprint

- Existing social LCA methods hampered by:
 - Excessive data requirement
 - Lack of social/economic impact pathways
 - Excessive focus on site-specific data
- The Social Footprint (SF) is the equity-weighted share of the wellbeing and productivity gap that can be ascribed to a product or service
 - A complete top-down measure of all social, biophysical and economic externalities
 - Low data requirement for screening purposes
 - Uniform monetary valuation

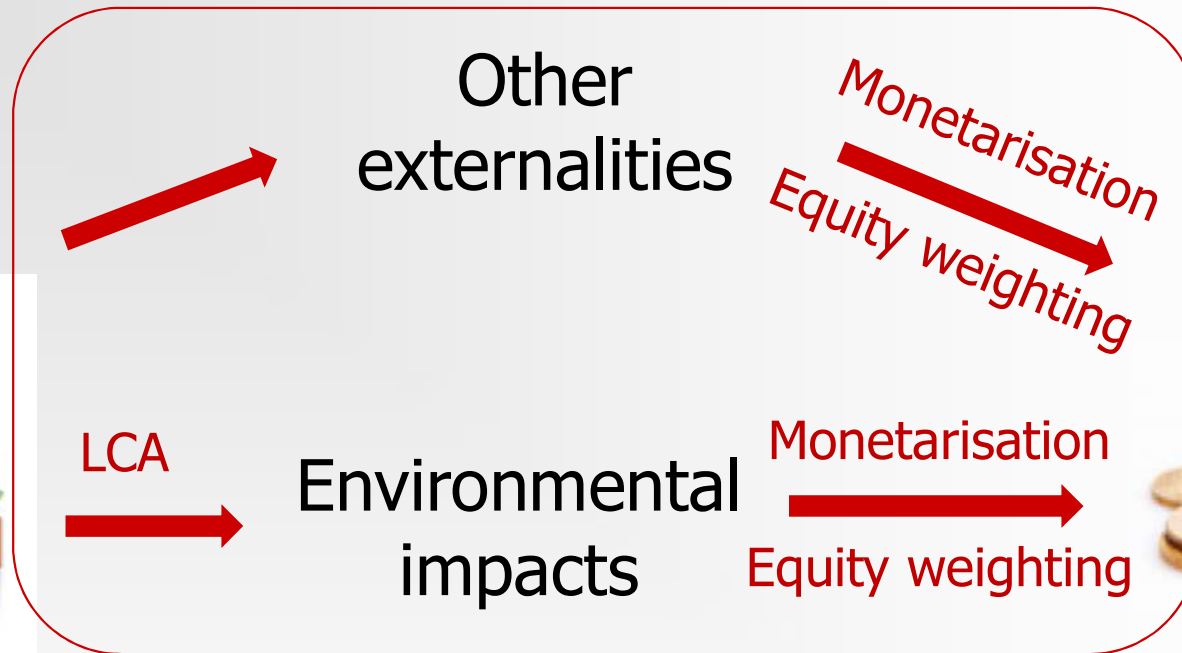
The social footprint

$$SF = PI - IR$$

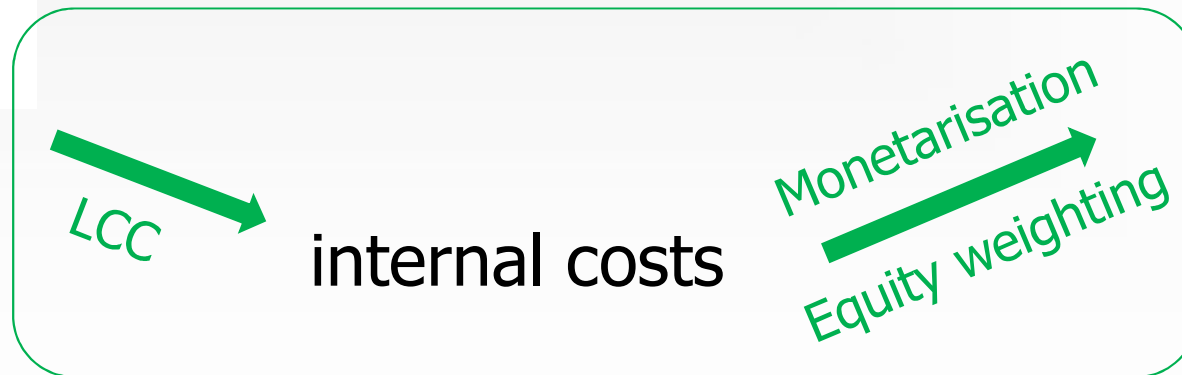


Production
and
consumption

Productivity impact (PI)



Global
wellbeing



Income redistribution (IR)

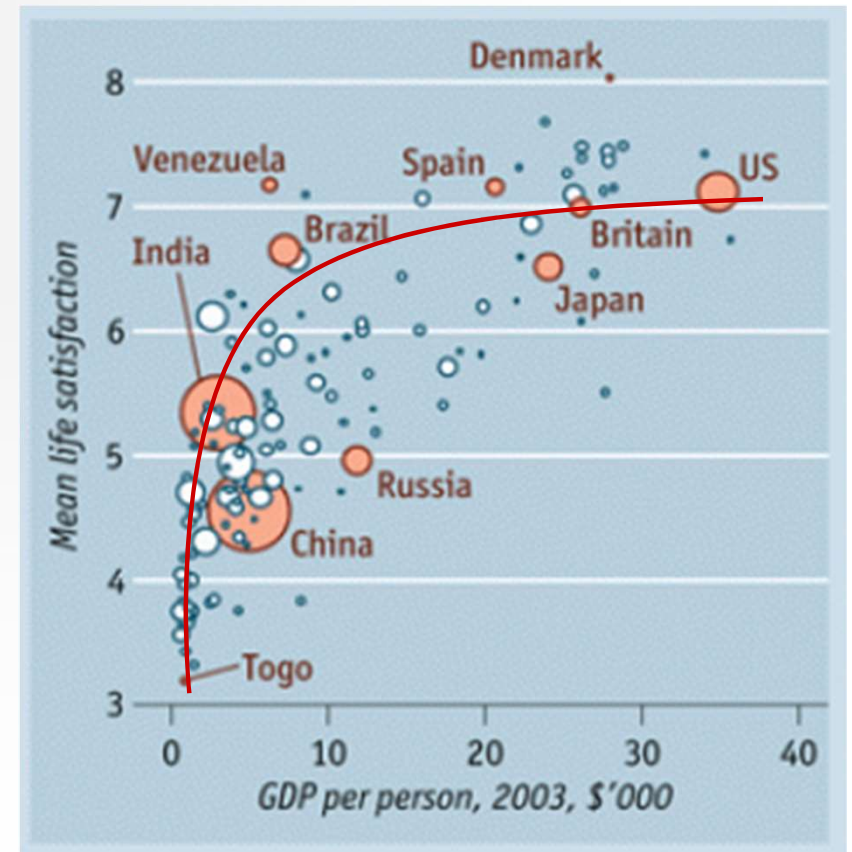
The social footprint

IR = Equity-weighted, purchase-power corrected, life cycle costs

$$Utility = \left(\frac{averageIncome}{subgroupIncome} \right)^{\delta}$$

δ = elasticity of marginal utility of income

Activity	Value added (VA)	VA, equity-weighted
Apparel production, FR	1€	0.2 €
Apparel production, IN	1€	7.4€



The social footprint

PI = Equity-weighted, purchase-power corrected,
well-being and productivity gap

= Difference between current GDP and potential GDP in the absence of externalities

- US GDP per capita as starting point
- Correction factors to account for externalities in US:

$$57,600 \text{ USD}_{2016} + 17.6\% + 2.5\% + 1\% + 20\% + 35\% \approx 115,000 \text{ USD}_{2016}$$

Household
production

Trade
barriers

Unemployment

Avoidable
health
impact

Underinvestment
in education

The social footprint

- A country-specific PI is calculated
- Distributed over the industries of each country in proportion to value added and utility-weighted:

Activity	PI_{PPP}	PI_{PPP}, equity-weighted
Raw milk production, SE	5.9 €/h	4.9 €/h
Raw milk production, IN	18.4 €/h	219 €/h

Case study: A DRS in Spain

- In a deposit-refund system (DRS) consumers pay a deposit when purchasing a product; the deposit is refunded when the packaging is returned to a shop
- The goal is not to reuse, but to recycle materials
- Ongoing debate in several regions in Spain on the suitability of such a system in order to increase stagnant recycling rates



Proposed DRS affects only beverages < 3 L, except dairy

Case study: scope

- Two scenarios under study:

A: current situation for packaging waste management (Green Dot System, GDS)

B: Introduction of a DRS achieving 90% return rate, coexisting with GDS for the rest of packaging waste

- Functional unit is the total amount of packaging waste managed in Spain in 2014: 2.5 million tonnes

A



2.5 million t collected
1.7 million t recycled

B



+



1.4 million t

1.1 million t

2.0 million t recycled

Case study: Data

- Primary data used:
 - Waste balances for both scenarios
 - Operational data on current system (collection, transports, sorting, disposal of residues)
 - Theoretical dimensioning and costs of the DRS in Spain (manual/automatic collection, type of commercial establishments involved, transports, sorting activities, etc.)
 - Expected rebound effects on GDS (collection and sorting inefficiencies)

Case study: Data

- Background data used: Exiobase v3.3.10
 - Global, detailed Multi-regional Environmentally Extended Supply and Use/Input Output database
 - 43 countries + 5 RoW regions
 - 164 economic sectors per country
 - Extended by 2.-0 LCA consultants with IR and PI values
 - Implemented in SimaPro:



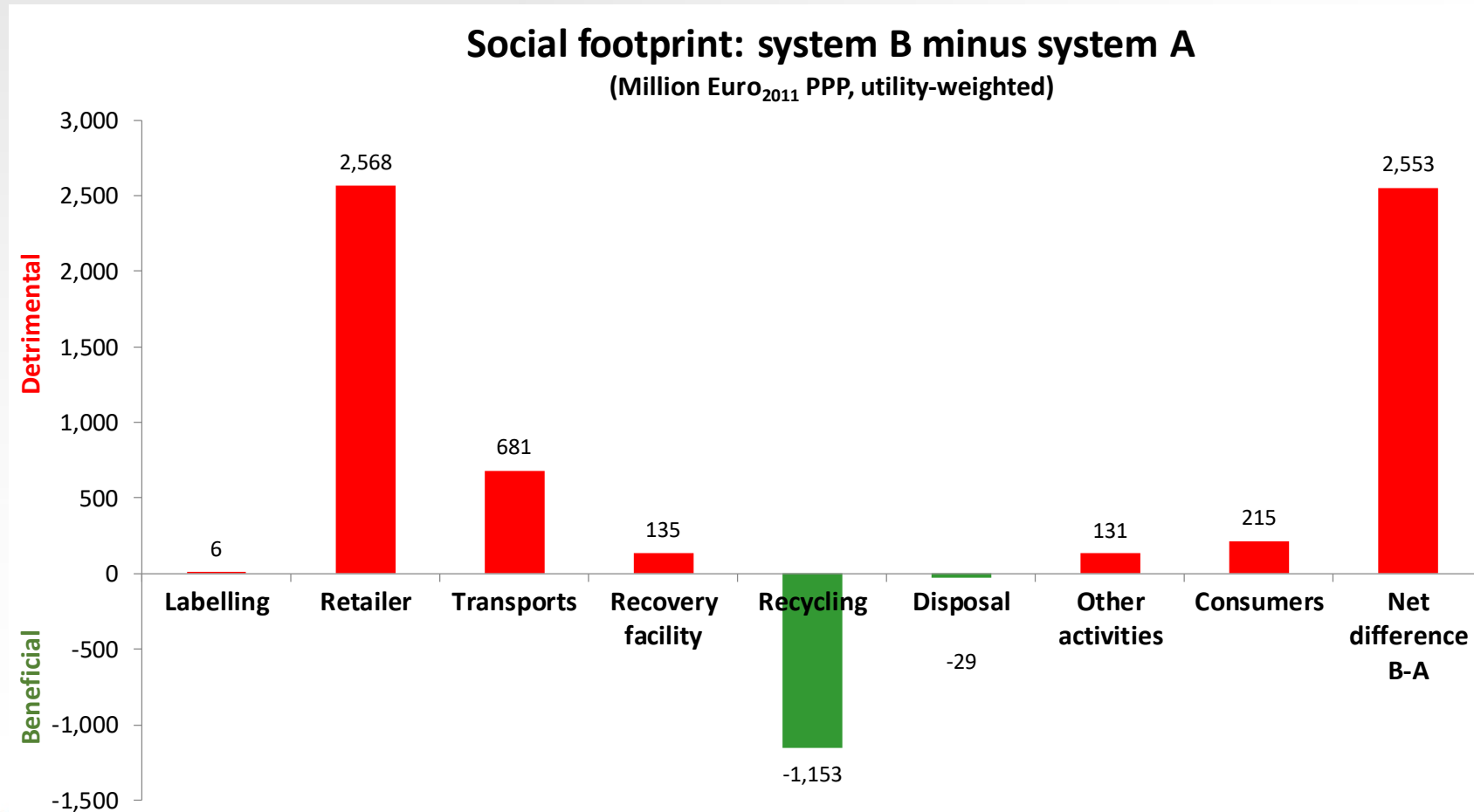
Outputs to technosphere: Products and co-products	Amount	Unit
_64 Manufacture of rubber and plastic products (25) {ES} (linked)	544559	ton

Social issues	Subcompartment	Amount	Unit
Productivity impact, raw		5923.375	MEUR,PPP
Productivity impact, raw, utility-weighted		122.9795	MEUR,PPP
Utility-weighted value added (PPP), total		89.2279	MEUR,PPP

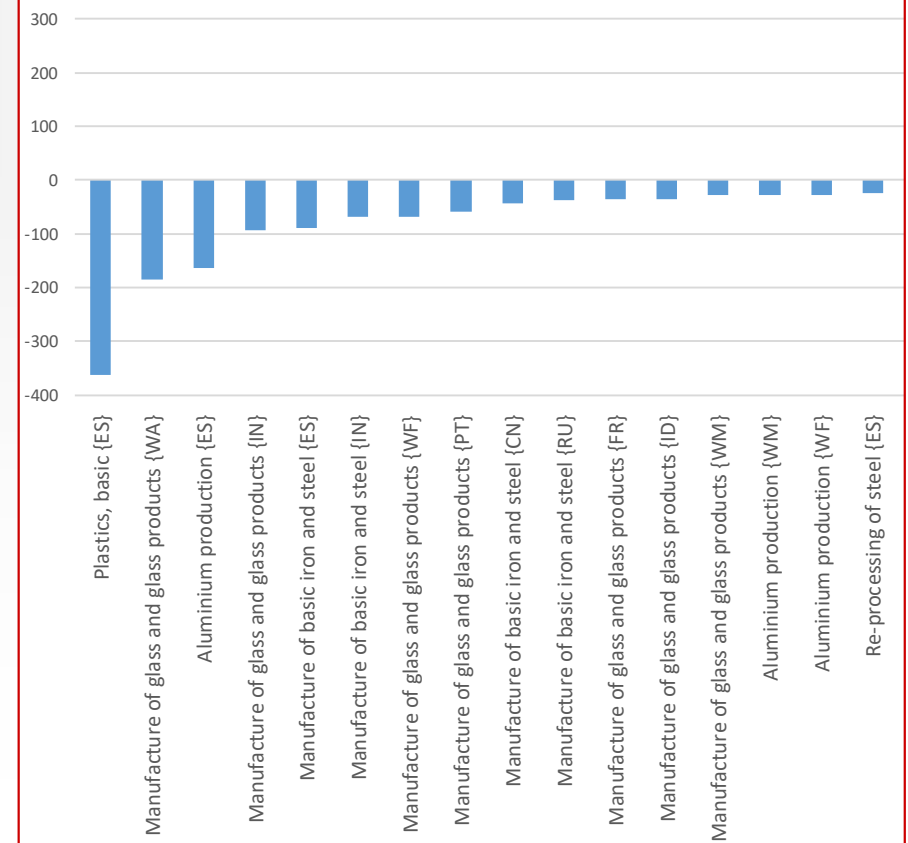
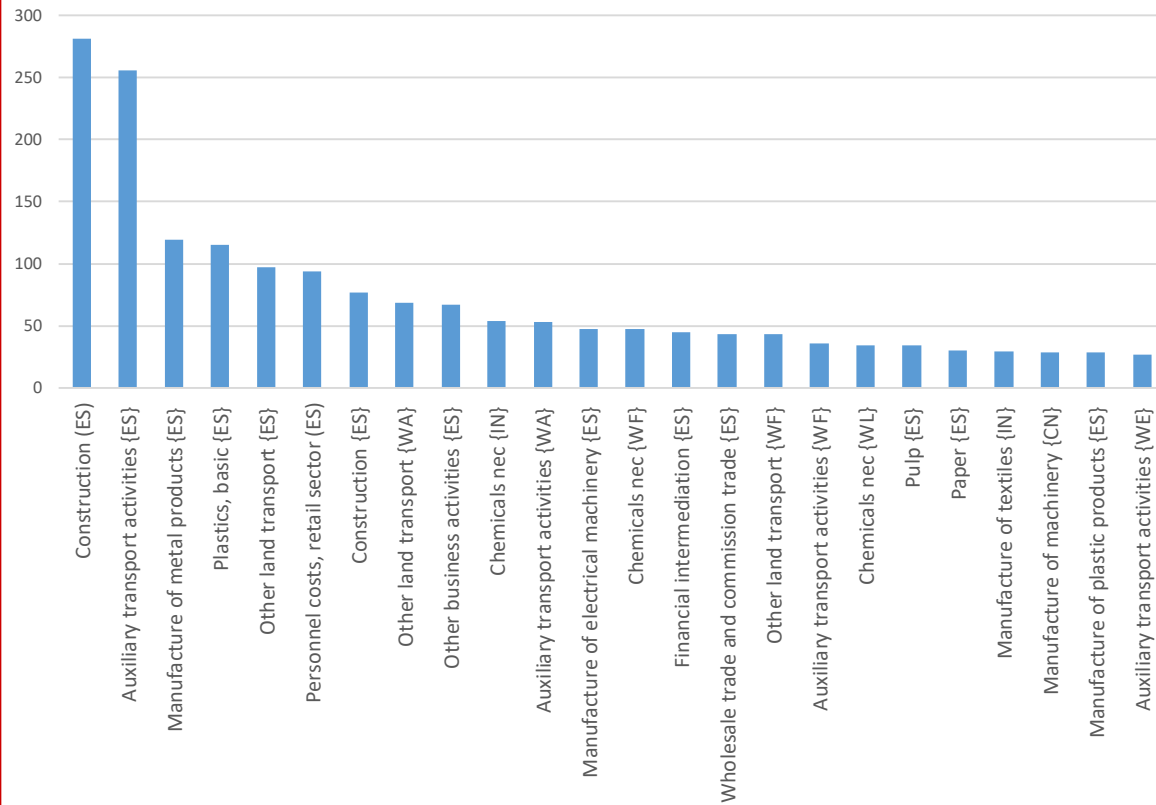
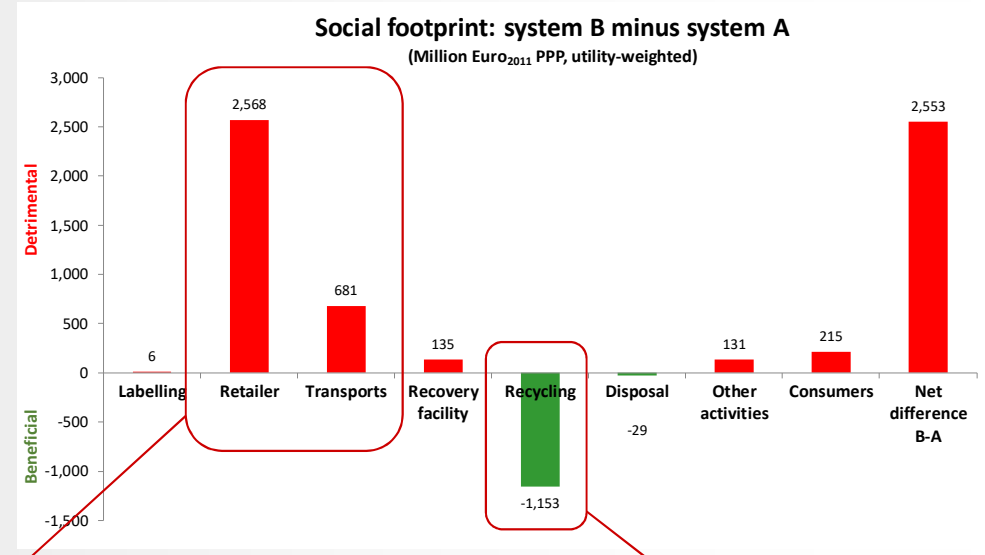
Case study: Results

SF in MEUR₂₀₁₁ PPP, utility-weighted

Scenario	IR	PI	SF = RI+IP
A	181	-5,247	-5,066
B	-100	-2,413	-2,513



Case study: Results



Conclusions

- In spite of higher recycling rates, the introduction of a DRS for beverage containers in Spain involves a higher social footprint than the current GDS
- Similar conclusions were drawn by parallel environmental and economic assessments
- The social footprint concept combined with Exiobase provides a powerful quantitative Life cycle-based sustainability screening
- Comprehensive assessments can be produced with much lower efforts than seen so far

Thank you!

- More info on social footprint: <https://lca-net.com/clubs/social-lca/>
Weidema B P (2018) The social footprint—a practical approach to comprehensive and consistent social LCA. Int J Life Cycle Assess, 23(3):700-709
- More info on the DRS sustainability assessment:
<https://www.esci.upf.edu/en/unesco-chair-in-life-cycle-and-climate-change/ariadna-study>

