



Storm Communications
T: 020 7240 2444
E: procarton@stormcom.co.uk

Cartonboard beats blister packs in detailed study of comparative carbon footprint

August 2021 - A new report has highlighted the outstanding environmental credentials of cartonboard packaging for consumer electronics packaging when compared against fossil-based alternatives.

Published in June 2021, *Cartonboard Life Cycle; Comparing the carbon footprint of carton packaging against alternative solutions*, goes into the granular detail of the cradle-to-grave environmental performance of cartonboard for small electrical goods compared to blister packs, alongside similar packaging comparisons for other consumer products such as frozen and take-away food.

The study, carried out by RISE (Research Institutes of Sweden) Bioeconomy unit for Pro Carton, the European Association for Carton and Cartonboard Manufacturers, provides an insight into the relative carbon footprints for packaging in different consumer sectors, alongside detailed explanations of the factors driving those comparative footprints.

Pro Carton General Manager Tony Hitchin explains that the research compares the cradle-to-grave carbon footprint of the complete packaging solution rather than just comparing the materials on a per tonne basis: "It's known that the carbon impact per tonne of material is much lower for cartonboard than polymers regardless of whether you look just at fossil emissions or also take the biogenic emissions and removals into consideration (see table below). We wanted to compare products on a per unit basis too as cartonboard packaging may not weigh the same as a fossil-based solution. Furthermore, the conversion and end-of-life impacts for each of the solutions will be different. That's why in this study we have compared specific packaging solutions for the similar products on a cradle-to-grave basis."



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Cradle-to-gate comparison of fossil carbon footprint per tonne of material ready for conversion

Material	Total carbon footprint (kgCO ₂ e per tonne of material ready for conversion)	Fossil carbon footprint (kgCO ₂ e per tonne of material ready for conversion)	Source
Cartonboard	262	1,047	Pro Carton
Amorphous PET granulate	3,093	3,089	Ecoinvent 3.6
PP	2,110	2,122	Ecoinvent 3.6
PVC	2,122	2,108	Ecoinvent 3.6
LDPE granulate	2,305	2,286	Ecoinvent 3.6
HDPE granulate	2,110	2,092	Ecoinvent 3.6

RISE’s cradle-to-grave comparison ensures that the *entire* lifecycle of packaging is taken into account – from how it is produced (or grown in the case of the wood used in cartonboard manufacture) to processing and disposal. The study reports both fossil green-house-gas (GHG) emissions *and* biogenic GHG emissions and removals.

Fossil GHG emissions arise from non-renewable sources such as fossil fuels, while Biogenic emissions arise from the combustion of biofuels and the degradation of bio-based products. Biogenic removals refer to CO₂ uptake from the atmosphere through photosynthesis during biomass growth.

Stresses Hitchin: “Whilst the unique aspects of the life-cycle of fibre-based packaging are taken into account when calculating the total carbon footprint, we also wanted to see what the results would be when only the fossil green-house-gas (GHG) emissions were considered and the cartonboard solution gave a favourable result.”

Case Study: Small electricals packaging



This case study compared a typical PVC blister pack (with cartonboard fitments) with a cartonboard box for packaging an HDMI cable. The PVC blister pack weighed 58g & cartonboard fitments weighed 20g. The cartonboard box weighed 35g and PET hanger tag weighed 2g. A recycling rate of 84.6% was considered for the cartonboard elements of both packs, reflecting average European recycling rates for paper and cardboard packaging (European Commission, 2017). For the non-recycled portion of the cartonboard boxes, 8.5% was assumed to be sent for energy recovery and 6.9% is assumed to be disposed of to landfill (European Commission, 2015). The blister pack was not considered recyclable; 55% is assumed to be sent for energy recovery and 45% is assumed to go to landfill.

Says Hitchin: “This analysis makes it very clear that cartonboard has a much lower impact than the comparative packaging per pack.”

Case study: HDMI cable - kgCO₂e per 1,000 packs

	Fossil GHG emissions	Biogenic GHG emissions	Biogenic GHG removals	dLUC emissions	Total GHG emissions and removals
Carton	45.5	37.4	-59.9	0.3	23.3
PVC blister plus cartonboard fitments	235.5	20.2	-32.3	0.2	223.6



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Comparative results

From the perspective of Fossil GHG emissions only, the cartonboard box had a considerably lower impact (45.5kgCO₂e per 1,000 packs) compared to the PVC blister pack with cartonboard fitments (235.5kgCO₂e per 1,000 packs).

However, when biogenic emissions, removals and dLUC (direct land use change) were also considered, the footprint of the cartonboard pack (23.3kgCO₂e per 1,000 packs) was further reduced relative to the footprint of the PVC blister with cartonboard fitments (223.6kgCO₂e per 1,000 packs). This is mainly due to the uptake of carbon during the growth phase of the forests. This biogenic carbon removal was larger than the biogenic emissions that occurred (from the combustion of biofuels at the mill) during the manufacture of the board.

Hitchin also underlines that carton packaging has high recycling rates. “This means that a proportion of the original carbon contained in the product when it first comes to market continues through the life-cycle of subsequent products outside the boundaries of this analysis,” he says.

The report also considered different recycling rates but it concluded that the results for the two packaging systems are not sensitive to the recycling rate assumed.

Commenting on the results, Pro Carton’s Hitchin concludes: “It’s clear that cartonboard consistently scores better than its fossil-based packaging counterparts. Cartonboard clearly offers a protective, convenient, and customer-friendly alternative to conventional blister packs.

“We know from other research that consumers have an overwhelming preference for cartonboard packaging over plastic and this study further supports the merits of changing to cartonboard packaging.”

The full report can be found here: <https://www.procarton.com/publications-news/publications/>

Ends

Notes to editors:

For further information or a full copy of the report please contact the Pro Carton press office on +44 (0) 20 7240 2444 or procarton@stormcom.co.uk



PRO CARTON
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A BETTER WORLD

Storm Communications
T: 020 7240 2444
E: procarton@stormcom.co.uk

About Pro Carton

Pro Carton is the European Association of Carton and Cartonboard manufacturers. Its main purpose is to promote the use of cartons and cartonboard as an economically and ecologically balanced packaging medium.

<https://www.procarton.com>