Carbon footprint report of Delipap's hygiene products

based on ISO 14067:2018

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Delipap

Contents:

1. Delipap Oy

Delipap is a Finnish family business that develops, manufactures, markets, and sells hygiene products for the whole family. Delipap is the only manufacturer of disposable feminine hygiene products and children's nappies in Finland. Delipap considers environmental responsibility throughout the lifecycle of its products, from the selection of raw materials to their disposal. Delipap's products have been granted the Nordic Swan Ecolabel.

Delipap wants to be aware of the lifecycle greenhouse gas emissions of its products. Delipap, together with Clonet Oy, has previously studied the carbon footprint of Moomin Baby diaper products, five Wolva products, and five Vuokkoset BIO products. During the spring of 2022, the carbon footprints of other Delipap pad products were studied.

2 Determining the carbon footprints

The carbon footprint describes the climate impact caused by a specific identifiable entity - in this case, individual Delipap hygiene products. The climate impact is caused by the release of greenhouse gases such as carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) into the atmosphere. The carbon footprint is expressed in terms of carbon dioxide equivalents, taking into consideration the different global warming potentials of different greenhouse gases. In determining the carbon footprint, all direct and indirect emissions during a lifecycle related to a given entity are taken into account. In the case of a product, the carbon footprint is determined per selected functional unit.

The carbon footprint is expressed as the mass of emissions in grams (g) for hygiene products.

Determination of the carbon footprint of Delipap's hygiene products is based on the ISO 14067: 2018 carbon footprint of products standard, which has been adopted as a Finnish national standard. The standard defines the principles, requirements, and guidelines for quantification and reporting the Carbon Footprint of Products (CFP). The standard is based on the lifecycle assessment standards ISO 14040 and 14044 but addresses only one impact category: climate change. The standard does not take a stand on carbon footprint communication or emissions off-setting.

A systematic approach has been used to determine the carbon footprint of Delipap's products in accordance with Annex C of ISO 14067: 2018. Thus, the same method and constraints, allocation procedures, and initial assumptions described in this report were used to determine the carbon footprint of all different sized pads and pantyliners, including assumptions regarding product use and end-of-life phases.

The systematic approach is based on applying the latest version of the Product Category Rule (PCR) for Absorbent Hygiene Products *(EPD, 2022)*.

The calculation was carried out with a product-specific carbon footprint calculator tailored to Delipap's use, built on the OpenCO2.net platform developed by Clonet Oy.

3. Defining the goals and scope of the calculation

Goal and scope of the calculation

The goal of the calculation was to determine the total carbon footprint of 24 hygiene products manufactured by Delipap. The calculation results can be utilized in product development, for example, in material selection and the planning of supply channels. Product-specific carbon footprint data also serve as a basis for planning Delipap's emissions reduction measures and possible emissions off-setting.

Table 1. Hygiene products included in the carbon footprint calculation

PRODUCT NAME AND PACKAGE SIZE	PRODUCT CODE	PRODUCT WEIGHT (g/pcs)*)
Vuokkoset 28 Ultra Light Normal, pantyliner	70019	2.4
Vuokkoset 42 Soft Normal, pantyliner	70027	3.4
Vuokkoset 2x42 Duo Soft Normal, pantyliner	70039	3.6
Vuokkoset 26 Cotton Normal, pantyliner	70042	4.3
Vuokkoset 30 Normal, pantyliner	70043	4.1
Vuokkoset 24 Long, pantyliner	70077	4.5
Vuokkoset 30 Classic Normal, pad	84260	6.8
Vuokkoset 9 Cotton Night Wings, pad	89525	9.9
Vuokkoset 14 Cotton Normal, pad	89570	6.0
Vuokkoset 12 Cotton Normal Wings, pad	89575	6.3
Vuokkoset 14 Normal, pad	89605	5.6
Vuokkoset 12 Normal Wings, pad	89610	6.1
Vuokkoset 10 Long Wings, pad	89615	8.6
Vuokkoset 9 Night Wings, pad	89620	9.7
Vuokkoset 2x14 Duo Normal, pad	89635	5.5
Vuokkoset 2x12, Duo Normal Wings, pad	89640	6.0
Vuokkoset Organic Tampon Mini, 16 pcs, tampon	88915	3.1
Vuokkoset Organic Tampon Normal, 16 pcs, tampon	88925	3.8
Vuokkoset Organic Tampon Super, 16 pcs, tampon	88935	4.6
Vuokkoset 26 Bio Soft Normal, pantyliner	70095	2.5

Vuokkoset 24 Bio Ultra Light Normal, pantyliner	70153	1.6
Vuokkoset Bio 12 Normal Wings	89580	5.9
Vuokkoset Bio 10 Long Wings	89585	7.4
Vuokkoset Bio 9 Night Wings	89600	8.3

*) The product weight shown here is the total weight at the point of sale, including packaging materials.

Functional unit

The functional unit is one hygiene product in this calculation, and all calculation results are shown for one product.

System boundary

The calculation includes all lifecycle stages, from the cradle to the grave. However, in the case of disposable products, the use phase is not an essential step, as the use phase is short, and the products are disposed of immediately after use. Therefore, the use phase is excluded from the calculation. *(EPD, 2022)*

The lifecycle stages included in the calculation are divided into the following three categories as follows:

- Upstream processes before production (cradle-to-gate)
  - extraction and refinement of natural resources
  - production of packaging materials (excluding pallets)
  - upstream processes of energy production
  - production of raw materials
- Core processes (gate-to-gate)
  - transportation of raw materials used in production
  - manufacturing of products
  - production of energy used for production
  - treatment of waste generated during production
- Downstream processes after production (gate-to-crave)
  - transportation of products to the average customer (retail or distribution point)
  - waste management of used products and packaging

In addition to the use phase, the following are excluded from the calculation:

- manufacturing of production equipment, buildings, and other capital goods
- business travel of personnel
- employee commuting
- research and development activities
- pallets

Transportation from wholesale to individual retailers and retailers to consumers was also excluded from the calculation, as no reliable data on transport modes and distances was available.

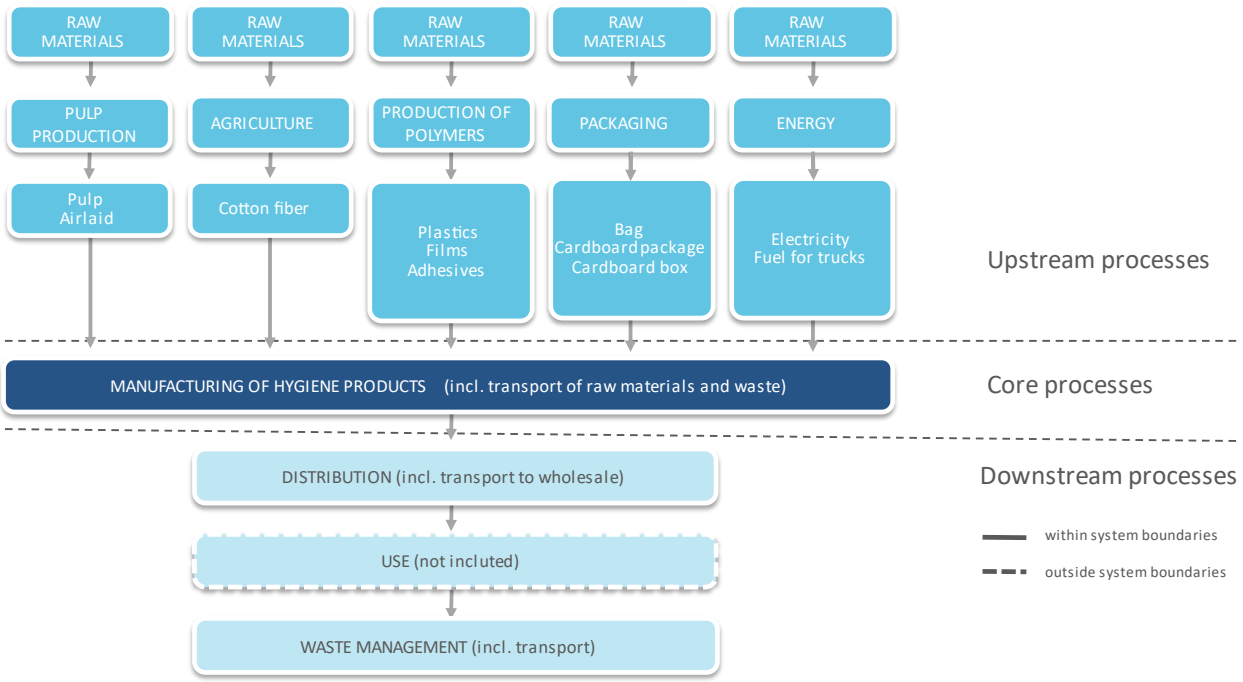

Figure 1. System boundary to be included in the calculation

In terms of core processes, the geographical scope applies to the Veikkola production plant, where Delipap's hygiene products are manufactured. The use and end-of-life of the products are limited to Finland, in which case the downstream processes cover the territory of Finland.

All raw materials used in the manufacture of the products were included in the calculation, as detailed product-specific input data for all products were provided. Coverage of the calculation in this respect is 100%.

Manufacturing waste is included in the calculation.

Data time boundary

The production data used in the calculation are from 2021. Estimated data were also used as input data.

Input data and input data quality requirements

Primary data must be used in the calculation when available. To the extent that primary data is unavailable, secondary data (selected Generic data/proxy data) may be used for upstream and downstream processes.

The following emission factor data considered representative in Finland were used in the calculation:

- emissions database of the OpenCO2.net platform
- Transportation: VTT, Lipasto database
- Waste management: Statistics Finland, Waste statistics

In addition, the EcoInvent v3.8 database was bused as a reference.

The instructions are to dispose of hygiene products with mixed waste, from where they are diverted to energy recovery or, to a lesser extent, landfills (landfilling of organic waste is

prohibited by the Government Decree on Landfills). According to Finnish waste statistics, in 2020 energy recovery accounted for more than 99% and landfilling for less than 1% of mixed waste *(Statistics Finland, 2021)*. In calculating these percentages, material recovery, aerobic and anaerobic digestion, and incineration without energy recovery (which together accounted for about 1% of the total amount of mixed waste) are excluded from the calculations.

The instructions are to sort the cardboard packaging of hygiene products for cardboard recycling. Almost 99% of paper and board waste is utilized as material *(Statistics Finland, 2021*).

The instructions are to sort the plastic packaging of hygiene products for plastic collection. More than 63% of separately collected plastic waste is utilized as material and about 38% for energy.

Assumptions, especially regarding the use and decommissioning of products

The use phase is excluded from the calculation, so there are no assumptions involved.

Waste treatment processes are assumed to follow the Finnish average waste treatment processes for mixed waste (hygiene products) and cardboard and plastic (packaging).

4. Inventory analysis (LCI)

Unit processes included in the calculation

The calculation includes all unit processes included in the system boundary.

Upstream processes:

- manufacture of packaging materials for hygiene products
- lifecycle impacts of energy production
- manufacture of raw materials for hygiene products

Core processes:

- transportation of raw materials from their suppliers to the Veikkola production plant
- energy consumption during the manufacture of products at the Veikkola production plant
- waste generated during the manufacture of hygiene products

Downstream processes:

- transport of hygiene products to the retailer
- disposal of hygiene products and packaging (incl. transportation)

Greenhouse gas emissions included in the calculation

In addition to carbon dioxide (CO_2) emissions, methane (CH_4) and nitrous oxide (N_2O) emissions from raw materials and transportation are included in the calculation to the extent that data on these emissions were available. Characterization coefficients over 100 years were used in the calculation.

Input data used in the calculation and their validation

The calculation was performed based on input data provided by Delipap. The emission factor data provided by the raw material suppliers were compared with the emission factors obtained from public emission databases to assess their reliability. In other respects, the previously mentioned sources considered reliable were used.

Impact of system boundary on emissions

The impact of non-calculated emission sources on the calculation results were assessed using sensitivity analyses.

Allocation procedures

As several different products are manufactured at the Veikkola production plant, allocation cannot be completely avoided. The allocation was made on a mass basis.

Specific greenhouse gas emissions and removals, e.g., due to LUC (land-use change)

Biogenic emissions from products are not included in the calculation because carbon is only stored in the products for a short time and is released into the atmosphere when the products are disposed of by incineration.

Emissions from the production of electricity by Delipap were calculated based on supplier-specific data. The origin of electricity used at the factory is guaranteed for hydropower.

Emissions related to land-use change and land use are not certain for all relevant raw materials.

Emissions from air travel and other business travel were not included in the calculation according to the PRC document *(EPD, 2022)*.

5. Impact assessment (LCIA)

Calculation results

The carbon footprint calculation was implemented with a product-specific carbon footprint calculator customized to Delipap's use built on the OpenCO2.net platform. The following table summarizes the calculation results.

Table 3. Summary of the carbon footprint of Delipap's hygiene products (gCO_2eq/pc, including emissions from fossil sources)

PRODUCT NAME	UP-STREAM	CORE PROCESSES	CRADLE-TO-GATE	DOWN-STREAM	IN TOTAL (g CO2eq/pc)
Vuokkoset 28 Ultra Light Normal, pantyliner	7.69	0.347	**8.04**	0.079	**8.12**
Vuokkoset 42 Soft Normal, pantyliner	4.51	0.134	**4.64**	0.096	**4.74**
Vuokkoset 2x42 Duo Soft Normal, pantyliner	4.98	0.140	**5.12**	0.101	**5.22**
Vuokkoset 26 Cotton Normal, pantyliner	6.42	0.387	**6.81**	0.131	**6.94**

Vuokkoset 30 Normal, pantyliner	5.16	0.325	**5.48**	0.124	**5.61**
Vuokkoset 24 Long, pantyliner	5.72	0.361	**6.08**	0.131	**6.21**
Vuokkoset 30 Classic Normal, pad	6.62	0.236	**6.85**	0.196	**7.05**
Vuokkoset 9 Cotton Night Wings, pad	17.3	1.45	**18.7**	0.269	**19.0**
Vuokkoset 14 Cotton Normal, pad	13.3	1.06	**14.4**	0.167	**14.5**
Vuokkoset 12 Cotton Wings Normal, pad	16.8	1.13	**17.9**	0.192	**18.1**
Vuokkoset 14 Normal, pad	8.96	0.830	**9.79**	0.161	**9.96**
Vuokkoset 12 Normal Wings, pad	11.3	0.925	**12.2**	0.184	**12.4**
Vuokkoset 10 Long Wings, pad	15.6	1.38	**17.0**	0.253	**17.3**
Vuokkoset 9 Night Wings, pad	17.1	1.49	**18.6**	0.283	**18.9**
Vuokkoset 2x14 Duo Normal, pad	8.94	0.836	**9.77**	0.159	**9.93**
Vuokkoset 2x12, Duo Normal Wings, pad	11.2	0.920	**12.1**	0.181	**12.3**
Vuokkoset Organic Tampon Mini, 16 pcs, tampon	3.10	4.610	**7.71**	0.079	**7.79**
Vuokkoset Organic Tampon Normal, 16 pcs, tampon	3.84	4.86	**8.70**	0.099	**8.79**
Vuokkoset Organic Tampon Super, 16 pcs, tampon	4.67	5.12	**9.78**	0.119	**9.90**
Vuokkoset 26 Bio Soft Normal, pantyliner	7.47	0.213	**7.69**	0.118	**7.80**

Vuokkoset 24 Bio Ultra Light Normal, pantyliner	10.3	0.436	**10.8**	0.084	**10.9**
Vuokkoset Bio 12 Normal Wings	19.2	1.25	**20.4**	0.213	**20.7**
Vuokkoset Bio 10 Long Wings	22.6	1.60	**24.2**	0.264	**24.4**
Vuokkoset Bio 9 Night Wings	27.6	1.74	**29.3**	0.297	**29.6**

Impact assessment of biogenic emissions

For pulp, the supplier obtained information on the amount of biogenic carbon dioxide stored in the raw material. The amount of carbon dioxide stored in some of the hygiene products was estimated at -2.5…-9.5 g/piece. For cotton and Airlaid, the biogenic carbon share is unknown and could not be estimated.

6. Interpretation of results

Major emission sources

The most significant source of emissions from the hygiene products considered here is the manufacture of their raw materials. The transportation of raw materials is also a substantial source of emissions.

Emissions from Delipap's own operations are low because the production of hygiene products uses electricity produced from renewable energy sources, and some of the waste generated during production is recycled. All remaining production waste is incinerated for energy.

Completeness, consistency, and sensitivity analysis of calculations

All significant emission sources were included in the calculation. Based on the sensitivity analyses performed, the calculation consists of 99% of the emissions generated during the lifecycle of the products.

Although reliable sources for emission factors were used in the calculation, there is uncertainty about the emission factor data for the secondary data. The reliability of the calculation can be further improved if more detailed emission factor data (primary data) are obtained from raw material suppliers in the future. When using secondary data, the emission factors were chosen according to the precautionary principle, so emissions are likely to have been overestimated in some respects.

7. Critical review

The calculations were performed following ISO 14067:2018 guidelines, and considering the guidelines of the PCR document *(EPD, 2022)*, the use of which has been approved by EPD International AB.

The calculations were performed with a carbon footprint calculator implemented on the OpenCO2.net platform. The platform calculation methods and formulas have been extensively tested.

The calculator customized for Delipap was implemented by Anna Gaib MSc, and Patrik Borenius MSc (Tech). The calculations were performed by Kirsi Heiskanen, Delipap's engineer. The calculator and calculations were checked and reviewed by Sari Siitonen, DSc (Tech), eMBA.

References:

EPD, 2022, PCR, Absorbent Hygiene Products, 2011:14 Version 3.0.2, The International EPD® System (Date 2022-04-20). Permission to use the document was obtained from EPD International AB on May 10, 2022.

ISO 14067:2018 -standard: Greenhouse gases — Carbon footprint of products — Requirements and guidelines for quantification

Statistics Finland, 2021. Waste statistics: Municipal waste by treatment method 2020