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LCA Packaging of Paper Tissues WEPA Professional

Environmental Comparison of Paperboard Container and Film Pouch Packaging for Paper Tissues

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Legal Notice

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Summary

WEPA has recently begun offering “Away from Home” customers the option to purchase paper tissues in a pouch packaging. In addition to a number of other advantages, 25% more sheets can be provided per packaging unit compared to similar volumes of paperboard container packaging, which remain available. Against the backdrop of the current political efforts to reduce consumption of plastic carrier bags, critical questions are expected from customers regarding this new plastic packaging. For this reason, a life cycle assessment (LCA) should be used to compare the environmental impacts of the two packaging methods (paperboard container and plastic) with respect to their specific application here for WEPA Professional paper tissues.

Packaging with a volume of 1,000 paper tissues has been selected to serve as the functional unit for this study.

Manufacture, transport and disposal of packaging as well as the greater transport requirements for paperboard container packaging will be considered to determine the environmental footprint of these two packaging methods. The ecological scarcity method (2013 V1.02) (Frischknecht & Büsser Knöpfel, 2013) will be used to summarise the environmental impacts into one indicator (environmental footprint).

This LCA will reveal that the new plastic packaging used for WEPA Professional paper tissues is environmentally favourable: the environmental footprint is roughly half that of paperboard container packaging. The primary reason for this difference is that the same level of packaging output can be achieved with much less material input.

1 Starting Position and Objective

1.1 Introduction

WEPA has recently begun offering "Away from Home" customers the option to purchase paper tissues in a pouch packaging. In addition to a number of other advantages, 25% more sheets can be provided per packaging unit compared to similar volumes of paperboard container packaging, which remain available. Against the backdrop of the current political efforts to reduce consumption of plastic carrier bags, critical questions are expected from customers regarding this new plastic packaging. For this reason, a life cycle assessment (LCA) should be used to compare the environmental impacts of the two packaging methods (paperboard container and plastic) with respect to their specific application here for WEPA Professional paper tissues.

Based on its many years of experience in environmental consulting and product life cycle assessments, Carbotech AG has been instructed to compare the environmental impacts of these two packaging methods using the life cycle assessment method.

1.2 Objective

This study will calculate and compare the environmental footprints of the packaging methods used for WEPA paper tissues, one made of recovered paper cardboard and the other of PE film.

2 Method

An LCA is the most comprehensive and informative method for assessing the environmental impact of products and systems. For this reason, this method was used to determine the environmental impact of the plaster in question.

This chapter describes the method used, the procedure, the data employed, and any underlying assumptions.

2.1 General Description of Life Cycle Assessing

The LCA (Life Cycle Assessment) is a method for calculating and assessing the impacts of human activities on the environment, from which optimizing potential can be derived. Due to the complexity of nature and the global economic system, it is not sufficient to consider only individual problematic substances or local effects. Due to the demand for a comprehensive assessment, the methodology must meet the following requirements:

- account as broadly as possible for the different types of environment impacts
- cover the entire life cycle
- quantification of the environmental impacts
- assessment of the various impacts as a basis for decision-making

- gain scientific supporting evidence for greater reliability and acceptance.

The LCA is the method which today best fulfils these requirements. The results of the LCA can be used:

- as decision-making support for various alternatives
- to determine the relevant impacts
- in strategic planning for the calculation of optimizing potential
- for the calculation of major influencing factors
- in the evaluation of measures
- to derive recommendations for action.

This study uses the life cycle assessment method to perform an environmental comparative analysis.

2.2 LCA Procedures

After the questions and system to be investigated have been defined, the goods, materials and energy flows, as well as the resource demands, are determined. Finally, the impacts on the environment are determined by means of chosen indicators, which describe these impacts. With the aim of reducing the results to a single figure, and thereby make the interpretation possible, or at least easier, the assessment of the various environmental impacts can be weighted accordingly.

As described in ISO 14040 and ISO 14044 (ISO 14040, 2006; ISO 14044, 2006) an LCA involves the following steps:

- Definition of goal, scope and system boundaries (framework conditions)
- Determination of the relevant material and energy flows, as wells as resource demands (life cycle inventory)
- Calculation of the environmental impacts (impact assessment)
- Interpretation of the environmental impacts on the basis of the specified goal (impact analysis)
- Preparation of recommendations for measures (optimization)

As Figure 1 shows, this is not a linear process, rather an interactive fact-finding and optimization process.

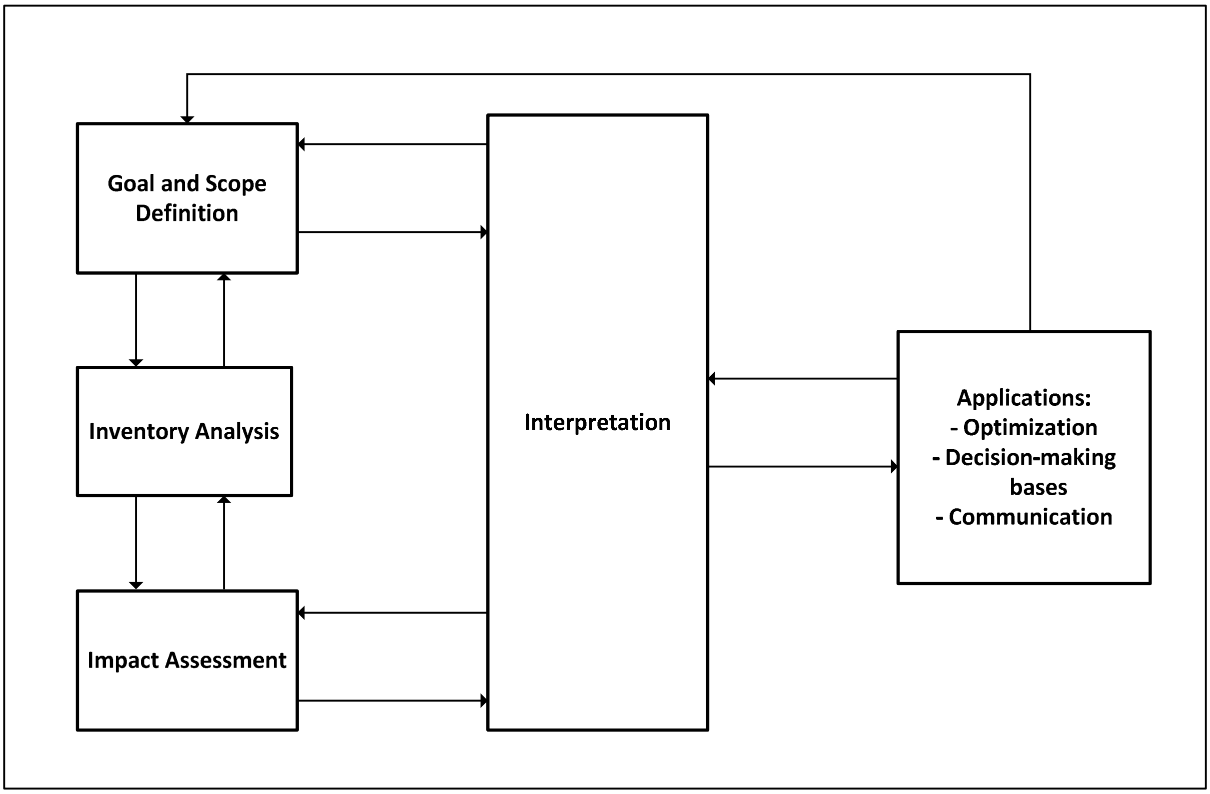

Figure 1: Steps of an LCA in accordance ISO 14040/44

This study is based primarily on the ISO 14040 standard. The procedure corresponds in the main points to its specifications, but in certain points, such as the use of total aggregate methods, this study goes beyond the standard's prescriptions.

2.3 Goal and Scope

The definition of the systems to be studied and compared is based on the objective and the question formulated. These result in different framework conditions and system boundaries. The system boundaries specify which processes and upstream processes are to be taken into account. In doing so, the temporal parameters of the data used are defined, as are the environmental impacts to be studied.

2.3.1 Goal

As described in Section 1, this study will pursue the objective of comparing the overall environmental impacts of film and paperboard container packaging for paper tissues using the life cycle assessment method.

2.3.2 Functional Unit

If a product or service were to be compared to alternatives, these would have to provide the same benefits or fulfil the same function. The quantity this comparison takes into account is indicated as a functional unit.

Packaging with a volume of 1,000 paper tissues has been selected to serve as the functional unit for this study.

2.3.3 System Boundaries

The LCA considers the potential environmental impacts of a product over its entire life cycle ("from the cradle to the grave"). Its scope encompasses from the extraction of raw materials, through processing to packaged goods, packaging, transport, use and onwards to disposal. For all of these phases, all of the environmentally related processes are determined and evaluated as far as possible. Depending on the questions being posed, it may be sensible to simplify the system, for example by not comparing identical parts as part of a comparative analysis.

The life cycle system boundary for this LCA covers all related emissions and resource consumption during production, use and disposal of the packaging.

These cover the following parameters (see also Figure 2):

- raw materials, manufacture and disposal of packaging
- transport of empty packaging from the manufacturing site to WEPA
- differences in transport with respect to capacity when delivering paper tissues
- fuel provisions, such as crude oil, natural gas, coal or electricity, etc. for the processes involved
- The impacts in terms of soil, air and water emissions and the resource requirements, including energy resources and land use, are taken into account for all these processes.

All those life cycle components not directly attributable to packaging or those where there is no significant difference between the two packaging methods are not taken into account. The following aspects have therefore not been included in this study:

- packaging content (paper tissues)
- pre-packaging of paper tissues
- printing/labelling of packaging
- distribution and utilisation phase of paper tissues

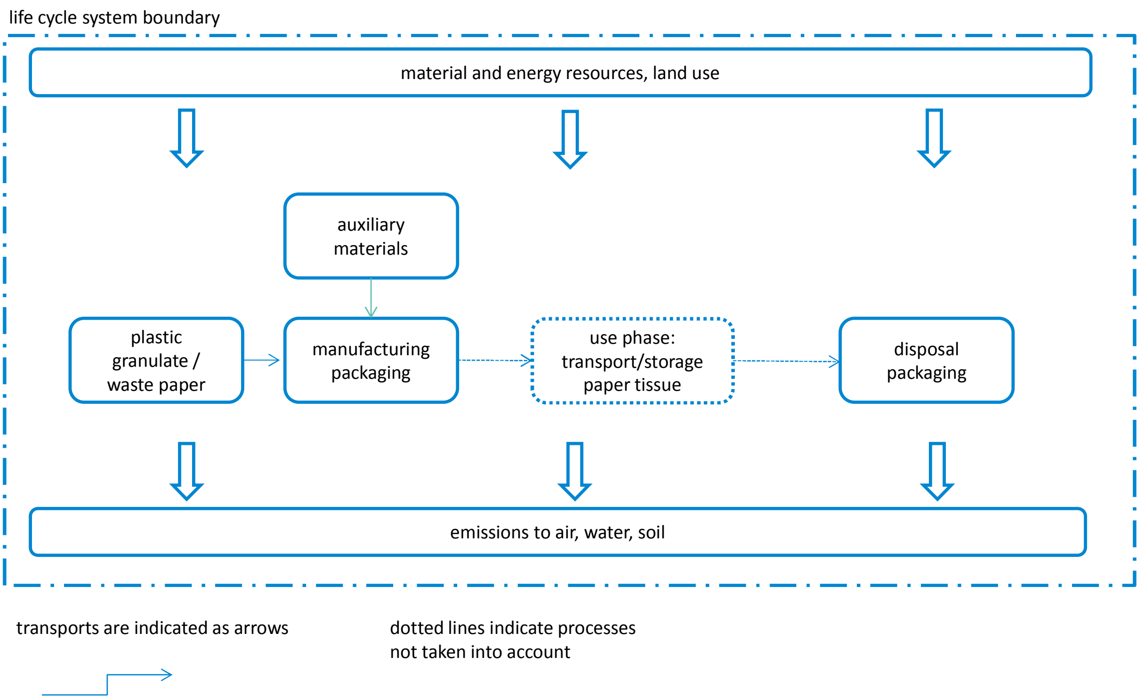

Figure 2: Schematic representation of the processes taken into account

Temporal System Boundaries

The system indicator data refers to WEPA comfort 25 x 23 cm 2-layer V-fold paper tissues. The ecoinvent V3.1 life cycle inventory database (ecoinvent, 2015) was used for all background data and life cycle inventories.

2.4 Inventory Analysis

2.4.1 Product System Modelling

A model for the system to be compared was formulated in the inventory analysis and the energy and material flows for the associated processes were recorded. These include:

- how a process relates to other processes in the technosphere, e.g., quantity of raw materials required, auxiliary materials, energy demand, transport and utilisation and disposal systems.
- how a process relates to its natural environment in the ecosphere, e.g., demand for resources (fossil fuels, land resources, etc.) and emissions, such as CO_2, VOC, methane, nitrogen oxide, etc.

The life cycle inventory was calculated using the LCA Software SimaPro V8.2 (PRé Consultants, 2016) and used in the Impact Assessment. Data on packaging material requirements, transport distance and transport capacity were provided by WEPA Professional GmbH (the data bases is listed in detail in Section 3).

2.4.2 Assumptions and Calculation Bases

The calculations were based on the following assumptions:

- The pre-packaging of paper tissues in film pouches and paperboard containers and the labelling of this packaging are comparable with respect to resource consumption and environmental impact. On this basis, they have no bearing on this comparison and were not taken into account.
- The plastic packaging is disposed of at a waste incineration plant.

2.5 Impact Assessment

In this stage, the Life Cycle Inventory was analysed for environmental impacts. This impact analysis was conducted as follows:

- Classification (sub-division according to impact): the materials were grouped according to their various impacts on the environment.
- Characterisation (environmental impact calculation): the individual substances were weighted in accordance with their potential to do harm compared to a reference substance. From this was derived a damage potential for a specific environmental impact.

2.6 Interpretation of Environmental Impacts

The impact assessment results concern the collation of different indicators, each of which describes one aspect of the environmental impacts. In order to obtain a well-founded decision-making basis, the different impacts can be weighted, and summed to a single figure. Quantifying various environmental impacts is a process that incorporates value systems and has therefore been supported as broadly as possible for greater acceptance.

This study utilises the ecological scarcity method 2013 (Frischknecht & Büsser Knöpfel, 2013). This method is based on pollutant flows and takes into account the current pollution loads as well as environmental policy objectives relating to each pollutant (cf. Figure 3) and is therefore broadly supported with respect to values.
The results are expressed in eco-points (EP).

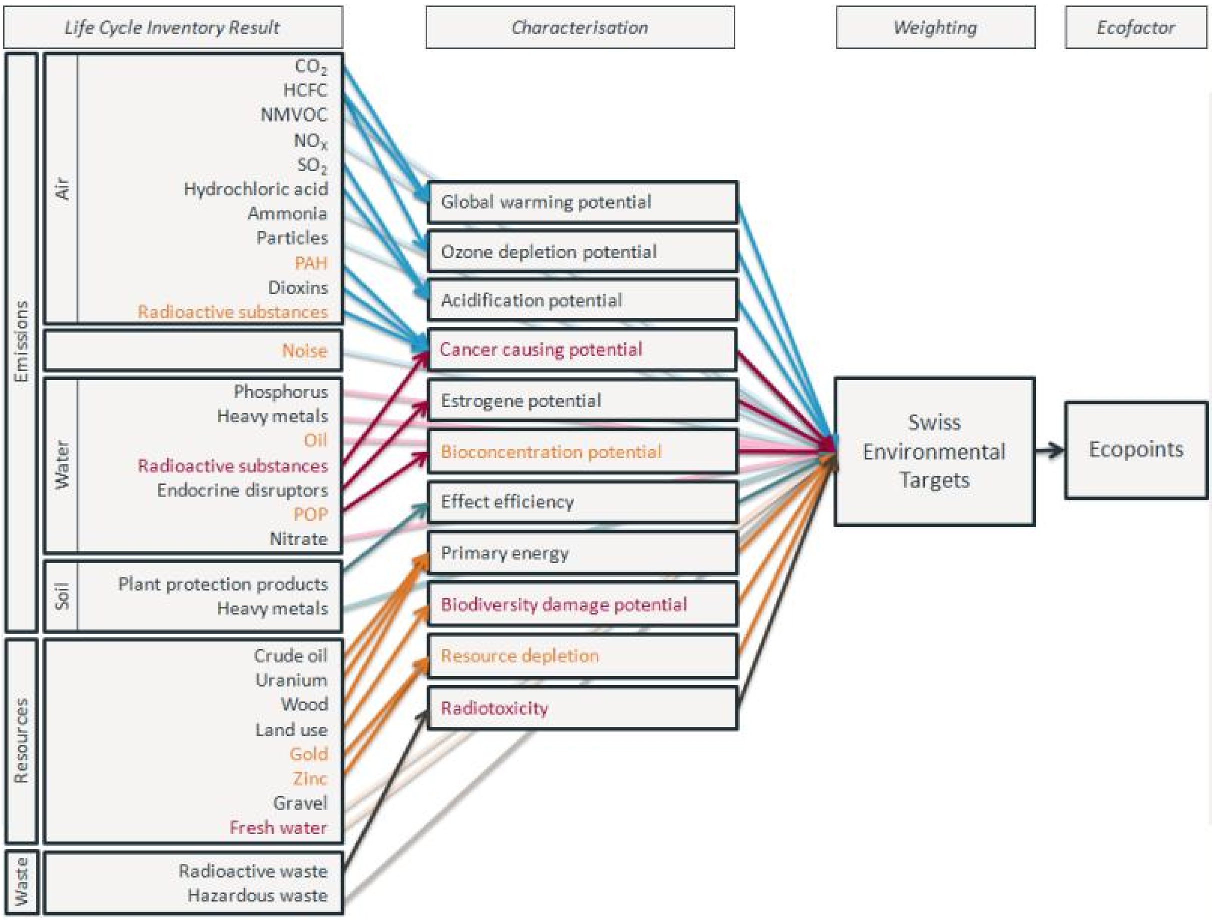

Figure 3: Basic formula for the ecological scarcity method (diagram from Frischknecht & Büsser Knöpfel, 2013)

3 Data basis

The data in Table 1 have been provided by WEPA Professional GmbH. The authors of this study have tested these data for plausibility and used them in calculating the life cycle assessment.

Table 1: Input data

	Paperboard container	**Film pouch**
Material	Recovered paper (corrugated cardboard)	PE film
Weight (per packaging/per 1,000 sheets)	574 g/179 g	94.4 g/23.6 g
Transport of empty packaging	16 km	637 km
Sheet volume per packaging	3,200	4,000
Delivery transport (average January-April 2016)	290 km	290 km
Packaging number per pallet for delivery	32	32
Pallets per lorry for delivery (average January-April 2016)	6.13	6.13

Compared to paperboard container packaging, the film pouch could be packaged with 25% more paper tissues at a somewhat smaller volume.

The data basis for the upstream and downstream processes was based on standard data from ecoinvent V3.1 (ecoinvent, 2015).

4 Results and Discussion

Compared to paperboard container packaging, the film pouch had roughly half the environmental footprint per 1,000 paper tissues (see Figure 4) and is therefore favourable environmentally. The primary reason for this difference is that the same level of packaging output can be achieved with much less material. As such, some 179 g of paperboard is required to package 1,000 sheets of paper tissue compared to just 23.6 g of plastic film needed to package the same amount. This means that nearly eight times as much paperboard container packaging is required to package the same quantity of paper tissues compared to plastic film packaging.

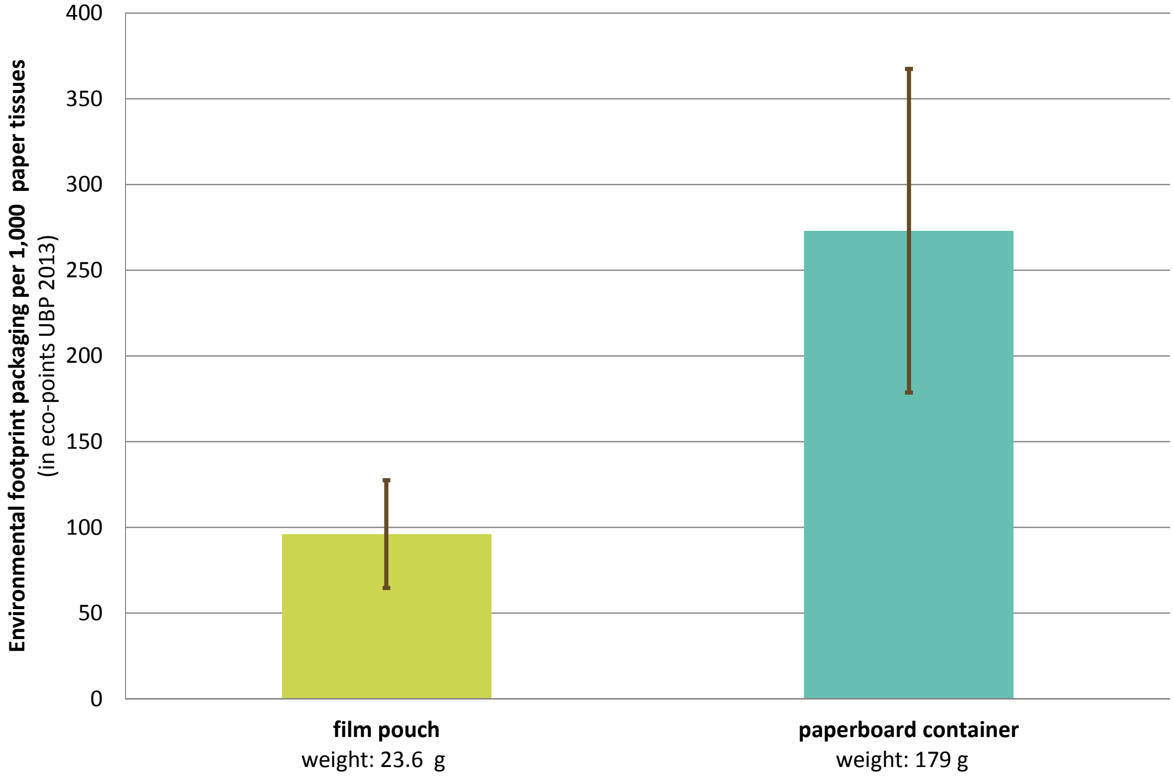

Figure 4: Environmental footprint for the packaging of 1,000 paper tissues in film pouches compared to paperboard containers (delivery distance 290 km)
The lines on the bars represent the uncertainty of the results. The portion of the uncertainty line that does not overlap with the bar indicates the significant variance in the environmental footprint.

For both packaging methods, the greatest contribution to the environmental footprint came from material production as well as both the upstream and downstream processes (Figure 5).

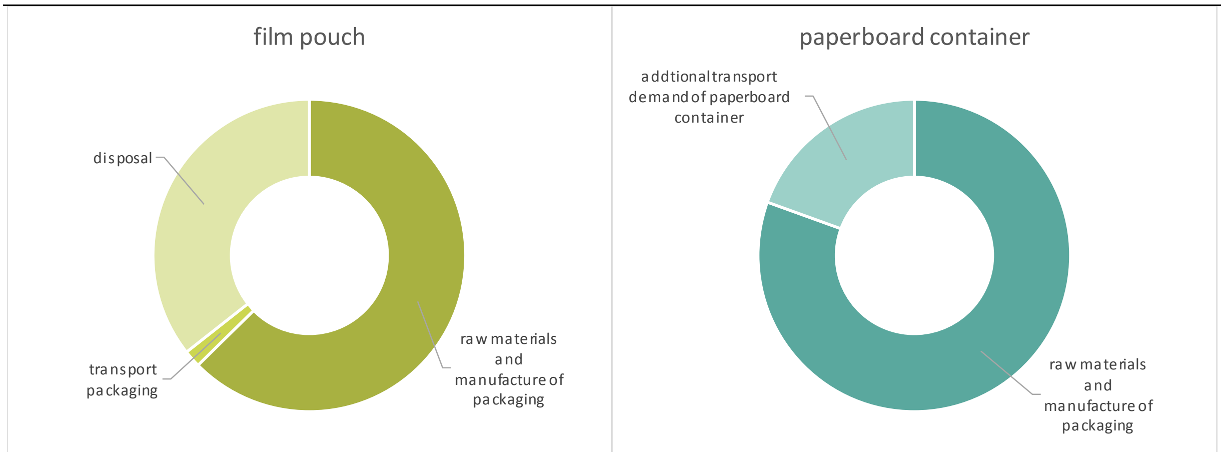

Figure 5: How different processes contribute to the environmental footprints of film pouch and paperboard container packaging (delivery distance 290 km)

Disposal of materials for film pouches contributed around one-third of the environmental impact (primarily CO_2 emissions when incinerating plastic). When calculating the environmental footprint of the paperboard container packaging, the additional transport requirements were taken into account. These are due to the fact that the paper tissues in paperboard container packaging are less able to be compressed (fewer paper tissues per lorry during delivery corresponds to greater demand for transport services per sheet of paper tissue). The proportion additional transport contributed to the environmental footprint was 19% and is based on an average delivery distance of 290 km. For longer or shorter delivery distances, the environmental footprint of paperboard containers was greater or smaller accordingly. The proportion transport of empty packaging contributed to the environmental footprint was negligible for both packaging methods.

5 Literature

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