

Fact sheet

Continuous improvement of environmental footprint of paper sacks

Introduction

As the European Commission has set ambitious climate targets, stakeholders are increasingly looking at standards that broaden the focus beyond emissions related to their production activities to encompass the entire value chain. The fossil carbon footprint that is associated with the whole supply chain – including the manufacture, transport and distribution of a certain product or packaging – is an established tool. It gives customers an indication about a product's impact on the climate. CEPI Eurokraft and EUROSAC have investigated the environmental impact of sack kraft paper and paper sacks since 2007. The associations are pleased to present the latest carbon footprint calculation for sack kraft paper and paper sacks in Europe for 2021.

About the research

The analysis has been carried out by the Swedish research institute RISE using two different methods. The calculations are based on guidelines and tools developed by the Confederation of European Paper Industries (CEPI)¹ and by the International Confederation of Paper and Board Converters in Europe (CITPA)².

- First, a cradle-to-gate calculation of the fossil carbon impact of sack kraft paper and paper sacks was conducted.
- In the second step, the study included the total carbon impact, i.e. fossil carbon emissions, biogenic carbon emissions, biogenic carbon removals and emissions due to direct land use change of paper sacks.

Data sources

The calculations make use of the gate-to-gate life cycle inventory data for 2021 covering sack kraft paper production and paper sack converting. The datasets were compiled by CEPI Eurokraft and EUROSAC from representative European mills and converting facilities. They cover 75% of sack kraft paper production in Europe and approximately 58% of sack converting activities across Europe. A weighted average grid electricity mix is considered based on actual consumption at each mill and converting plant, and the relative share of production for each mill and converting plant. Fossil GHG emission factors for electricity consider specific product mixes where possible. If this information is not available, national grid electricity mixes are considered. Emissions factors for electricity purchased from the national grid are sourced from IEA Emission Factors 2021. Carbon factors for emissions and removals for, for example, inputs

¹ Framework for Carbon Footprints for Paper and Board Products, CEPI, Beaufort-Langevald, A. d., April 2017

² Guidelines for calculating carbon footprints for paper-based packaging, CITPA, March 2018



of raw materials and fuels, purchased electricity, emissions from various modes of transport have been sourced from recognised life cycle inventory databases.

Paper sacks specification

Paper sacks are manufactured from sack kraft paper combined with other components to deliver an effective, lightweight and functional package. The sack kraft paper is manufactured primarily from virgin fibres. The paper sack considered in this analysis represents an average European paper sack. Its composition is summarised in the table below:

Component	Share of composition by weight	
Paper	91.2%	115.2 g
Film (HDPE/LDPE)	5.7%	7.2 g
Glue (starch and PVA glues)	1.7%	2.1 g
Ink	1.2%	1.5 g
Other components	0.3%	0.3 g
Total	100%	126.4 g

CARBON FOOTPRINT RESULTS

There is a consistent downward trend in the cradle-to-gate fossil carbon impact of average European sack kraft paper and paper sacks.

For the production of sack kraft paper

- 2018 to 2021: The reduction in fossil carbon impact per tonne of sack kraft paper was 5% – from 442 kg CO₂e³ to 421 kg CO₂e.
- 2007 to 2021: There is a significant reduction in fossil carbon impact per tonne of sack kraft paper of approximately 26% – from 570 kg CO₂e to 421 kg CO₂e.

For the production of paper sacks

- Paper production dominates the cradle-to-gate fossil carbon footprint of average European paper sacks.
- 2018 to 2021: The fossil carbon impact per paper sack is slightly reduced by 1% – from 87 g CO₂e⁴ in 2018 to 86 g CO₂e per sack in 2021.

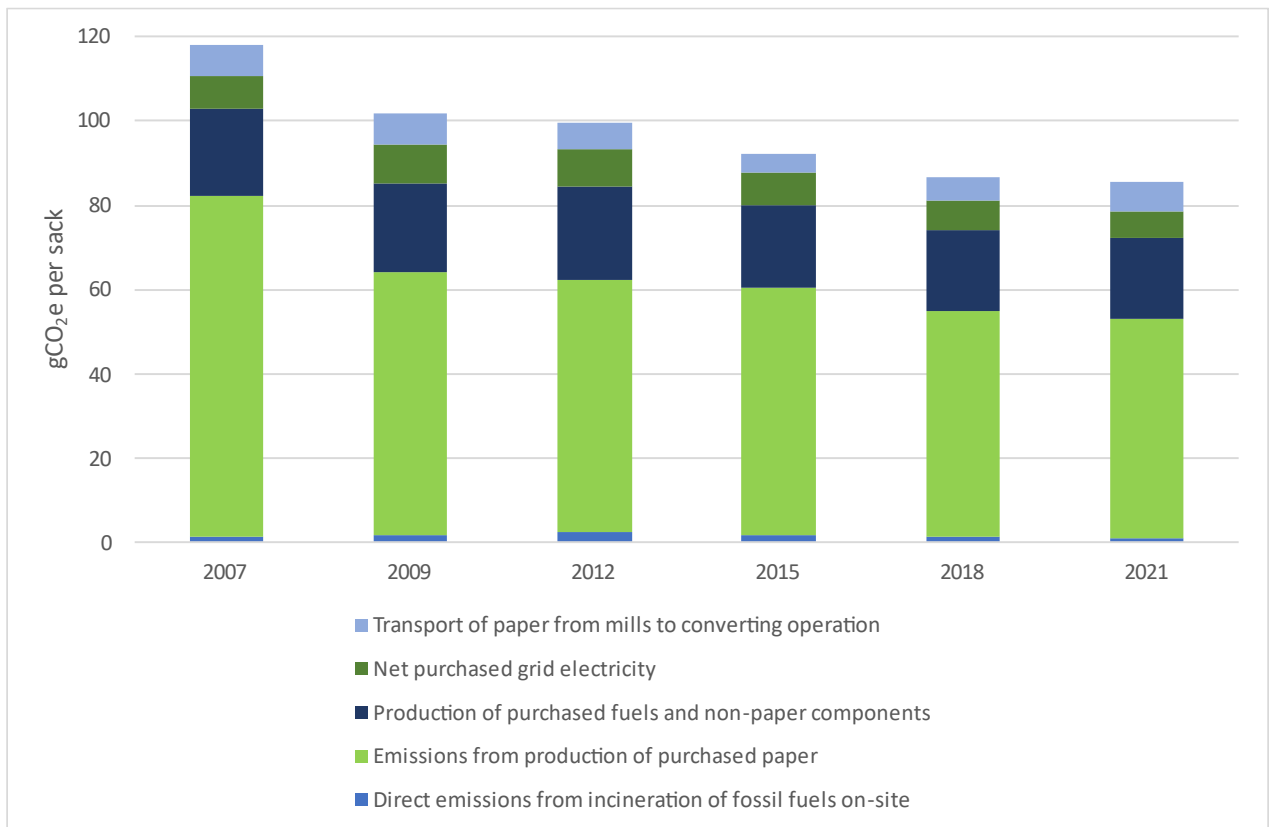
³ Note: the value for 2018 has been restated from 455 kg CO₂e per tonne due to the identification of an error in the quantity of CaO (calcium oxide) considered in the life cycle inventory for sack kraft paper.

⁴ Note: the value for 2018 has been restated from 85 g CO₂e per tonne due to the corrections to the paper footprint and due to the identification of an error in the quantity of PE considered in the average paper sack.

The emissions per paper sack in 2021 are as follows:

Description	Fossil GHG emissions	Percentage
Production of purchased kraft paper	51.9 g CO ₂ e	61%
Production of purchased fuels and non-paper inputs	19.3 g CO ₂ e	23%
Production of purchased electricity	6.3 g CO ₂ e	7%
Transport to converting operation	6.7 g CO ₂ e	8%
Direct emissions from production site	1.2 g CO ₂ e	1%
	85.5 g CO₂e⁵	100%

- 2007 to 2018: The fossil carbon impact per paper sack has been reduced by 28% – from 118 g CO₂e to 85.5 g CO₂e. The figure below shows the continuous downward trend since 2007:



⁵ Numbers may not add up correctly due to rounding issues

Main causes for the improvements

The improvement of the fossil impact per tonne of sack kraft paper from 2007–2021 are mainly due to fewer emissions from:

- net purchased grid electricity, which have reduced by 44% (due to a combination of lower consumption by the mills, decarbonisation of national grid electricity, and specific CO₂-free electricity purchasing strategies by many of the mills)
- combustion of fuels consumed by the mills, which have reduced by 26% and the production of purchased fuels, which have reduced by 63% (due to reduced consumption and changes in the fuel mix consumed by the mills)

When it comes to the sack, besides the fewer emissions from the purchased paper, the improvement can be attributed to reductions in sack weight and in fossil fuel consumption (–14%).

Extending the system boundaries

As young trees grow, they absorb carbon dioxide (CO₂) from the atmosphere. When forests are managed sustainably, carbon stocks are growing or at least stable⁶. The carbon is stored in forest products such as paper sacks during their life cycle. Including the cradle-to-gate biogenic removals as well as emissions in the calculation, the carbon footprint would even come to a negative result. This reinforces the fact that paper sacks are a low carbon (potentially carbon negative) solution. Extending the boundaries of the analysis to include end-of-life (cradle-to-grave) would give a more complete picture. However, this methodology is problematic due to data accuracy and sensitivity. In general, it can be stated that paper sacks store carbon, and the recycling of paper and board products delays the stored CO₂ from returning to the atmosphere. Therefore, the recycling of paper sacks at end-of-life should be encouraged and pursued.

ENERGY CONSUMPTION

The production of sack kraft paper is very energy-efficient and uses a high degree of renewable energy sources:

- External fossil fuel consumption has been reduced by 9% from 2015⁷ to 2021.
- Biofuels account for 92% of all fuels consumed on-site, the majority (78%) of which comes from internally produced biofuels.
- The mills produce 59% of their own electricity requirements.
- 29% of the purchased grid electricity consumed by the mills in 2021 was identified as “green” electricity⁸.

⁶ According to the European GHG inventory, forests of the EU-28 are a net carbon sink, with net CO₂ removals by forests having increased by over 19% between 1990 and 2014.

⁷ For 2018–2021, there is a much larger reduction due to changes in the fuel mix used. But this number might be misleading because there was an increase before between 2015 and 2018. Therefore, we used the more realistic figure from 2015.

⁸ Defined as low carbon electricity, i.e. generated by wind, solar, hydro, nuclear, etc. and supported by specific product certification.



Performance powered by nature.

CEPI Eurokraft is the European Association for Producers of Sack Kraft Paper for the Paper Sack Industry and Kraft Paper for the Packaging Industry. It has ten member companies representing a volume of 3.0 million tonnes of paper produced in eleven countries. www.cepi-eurokraft.org

EUROSAC is the European Federation of Multiwall Paper Sack Manufacturers. The federation represents over 80 % of European paper sack manufacturers. Its members operate in 20 different countries. They produce more than 5 billion paper sacks per year, representing 630,000 tonnes of paper converted in 55 plants. Sack manufacturers from all continents and bag manufacturers also contribute to the federation as corresponding members, and more than 30 suppliers (paper, film, machine or glue manufacturers) are registered as associate members. www.eurosac.org

