

Foamo[®] Cup

Life Cycle Assessment

First Editions Ltd.

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Introduction

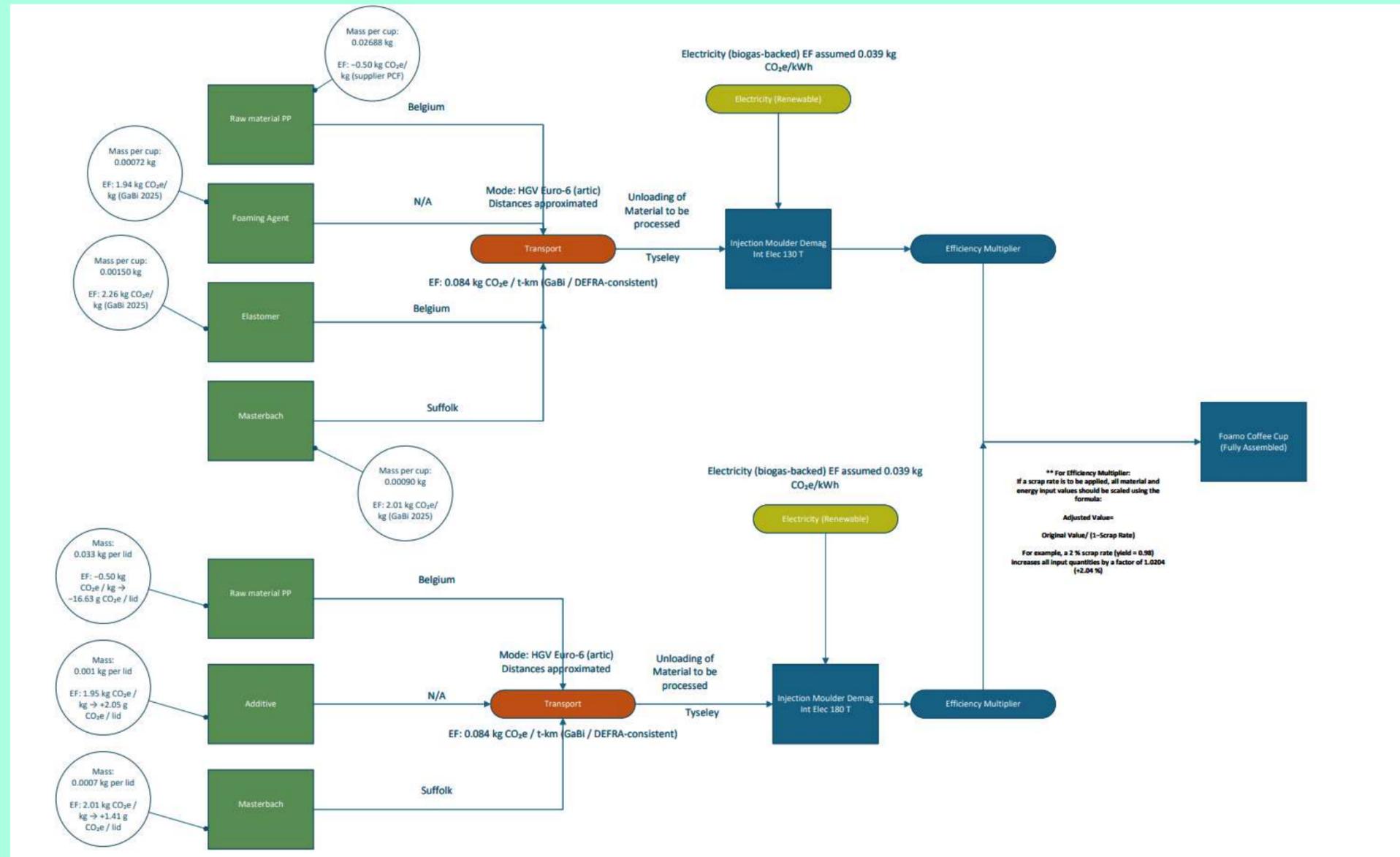
This Life Cycle Assessment provides an indicative carbon footprint for the Foamo Cup by modelling the product's cradle-to-gate impacts.

This study follows ISO 14040/14044 principles and uses a combination of primary data and reputable secondary datasets, with proxies.

It also identifies key contributors to overall CO₂e emissions, supporting evidence-based sustainability claims and offering insight into the cup's overall environmental profile.

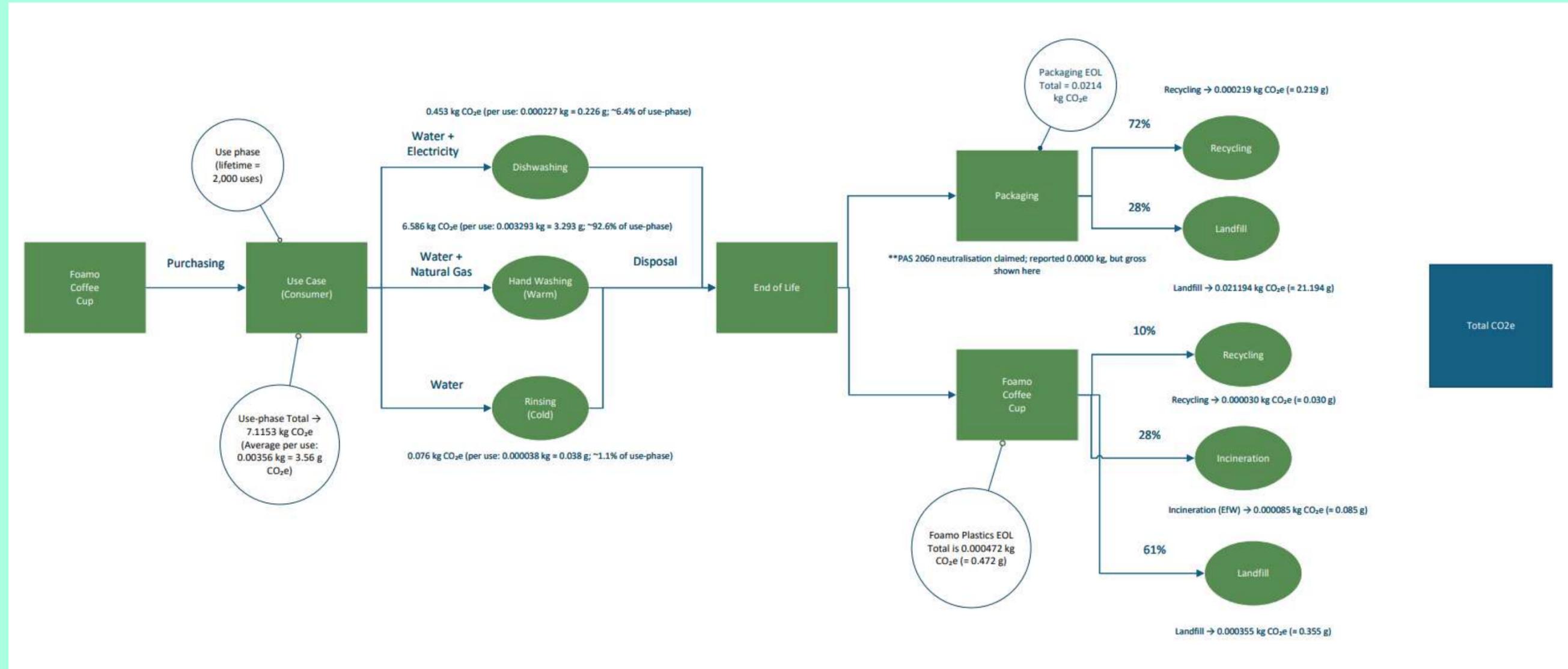


Cradle to Gate Process Map



The process maps and life cycle data presented in this document are subject to an estimated uncertainty margin of ±10 %, reflecting normal variability in supplier data, process assumptions, and modelling precision. Where direct data were unavailable, proxy values have been applied using reputable secondary sources (e.g., GaBi Sphera 2025 datasets, DEFRA 2025 factors, or supplier analogues). In the accompanying Excel sheet, such proxies are clearly indicated in the “Terminology / Assumptions / Notes” column where not explicitly specified elsewhere. All values represent best-estimate calculations derived from current evidence, literature, and database averages, aligned with good-practice LCA methodology.

Use Case & End of Life Process Map



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Key Life-Cycle Stages

Cradle to Gate

Component	CTG CO ₂ e (g)	Assumptions
Cup	-3.62	Includes metered 130 T energy and inbound transport
Lid	-11.36	Includes metered 180 T energy and inbound transport
CTG Total	-14.98	All values use PP EF = kg CO₂e/kg material (As issued by supplier)

Use Case

Method	Lifetime CO ₂ e (kg)	% of Total
Handwashing (Warm)	6.586	92.60%
Dishwashing	0.453	6.40%
Rinsing (Cold)	0.076	1.10%

Use-phase emissions total 7.11 kg CO₂e over an assumed 2,000-use lifetime, averaging 0.0036 kg CO₂e (3.6 g) per use

End of Life

Component	Material	Mass (Kg)	Route			Carbon Footprint	Assumptions
			Recycling (%)	Incineration (%)	Landfill (%)	Net CO ₂ e (kg)	
Foamo (Lid+Cup)	Plastic (PP-based eco blend)	0.065	10%	28%	61%	0.000472 kg CO₂e	End-of-life treatment of the Foamo Cup generates ~0.00047 kg CO ₂ e per cup set (≈ 0.47 g CO ₂ e per product), based on the disposal mix

Component	Material	Mass (Kg)	Route			Net CO ₂ e (kg)	Reported (kg CO ₂ e)	Assumptions
			Recycling (%)	Incineration (%)	Landfill (%)			
Packaging	Paperboard (corrugated, F-flute)	0.065	72%	0%	28%	0.0214 kg CO ₂ e	0	Assumed 72% recycling and 28% landfill based on typical market averages for paperboard packaging; supplier certified carbon -neutral under PAS 2060 (Scope 1-3, 2023-2025).

Summary of Carbon Footprint

Life-Cycle Stage	Process Boundary	Key Inclusions	CO ₂ e (g / unit)	Assumptions / Notes
Cradle-to-Gate (CTG)	Raw materials, inbound transport, site electricity, moulding	Eco PP credit, additives, renewable electricity, no scrap loss	-14.98	Supplier PP EF = -0.50 kg CO ₂ e / kg; electricity EF = 0.039 kg CO ₂ e / kWh; HGV Euro-6 = 0.084 kg CO ₂ e / t-km.
Use Phase	2,000 use lifetime; washing & rinsing energy + water	92.6 % hand washing (warm water + gas), 6.4 % dishwashing (electricity), 1.1 % cold rinse	3.56 g CO₂e / use ;7,115 g CO₂e / lifetime	0.00356 kg CO ₂ e / use from model; values include water heating and electric load.
Overall Life-Cycle Total (CTG + Use + EoL)	cradle → use → disposal	Complete model	Approx. 7,100 g CO₂e per Foamo set lifetime (Approx. 3.6 g per use)	Dominated by washing energy; CTG phase is net negative.

The complete life-cycle model (cradle-to-gate, use phase, and end-of-life) results in a total footprint of ~7.1 kg CO₂e per Foamo set over 2,000 uses (~3.6 g per use). The cradle-to-gate stage is net-negative due to the materials used.

*Note: These results are subject to an estimated uncertainty margin of ±10%, reflecting normal variability in supplier data, process assumptions, and modelling precision.

Foamo Cup Statistics

*7.1 Kg CO₂e Over 2000 uses
 Negative Cradle-to-gate impact
 Carbon neutral packaging at EoL



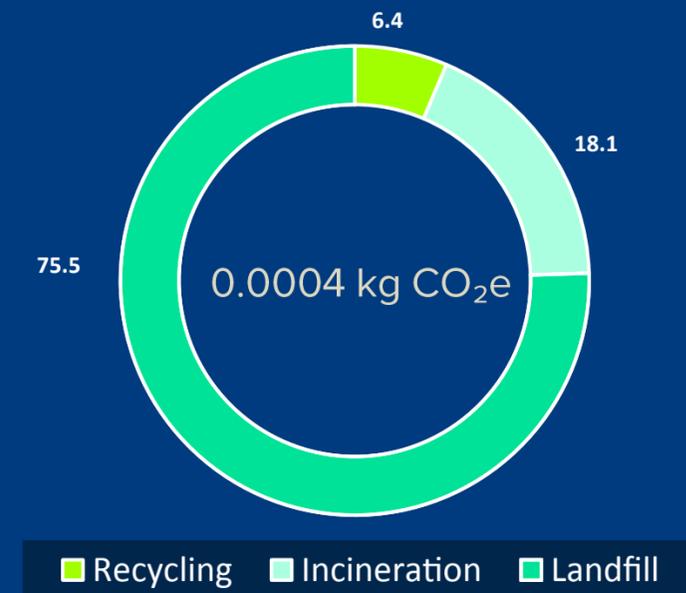
*Fossil based PP: ~1.6–1.7 kg CO₂e per kg.
 Renewable-attributed PP used in Foamo: ~-0.5 kg CO₂e per kg.

That indicates a reduction of over 2 kg CO₂e per kg of material before the cup is even used, and a 130% lower CTG footprint due to biogenic carbon storage.

Use Case Lifetime CO₂e



EoL Breakdown CO₂e



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Key Terminology

Term	Definition / Description	Units
Mass (kg)	Weight of each material or process input used to manufacture one Foamo Cup.	kg
Emission Factor (EF)	Conversion factor that quantifies greenhouse gas emissions associated with producing 1 kg of material, 1 kWh of energy, or 1 tonne-kilometre of transport.	kg CO ₂ e / unit
CO ₂ e (kg / g)	Calculated carbon emissions (in kg or g of CO ₂ equivalent) for each input, obtained by multiplying Mass × EF.	kg CO ₂ e / g CO ₂ e
Electricity (kWh)	Metered energy consumed by the injection moulding machine during cup production, based on average Wh per cycle.	kWh
Transport (t·km)	Emissions from transporting raw materials from supplier locations to the manufacturing site. (As listed in previous CTG LCA)	kg CO ₂ e / t·km
Cradle-to-Gate (CTG)	Lifecycle boundary covering all processes from raw material extraction through to factory gate, excluding use-phase and end-of-life.	–
Bornewables™ Credit	Supplier-specific carbon intensity reduction representing biogenic CO ₂ storage and renewable feedstock substitution in polypropylene production. (from supplier)	kg CO ₂ e / kg
Total CTG CO ₂ e	Sum of all cradle-to-gate carbon emissions (positive and negative) per Foamo Cup, expressed in grams of CO ₂ equivalent.	g CO ₂ e

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Key Terminology

Term	Definition / Description	Units
Amount	Quantity of resource or energy used per wash of the cup.	L, kWh, MJ
Method Share %	Percentage of total washes performed using that cleaning method (behavioural split).	%
Lifetime Washes	Number of times each method occurs over the cup's lifetime.	Number
CO ₂ e Factor	Emission factor converting resource use into carbon emissions, based on DEFRA 2025 UK data.	kg CO ₂ e / unit
Lifetime CO ₂ e / Method	Total emissions from one method across all its lifetime washes (Amount × EF × Lifetime Washes).	kg CO ₂ e
Total Lifetime CO ₂ e	Sum of all methods — total use-phase emissions from washing over the cup's lifespan.	kg CO ₂ e
Average CO ₂ e per Use	Average emissions per single wash/use event over the lifetime.	kg CO ₂ e / use
Emission Factor (EF)	Standardised conversion value linking energy/water usage to CO ₂ e. Derived from government or LCI datasets.	kg CO ₂ e / unit
Lifetime (Functional Unit)	Defined period or usage count for assessing impact — the cup's expected service life.	Years / Uses

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Key Terminology

Term	Definition / Description	Units
Component	The product or packaging element being assessed at end-of-life (e.g., paperboard box, cup body, lid).	–
Material	Primary material composition of the component (e.g., paperboard, PP-based blend bornewables).	–
Mass (kg)	Weight of the component considered in the EOL stage.	kg
Route	Waste management pathways applied to the material at disposal (recycling, incineration, landfill).	–
Recycling / Incineration / Landfill (%)	Percentage distribution of waste across each treatment route, based on market averages, supplier data, or DEFRA 2025 waste splits.	%
Emission Factor (EF)	CO ₂ e conversion factors for each waste route (e.g., recycling, incineration, landfill) derived from DEFRA 2025 UK or LCI datasets.	kg CO ₂ e / kg
Recycling EF / Incineration EF / Landfill EF	Specific emission factors for each disposal route — quantify direct CO ₂ e from waste processing.	kg CO ₂ e / kg
Substitution Credit (kg CO ₂ e/kg)	Carbon credit applied for avoided burdens (e.g., recycled content displacing virgin material production). Often assumed = 0 unless circular offset is modelled.	kg CO ₂ e / kg
Net CO ₂ e (kg)	Total end-of-life emissions for each component = $\sum (\text{Route } \% \times \text{EF} \times \text{Mass}) - \text{Substitution Credit}$.	kg CO ₂ e
Reported CO ₂ e (kg)	Final CO ₂ e reported in LCA summary after rounding and allocation per functional unit.	kg CO ₂ e
Assumptions	Notes on data sources, supplier certification (e.g., PAS 2060), or benchmark route splits (e.g., competitor LCAs, DEFRA datasets).	

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Assumptions

All calculations were performed in kilograms of CO₂ equivalent (kg CO₂e) for consistency with GaBi and DEFRA datasets. Some final results are reported in grams of CO₂e (g CO₂e) per cup or lid for readability, using the conversion: 1kg CO₂e=1000 g CO₂e. This allows small component impacts (e.g., 0.001 kg CO₂e = 1 g CO₂e) to be displayed with appropriate precision.

Life Cycle Stage	Description
Cradle to Gate	<p>Data Quality Hierarchy: Supplier PCFs (Tier 1) > GaBi Sphera datasets (Tier 2) > DEFRA 2025 factors (Tier 3).</p> <p>Estimated Error Margin: ±15 %, primarily from supplier dataset variance and transport distance assumptions.</p>
Cradle to Gate; Electricity 0.039 kg CO ₂ e/kWh	Renewable biogas electricity modelled using “Electricity from biogas (GB, GaBi 2025)” process. Allocation follows a market-based approach (not residual grid mix). There is a +/- 10% error margin
Transport (Closely aligned with supplier location) 0.084 kg CO ₂ e/t-km	(HGV Euro-6); Sphera Gabi Database 2025
Scrap Rate	<p>If a scrap rate is to be applied, all material and energy input values should be scaled using the formula: Adjusted Value= Original Value/ (1-Scrap Rate)</p> <p>For example, a 2 % scrap rate (yield = 0.98) increases all input quantities by a factor of 1.0204 (+2.04 %)</p>

Assumptions

Method	Input	Unit	Amount	Method Share %	Lifetime Washes	CO2e Factor (UK)	Lifetime CO2e/ Method	Assumptions
Dishwashing	*Water	l	0.3	5%	100	0.0003622	0.010866	Assumed 15 L per load and 50 cups per load (Gall, 2016).
	Electricity	Kwh	0.025		100	0.177	0.4425	Assumed 1.23 kWh per load and 50 cups per load (Gall, 2016).
Handwashing (Warm)	Water	l	0.5	74%	1480	0.0003622	0.268028	Assumed a tap debit of 14.6 L / min and a 2-second rinse (Western Water, 2015).
	*Natural Gas Heating	MJ	0.084		1480	0.05082	6.3179424	Assumed natural gas needed to heat water from 25 °C to 65 °C.
Rinsing (Cold)	Water	l	0.5	21%	420	0.0003622	0.076062	Assumed a tap debit of 16.5 L / min and a 15-second rinse; Rinse flow rate cross-checked with UK Waterwise (2023); 0.5 L per rinse remains within a conservative range and was retained from the base LCA.

*Water: EF per litre=10000.19130=0.0001913 kg CO₂e / L
 Converted from UK Gov GHG 2025 for cubic metres (m³); EF for Waste-Water Treatment 0.17088 kg CO₂e/m³=0.0001709 kg CO₂e / L

*Natural Gas: DEFRA reports natural gas at 0.18296 kg CO₂e / kWh (Gross CV). Since 1 kWh = 3.6 MJ, the equivalent factor per MJ is:
 $0.18296 \div 3.6 = 0.05082$ kg CO₂e / MJ.
 This value is used to convert 0.084 MJ of gas per wash into CO₂e.

Assumptions

Component	Material	Mass (Kg)	Route			Emission Factor (kg CO ₂ e/kg)	Substitution Credit (kg CO ₂ e/kg)	Net CO ₂ e (kg)	Reported (kg CO ₂ e)	Assumptions
			Recycling (%)	Incineration (%)	Landfill (%)					
Packaging (SANDLAND PACKAGING LTD, PAS 2060)	Paperboard (corrugated, F-flute)	0.065	72%	0%	28%	Recycling: 0.004686; Landfill: 1.164489	0	0.0214 kg CO ₂ e	0	Assumed 72% recycling and 28% landfill based on typical market averages for paperboard packaging; supplier certified carbon-neutral under PAS 2060 (Scope 1-3, 2023-2025).

*The packaging mass was estimated at 0.065 kg based on typical F-flute corrugated paperboard box specifications used for single reusable cup packaging. This aligns with industry averages for lightweight retail cartons of comparable size and reflects Sandland's standard corrugated format used for Foamo Cup packaging. Packaging split (72% recycling, 28% landfill) follow a similar products verified LCA general market average for paper and board waste treatment.

The waste disposal factors are published in units of kg CO₂e per tonne of material. To align with the LCA model (which uses kilograms as the mass basis), the factors were converted by dividing by 1,000:

For paper and board (board):

Closed-loop recycling = 4.68568 kg CO₂e / tonne → 0.004686 kg CO₂e / kg
 Landfill = 1164.48940 kg CO₂e / tonne → 1.164489 kg CO₂e / kg
 UK Gov/DEFRA GHG 2025

DEFRA GHG 2025 Emission factors do not include substitution credits.

GaBi databases include substitution credits

Due to Sandland Packaging's PAS 2060, the value will remain 0 irrespective of database inputs

*Calculation Method:

Recycling mass = 0.065 × 0.72 = 0.0468 kg
 Landfill mass = 0.065 × 0.28 = 0.0182 kg
 Recycling emissions = 0.0468 × 0.004686 = 0.000219 kg CO₂e
 Landfill emissions = 0.0182 × 1.164489 = 0.02119 kg CO₂e
 Sum= Recycling emissions + Landfill emissions
 Packaging EoL emissions = 0.0214 kg CO₂e/ cup

Assumptions

Component	Material	Mass (Kg)	Route			Recycling EF (kg CO ₂ e/kg)	Incineration EF (kg CO ₂ e/kg)	Landfill EF (kg CO ₂ e/kg)	Substitution Credit (kg CO ₂ e/kg)	Net CO ₂ e (kg)	Assumptions
			Recycling (%)	Incineration (%)	Landfill (%)						
Foamo Cup (Body)	Plastic (PP Based eco renewables)	0.03	10%	28%	61%	0.00468568	0.00468568	0.00898311	0	0.000218 Kg CO ₂ e	DEFRA 2025 waste disposal factors; route split 10/28/61 based on competitor's LCA analysis.
Foamo Lid	Plastic (PP-based eco renewables)	0.035	10%	28%	61%	0.00468568	0.00468568	0.00898311	0	0.000254 kg CO ₂ e	Same factors and split
Foamo (Lid+Cup)	Plastic (PP-based eco renewables)	0.065	10%	28%	61%	0.00468568	0.00468568	0.00898311	0	0.000472 kg CO ₂ e	End-of-life treatment of the Foamo Cup generates ~0.00047 kg CO ₂ e per cup set (≈ 0.47 g CO ₂ e per product), based on the disposal mix from similar product's verified LCA — 10 % recycled, 28 % incinerated (with energy recovery), and 61 % landfill)

*Mass_to_Recycling = Mass * 0.10

Mass_to_Incineration = Mass * 0.28

Mass_to_Landfill = Mass * 0.61

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References

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1. Almeida, J., Le Pellec, M. & Bengtsson, J. (2018) *Reusable coffee cups: Life cycle assessment and benchmark*. Edge Environment, Australia.
2. Department for Energy Security and Net Zero (DESNZ). (2025) *UK Government greenhouse gas conversion factors for company reporting: Methodology paper and conversion factors 2025*. London: DESNZ.
3. Sphera Solutions GmbH. (2025) *GaBi LCA Database and Modelling Software (Version 2025.1)*. Leinfelden-Echterdingen, Germany: Sphera Solutions GmbH.
4. Foamo Cup: Confidential Internal Data Pack. (2025) *Primary manufacturing, material inputs, transport details, and supplier-specific information used for LCA modelling*. (Not publicly available; provided directly by manufacturer.)
5. Gall, L. (2016) *How much water does a dishwasher use?* Canstar Blue. Available at: <http://www.canstarblue.com.au/appliances/kitchen/dishwashers/how-much-water-does-a-dishwasher-use/> (Accessed: 20th October 2025).
6. Western Water. (2015) *Fact Sheet: Kitchens*. (Accessed: 18th October 2025).
7. Sandland Packaging. (n.d.) *The ultimate cardboard packaging guide*. Available at: <https://sandlandpackaging.co.uk/the-ultimate-cardboard-packaging-guide/> (Accessed: 18th October 2025).
8. Hotline. (n.d.) *Product A8008 (packaging component)*. Available at: <https://www.hotline.co.uk/shopping/a8008> (Accessed: 20th October 2025).