



LETTER OF CONFORMANCE OF

GREENHOUSE GASES EMISSIONS

for

Global Paper Pallet Zrt.

Fillér str. 75/C/11, Budapest, 1022 Hungary

regarding to the subject of the analysis and within the system boundaries below:

- product: **Paper Pallet**
- system boundaries: **Cradle-to-Gate**
- supplementary requirements: **N/A**

Hereby, the University of Sopron verifies that, in the case of the above-mentioned product, the amount of life cycle greenhouse gas emissions is in accordance with the requirements of the standard

ISO 14067:2018

Greenhouse gases. Carbon footprint of products. Requirements and guidelines for quantification, expressed in kilograms of CO₂ equivalent [kg CO₂ eq], are as follows:

- **Product Carbon Footprint (GWP100 based on IPCC AR5, incl biogenic carbon): -4.0769 [kg CO₂ eq.]**
- **Functional unit: 1 piece of one-way paper pallet made of corrugated board (weight: 5.34 kg)**
- **Reference period: 01/01/2022-31/12/2022**
- **Level of Assurance: Reasonable**
- **Validity: 1 year (if there is no change in the life cycle greenhouse gas emissions of the assessed product)**
- **Verification registration number: 001/CFP/SOE/2023**

The above calculation took into account the impact assessment model prescribed by the ISO 14040:2006 and 14044:2006 standards, which enables the evaluation of life cycle greenhouse gas emissions and absorptions across the examined life cycle of the product.

This letter of conformance is not an accredited certificate, it reflects the expert opinion of the University of Sopron. The contents of the declaration were issued by the University of Sopron at the request of the **Global Paper Pallet Zrt.** company (hereinafter: Organization), acting as the Organization's agent, based on the complete and accurate information and data provided by the Organization. The University of Sopron disclaims all liability (e.g. financial, moral, compensation, etc.) for the activities of the Organization resulting from the use of this letter of conformance. Any queries regarding this letter of conformance should be addressed to the above Organization. This document is valid only together with the further findings available on page 2.

Date: 15/03/2023; Expiry date: 14/03/2024

For and on behalf of the University of Sopron:



Prof. dr. Attila Fábíán
Rector



Verification registration number: 001/CFP/SOE/2023

LETTER OF CONFORMANCE OF GREENHOUSE GASES EMISSIONS

continued for

Global Paper Pallet Zrt.

Fillér str. 75/C/11, Budapest, 1022 Hungary

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Functional unit: 1 piece of one-way paper pallet made of corrugated board (weight: 5.34 kg)

Further information regarding CFP Study

System boundaries: Cradle-to-Gate

The CFP report involves the life cycle stages of materials manufacture, transportation and product manufacture.

Primary (site specific) data reference period:

01/01/2022-31/12/2022. Processes under financial or operational control of the Organization.

Secondary data reference period:

Based on the databases of the GaBi Professional (Sphera/GaBi Thinkstep) software: the period between 2015 and 2022 was considered.

Life Cycle Assessment (LCA) tool:

The analysis was completed using the GaBi Professional (Sphera/GaBi Thinkstep) software.

Criteria:

The IPCC (2014) AR5 emission factors were applied in the CFP report for GWP100.

Location of product manufacture:

Gencsapáti, Vas County, Hungary

Date: 15/03/2023; Expiry date: 14/03/2024

This document is valid only together with the further findings available on page 1.



CARBON FOOTPRINT OF PAPER PALLET

PRODUCT LIFE CYCLE GREENHOUSE GASES EMISSIONS

EXECUTIVE SUMMARY



(<https://www.attapallet.com/en/home/>)

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Sopron, 15/03/2023

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CARBON FOOTPRINT OF PAPER PALLET

PRODUCT LIFE CYCLE GREENHOUSE GASES EMISSIONS

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Date: 15/03/2023; Expiry date: 14/03/2024.

On the following pages you can read the product carbon footprint calculation through Life Cycle Assessment of paper pallet by the University of Sopron. The investigation was limited to gate-to-gate and cradle-to-gate approach considering different scenarios.

Hungary, Sopron, 15th March 2023

ABBREVIATIONS

CB – Corrugated Board, corrugated paperboard

CFP – Carbon Footprint of Product

GHG – Greenhouse gas

GWP – Global Warming Potential

HU – Hungary

IT – Italy

IPCC – Intergovernmental Panel on Climate Change

LCA – Life Cycle Assessment

PP – Polypropylene

EXECUTIVE SUMMARY

Pallets have a significant role in the transportation, storage and distribution of products worldwide which are used by almost every industry.

The goal of the study was to examine the carbon footprint of the production of paper pallet using Life Cycle Assessment (LCA) methods, considering different system boundaries and scenarios.

Carbon footprints indicate air pollution and climate change based on total greenhouse gas (GHG) emissions expressed in terms of carbon dioxide equivalent.

The methodology applied for completing product carbon footprint calculation LCA corresponds to the requirements of ISO 14040:2006 and ISO 14044: 2006 standards. The analysis was completed using the GaBi Professional (Sphera/GaBi Thinkstep) software.

This study takes a look at non-returnable or one-way paper pallet. We accepted the paper pallet size of 800×1200×148 mm (see **Hiba! A hivatkozási forrás nem található.**).

Table 1. Main properties of the examined paper pallet

	Paper pallet
main component	Corrugated board
dimensions	800 mm × 1200 mm × 148 mm
weight	5340 g

The following functional unit is adopted for this assessment: 1 piece of one-way paper pallet made of corrugated board (5.34 kg/pallet).

In the case of paper pallet production scenarios (cradle-to gate and gate-to-gate), the decisive technological steps were the materials manufacture and the product manufacture of the paper pallet. Our studies did not include a detailed analysis of the usage phase and end of life (EoL) scenarios.

Different paper pallet production scenarios were investigated in the following system boundaries:

- System boundary No. 1: Gate-to-gate: paper pallet product manufacture phase (Hungarian (HU) and Italian (IT) case)
- System boundary No. 2: Cradle-to-gate (without any transportation): corrugated board and PP strap manufacture phase + paper pallet product manufacture phase (HU and IT case)
- System boundary No. 3: Cradle-to-gate (with road transportation; Truck-trailer, Euro 6, 34 - 40t gross weight / 27t payload capacity): corrugated board and PP strap manufacture phase + road transportation + paper pallet product manufacture phase (HU and IT case). Transportation phases with different road transport distances were considered such as: a) 50 km; b) 100 km; c) 150 km; d) 200 km; and e) maximum carbon neutral (theoretical) road transportation distance (km).

Adapted to the functional unit (1 piece of paper pallet), corrugated board material production was significant among the primary inventory data. We also took production auxiliary materials (hot melt glue, dispersion adhesive, etc.) and energy requirements (electricity, diesel) into account.

In the case of the paper pallet inputs, we also considered the reuse of waste paper and polypropylene strap. During the life cycle analysis, we also used the plug-in databases of the GaBi software to manage background effects.

In the case of the paper pallet product, we provide the carbon footprints of the different system boundaries and scenarios (considering different modules) regarding different carbon footprint calculation methodologies (CML 2001, PEF, IPCC AR5, ISO 14067). No significant difference was visible in the carbon footprint values, thanks to the consistent nature of the analysis performed with the GaBi LCA software.

Within the individual methodologies (except PEF), the carbon footprint values expressed with and without CO₂ emissions of biogenic origin can be seen.

To visualize the carbon footprint, Figure 1 shows the relevant values by ISO 14067 (results based on IPCC AR5) considering different scenarios (No. 1-3) of paper pallet.

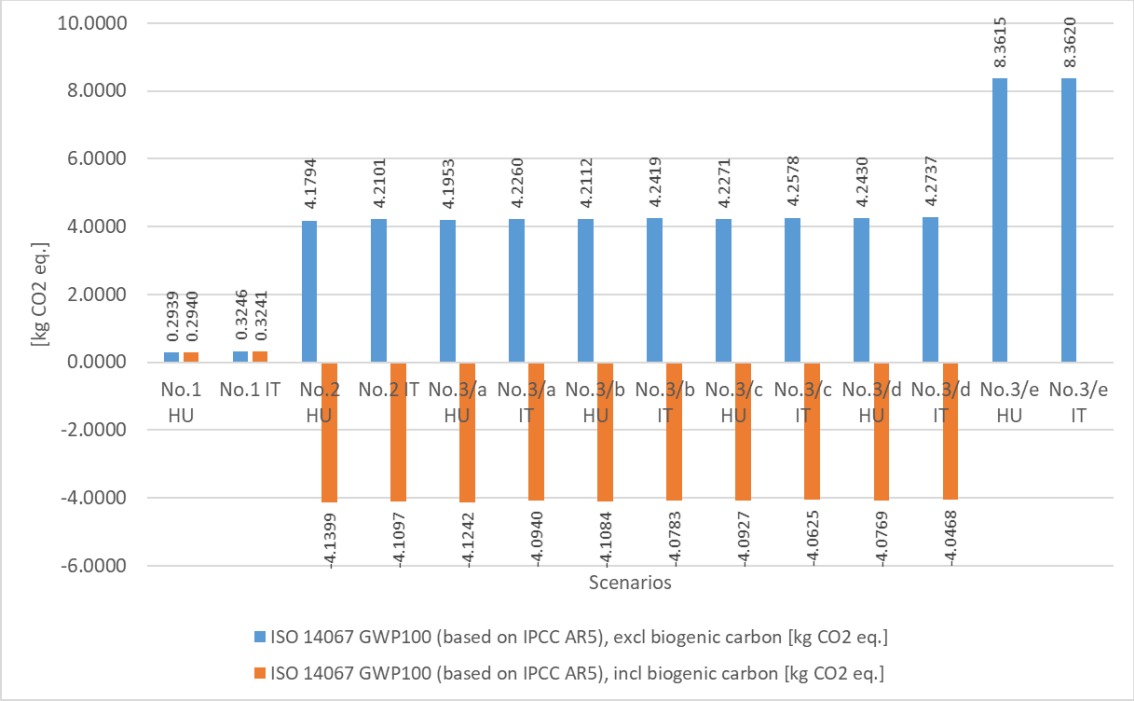


Figure 1. Carbon Footprint by ISO 14067 GWP100 (based on IPCC AR5) methodology of paper pallet scenarios (No. 1-3)

Within the examined system boundaries and scenarios, the product carbon footprints of paper pallet based on the ISO 14067 method (results based on IPCC AR5) - as the most recent internationally recognized standard available today - are the following (Table 2).

Table 2. Carbon footprint by ISO 14067 (based on IPCC AR5) for paper pallet production scenarios (No. 1-3)

Scenarios	No.1 HU	No.1 IT	No.2 HU	No.2 IT	No.3/a HU	No.3/a IT	No.3/b HU	No.3/b IT	No.3/c HU	No.3/c IT	No.3/d HU	No.3/d IT	No.3/e HU	No.3/e IT
ISO 14067 GWP100 (based on IPCC AR5), excl biogenic carbon [kg CO2 eq.]	0.2939	0.3246	4.1794	4.2101	4.1953	4.2260	4.2112	4.2419	4.2271	4.2578	4.2430	4.2737	8.3615	8.3620
ISO 14067 GWP100 (based on IPCC AR5), incl biogenic carbon [kg CO2 eq.]	0.2940	0.3241	-4.1399	-4.1097	-4.1242	-4.0940	-4.1084	-4.0783	-4.0927	-4.0625	-4.0769	-4.0468	-0.0002	0.0000

In the life cycle stage of material manufacture, namely in the corrugated board manufacture module the basic input material is recycled waste paper. This fact explains that carbon storage is realized in the product through corrugated paper, which is indicated by the negative carbon footprint.

Based on our calculations we can state that the approximate **gross carbon storage of paper pallet:**

- in the case of Scenario No. 2 HU is **-8.3193** kg CO₂ eq.
- in the case of Scenario No. 2 IT is **-8.3198** kg CO₂ eq.

Based on our calculations we can state that the approximate **net carbon storage of paper pallet based on ISO 14067 GWP100 (based on IPCC AR5), incl biogenic carbon [kg CO₂ eq.] carbon footprint value:**

- in the case of Scenario No. 2 HU is **-4.1399** kg CO₂ eq.
- in the case of Scenario No. 2 IT is **-4.1097** kg CO₂ eq.

Scenario No. 3 takes into account the carbon footprints of road transportation alternatives based on distances (km). Between the studied system boundaries and with the considered truck trailer (Truck-trailer, Euro 6, 34 - 40t gross weight / 27t payload capacity), considering functional unit (1 piece of paper pallet), theoretically maximum carbon neutral road transportation distance (km) can be calculated. We can state that in the cradle-to-gate approach theoretically approx. 13,000 km road transportation distance would be the limit for carbon neutral transport.

The research outcomes are only comparable with other LCA or carbon footprint calculation studies involving the same functional unit and system boundaries. A better understanding of environmental impacts and product carbon footprint can be obtained by the extension of system boundaries and inventories, and the involvement of further primary and secondary processes.

Main findings:

- Scenario No.3/d HU shows the practical and most appropriate carbon footprint of paper pallet product
- System boundaries: Cradle-to-Gate
- Supplementary requirements: N/A
- Product Carbon Footprint (GWP100 based on IPCC AR5, incl biogenic carbon): -4.0769 [kg CO₂ eq.]
- Functional unit: 1 piece of one-way paper pallet made of corrugated board (weight: 5.34 kg)

--- End of Executive Summary ---