ICRC project
LCA-based comparison

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23/01/2024

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Takeaway messages

Different virtual models were created for the 4 new types of bags, **to get a broader view of the influence of each hypothesis on the results.** All scenarios led to the same conclusions even when calculating other impact indicators.

THE IMPORTANCE OF BAG WEIGHT

There is a **direct correlation between the weight of the material and the environmental impact of the bag** → the 2 jute bags (AUST and GIOTTO-SUPSI) have the highest impact, while the 2 AIMPLAS have the lowest.

LIFETIME AND NUMBER OF REUSES

The greater the number, the lower the impact → If jute bags have a longer lifetime and can be used a greater number of times than plastic bags, the impact of a single use **can become competitive** with that of plastic bags. These two aspects are **the most relevant** to quantify the real impact of alternatives bags.

AGENDA

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MAIN INPUT DATA

Baseline vs alternative scenarios

The table provides an overview on the 3 "baseline bags" and 12 alternative scenarios. The "baseline bags" are here clustered into groups for the sake of simplicity, due to identical size and weight characteristics.

		ICRC Thread Poly (25 kg PP bag)	**WFP** Guler & Has (50 Kg PP bag)	**UNHCR** Shree balaji & Nizam-Alpinter (PP bales made of 2 sheets)
Length	m	0.71	0.95	1.32
Width	m	0.46	0.60	1.32
Surface	m^2	0.65	1.14	3.48
Weight	Kg	**0.100**	**0.105**	**0.800**
Density	kg/m^2	0.154	0.092	0.230

3 baseline bags

	ICRC	WFP	UNHCR
AIMPLAS (virgin)	X	X	X
AIMPLAS (partially recycled)			X
AUST	X	X	X
GIOTTO – SUPSI	X	X	X

The 4 alternatives and the resulting 10 scenarios

Data was provided in inches and converted to meters using the following equivalence: 1 inch = 2.54 cm

Alternative scenarios: the 4 new types of bags (1/2)

The 4 new types of bags AIMPLAS_virgin; AIMPLAS_recycled; AUST; GIOTTO-SUPSI) were modeled by **complementing the available primary data with information from the "baseline bags"**.

As shown in the example* below and in the next slide, the weight of the final product (i.e., a bag ready to be used) was calculated by complementing the ***density*** figure (primary data) with the ***surface*** figure sourced from the baseline model.

		AIMPLAS virgin	AIMPLAS recycled
Base fabric	ISPLEN PP 040	100%	100%
Coating	ISPLEN PP 089	77%	59%
	Recycled PP	0%	40%
	AO	3%	0%
	UV stabilizer	5%	1%
	PE	15%	0%
Density	kg/m²	0.083	0.083
Surface	m²	0.650	0.650
Weight	kg	**0.054**	**0.054**

virgin	recycled	
70.0%	70.0%	ISPLEN PP 040
25.1%	18.0%	ISPLEN PP 089
0.0%	12.0%	Recycled PP 089
4.9%	0.0%	PE
100.0%	100.0%	

For the two AIMPLAS models, the AO and UV stabilizers were excluded from the model (as the two materials represent <5% of the total mass of a bag).

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* Surface assumed equal to the one in the baseline.

The tables above are those of the comparison with **ICRC (therefore considering 0.65 m²).** An identical approach was used for the comparison with WFP (1.14 m²) and UNHCR (3.48 m²).

Alternative scenarios: the 4 new types of bags (2/2)

		AUST	GIOTTO
Fabric	Jute fibres	100%	100%
Coating	Natural latex	89.7%	-
	PVAc	7.0%	-
	Softener	2.0%	-
	Benzoate	1.0%	-
	Ammonium Sulphate	0.3%	-
Density	Fibres (kg/m2)	0.475	0.600
	Coating (kg/m^2)	0.125	-
Surface	m^2	0.650	0.650
Weight	kg	**0.390**	**0.390**

AUST	
79.2%	Jute fibres
19.3%	Natural latex
1.5%	PVAc
100.0%	

For the AUST model, the softener, benzoate and ammonium sulphate were excluded from the model (as the three materials represent <5% of the total mass of a bag).

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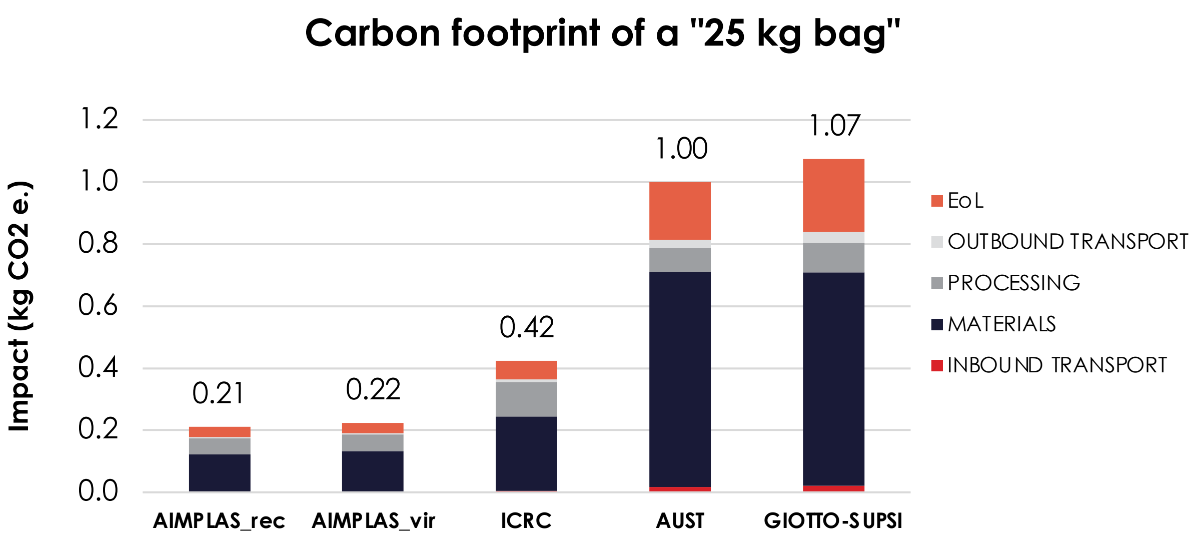
RESULTS

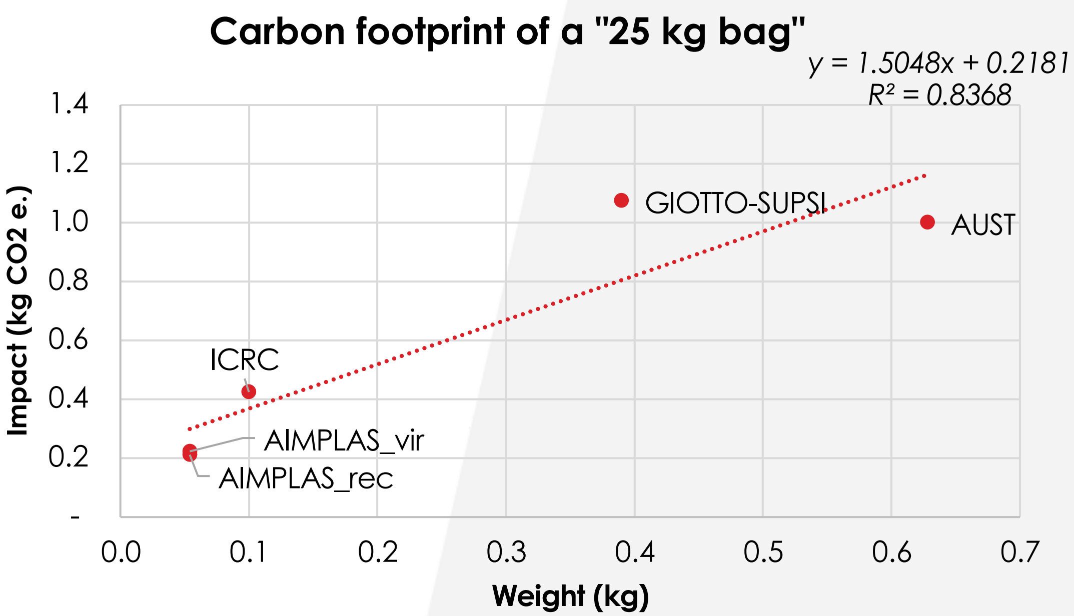
Carbon footprint: scaled on 1 bag

All scenarios led to the same conclusions. Therefore, for the sake of simplicity, the figures below and in the next slides are only those related to the scenario "25 kg bag".

Highlights:

- the material always accounts for >50% of the total impact
- there is a direct correlation between the weight of the material and the environmental impact of the bag → the 2 jute bags (AUST and GIOTTO-SUPSI) have the highest impact, while the 2 AIMPLAS have the lowest





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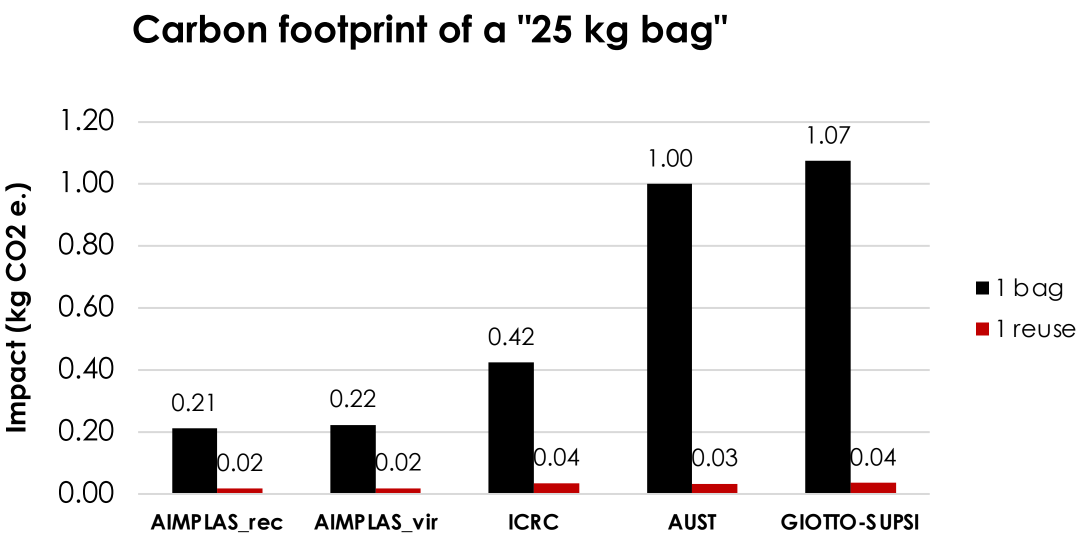
Carbon footprint: scaled on the function (1 use)

The function of bags is to transport goods. This means that, for a bag that is usable "n" times, **the environmental impact of each single use is "1/n"**.

Highlights:

- **Lifetime** and **Number of reuses** are the most relevant aspects for quantifying the real impact of bag alternatives (even more than weight!)
- the greater the number, the lower the impact → If jute bags have a longer lifetime and can be used a greater number of times than plastic bags, the impact of a single use **can become competitive** with that of plastic bags.



The table provides the data used in the model: the number of reuses per year (6 reuses regardless of the type of bag) is the main hypothesis. Therefore, to obtain reliable results, more precise information on this aspect should be collected.

	AIMPLAS	All baseline bags (including ICRC)	AUST/GIOTTO
Lifetime (years)	2	2	5
Nb.reuses/year	6	6	6
Total nb.reuses	**12**	**12**	**30**

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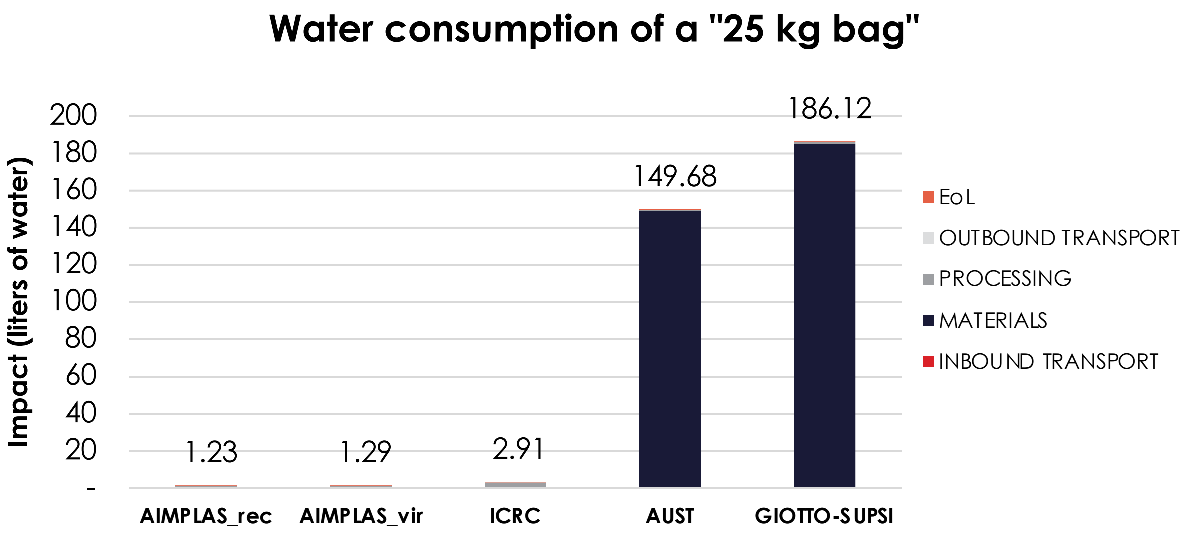
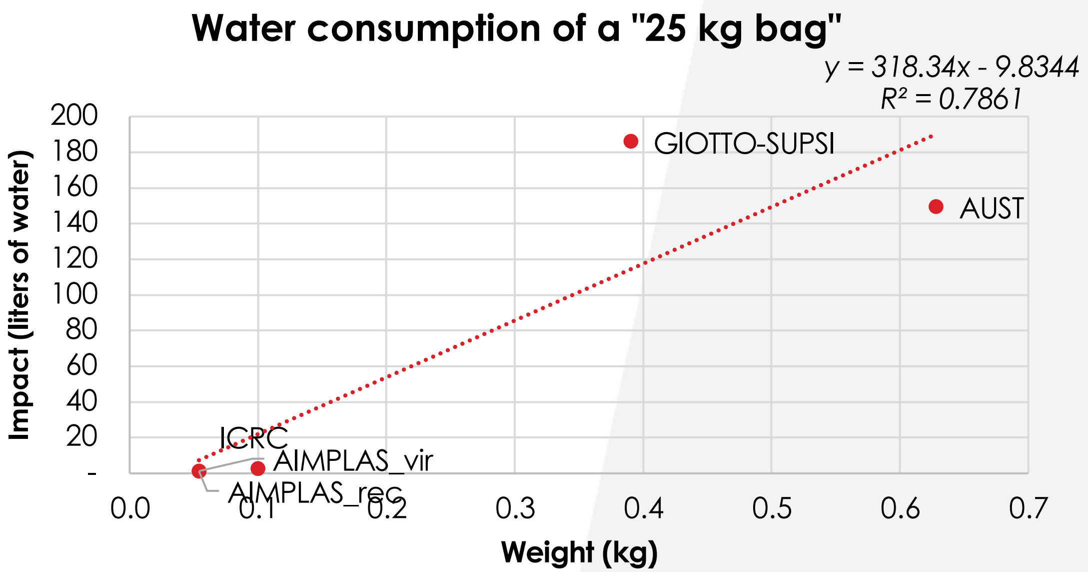
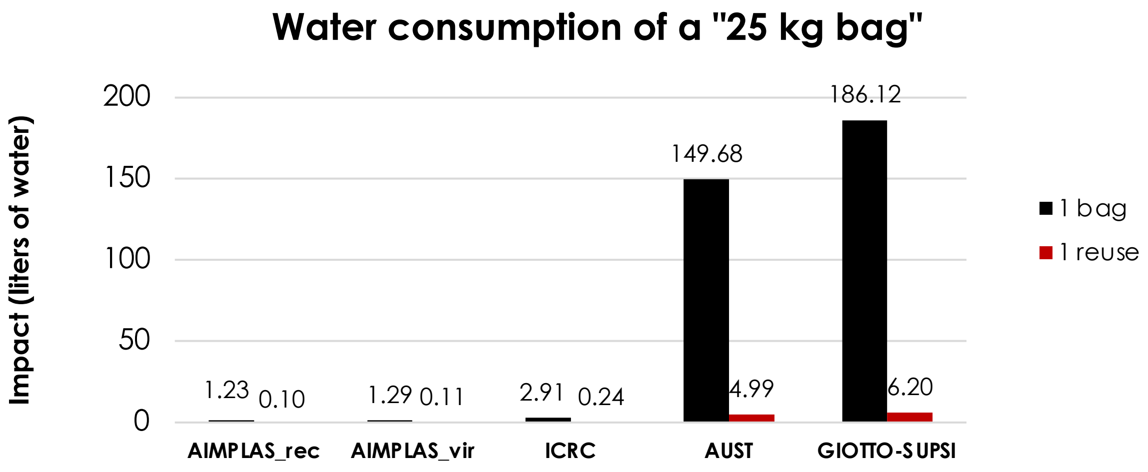
Water consumption







All scenarios led to the same conclusions even when calculating **other impact indicators** (Water consumption in this slide, Cumulative Energy Demand in the following one).

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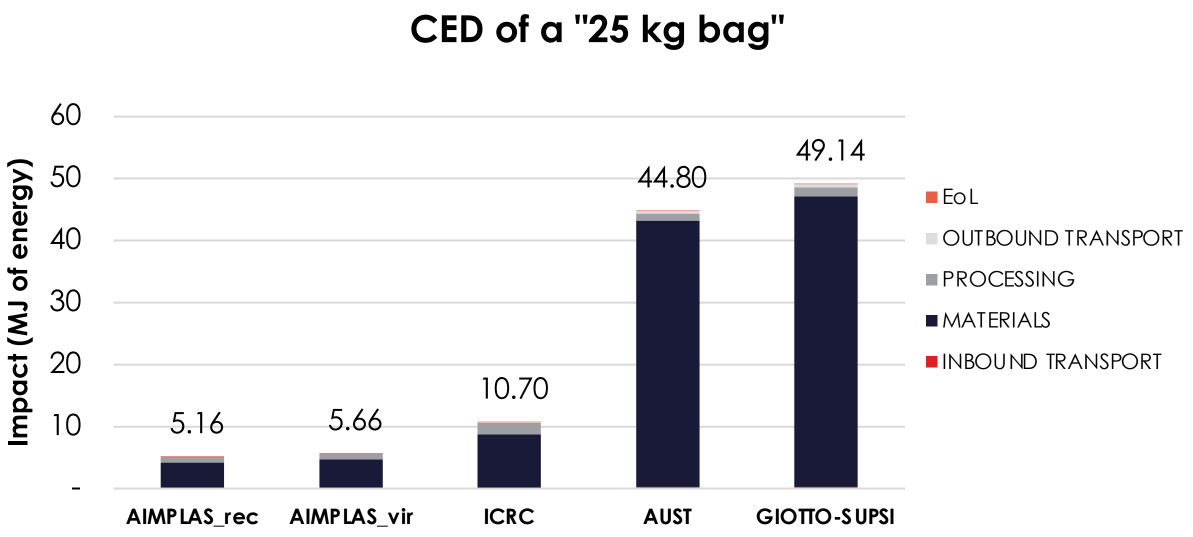
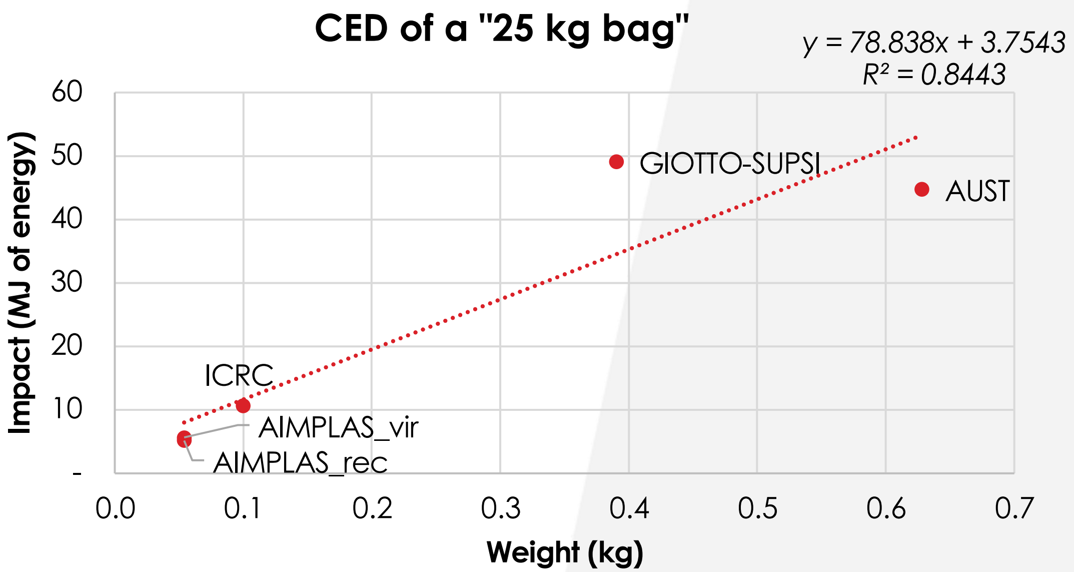
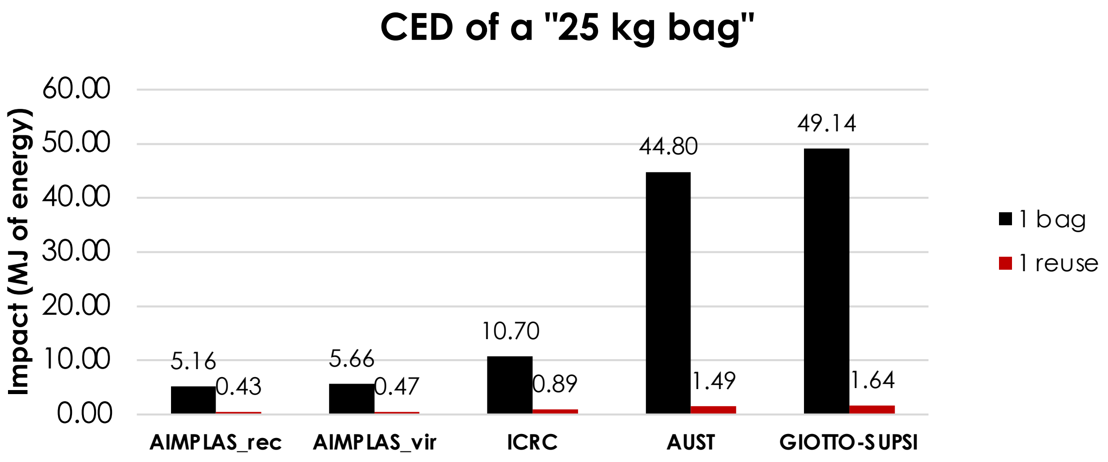
Cumulative Energy Demand (CED)



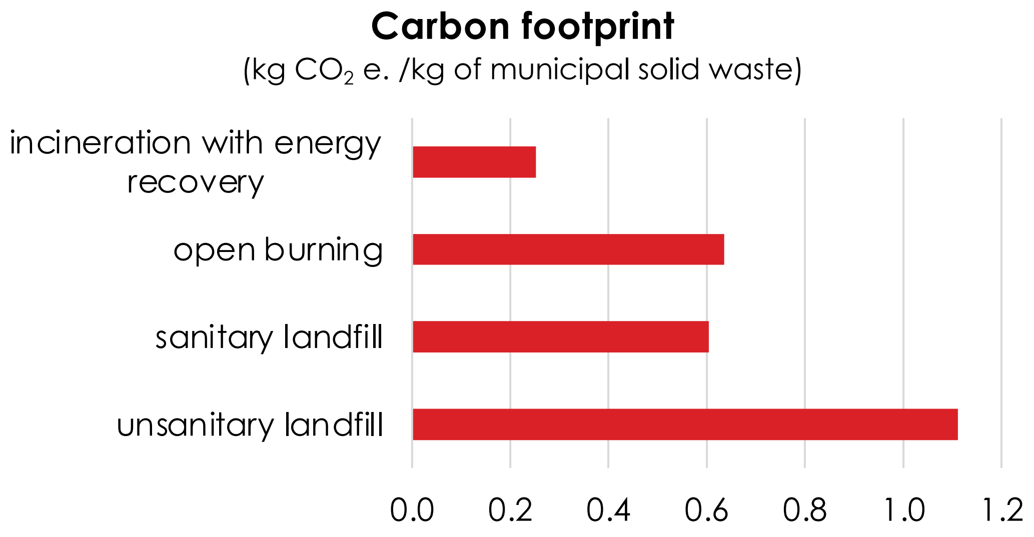




The importance of End of Life (EoL)

All bags are assumed to have the same EoL scenario, due to lack of data. The chosen scenario (as it is considered the most plausible) is the degradation of the bags in a **landfill**.

However, future in-depth analyses on the possible disposal scenarios (coupled with improved data on the quantity of materials and the number of reuses) could reveal significant differences between the various types of bags, as shown in the example below.



ANNEX

Waste rate

The ***waste rate*** determines the quantity of input material needed to obtain a unit of product. In terms of environmental impact, a higher waste ratio means a higher impact of the following processes:

- inbound transport;
- raw material;
- manufacturing activities to convert the raw material into a finished product.

As said, different models were created for the 4 new types of bags, in order to get a broader view of the influence of each variable on the results *.

		ICRC	WFP	WFP	UNHCR	UNHCR
Manufacturer (bag factory)		Threadz Poly	Guler	Has	Shreebalaji	Nizam-Alpinter
Waste rate	%	**8%**	**3%**	**8%**	**3%**	**10%**

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* For example, the Threadz Poly bag (with a size of 25 kg) was compared with the 4 alternatives (AIMPLAS, AUST, GIOTTO) keeping the bag surface and waste rate unchanged. The same approach was kept for the other bags: Guler/50kg/3% waste rate; Has/50kg/8% waste rate; etc.

Transportation

All bag models are based on the same Transportation scenarios:

Inbound	Transport by lorry (average)	km	100
	Transport by ship (average)	km	4,000
Outbound	Transport by lorry (average)	km	300
	Transport by ship (average)	km	5,800

Methodology

The project was carried out using professional LCA calculation software (**SimaPro**) and drawing on a solid international database (**Ecoinvent v.3**).

All alternative scenarios, once built, were analyzed using the following calculation methods:

Impact	Name of the method in SimaPro	Details
Carbon footprint	IPCC 2021 GWP100	The method contains the Global Warming Potential (GWP) climate change factors of IPCC (Intergovernmental Panel on Climate Change), with a timeframe of 100 years.
Water consumption	ReCiPe 2016 Midpoint (H)	Water consumption is the use of water in such a way that the water is evaporated, incorporated into products, transferred to other watersheds or disposed into the sea.
Cumulative Energy Demand (CED)	Cumulative Energy Demand	The method accounts for all types of energy (fossil, nuclear, solar, etc.) consumed through the entire lifecycle of the product.