



Carbon footprint report for Moomin Baby diapers based on ISO 14067:2018 standard

Public summary

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 Delipap

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1. Delipap

[Delipap](#) is a Finnish family-owned company 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 diapers in Finland. Delipap takes environmental responsibility into account throughout the life cycle of its products, from the selection of raw materials to their disposal. Delipap's products have also been awarded the Swan label.

Delipap wants to be aware of the greenhouse gas emissions during the life cycle of its products and has now, together with Clonet Oy, analysed the carbon footprint of Moomin Baby nappy products.

2. Determining the carbon footprint

The carbon footprint describes the climate burden caused by a specific, definable entity - in this case Delipap's single diaper products. The climate burden is caused by the emission of greenhouse gases such as carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O) into the atmosphere. The carbon footprint is expressed in terms of CO₂ equivalents, taking into account the different global warming effects of different greenhouse gases. The carbon footprint takes into account all direct and indirect emissions associated with a given entity over its life cycle. In the case of a product, the carbon footprint is determined per selected functional unit.

The carbon footprint is expressed in terms of the mass of emissions generated, in grams (g) in the case of nappy products.

The carbon footprint of Delipap's diaper products is based on the [ISO 14067:2018](#) product carbon footprint standard, which has been adopted as the Finnish national standard. The standard defines the principles, requirements and guidelines for determining and reporting the Carbon Footprint of Product (CFP). The standard is based on the life cycle assessment standards ISO 14040 and 14044, but focuses on only one impact category, climate change. The standard does not address carbon footprint communication or offsetting.

A systematic approach has been used to determine the carbon footprint of Delipap's diaper products according to Annex C of [ISO 14067:2018](#). This means that the same methodology and the same boundaries, allocation procedures and starting assumptions, including assumptions related to the use and disposal of the products, have been used to determine the carbon footprint of all different sizes and types of nappy products.

The systematic approach is based on the application of the latest version of the Product Category Rule (PCR) for Absorbent Hygiene Products (*EPD, 2020*).

The calculation has been carried out using the carbon footprint calculator of the [OpenCO2.net](#) platform developed by Clonet Oy.

3. Defining the objectives and scope of the calculation

Objective and scope of the calculation

The aim of the calculation was to determine the carbon footprint of ten disposable diaper products manufactured by Delipap. The results of the calculation can be used in product development, for example in material selection and planning of supply channels. The diaper-specific carbon footprint data will also serve as a basis if Delipap wants to offset some or all of the emissions of its diaper products.

Table 1. Delipap Moomin Baby nappy products included in the carbon footprint calculation

PRODUCT NAME AND PACKAGE SIZE	PRODUCT CODE	PRODUCT WEIGHT (g/piece) ^{*)}
BABY BABY 1 - 25 Pcs, adhesive nappy	58705	22,4
BABY 2 - 58 Pcs, adhesive nappy	58715	23,8
BABY BABY 3 - 50 Pcs, adhesive nappy	58725	30,5
BABY BABY 4 - 46 Pcs, adhesive nappy	58735	36,4
BABY 5 - 44 Pcs, adhesive nappy	58745	36,4
BABY BABY 6 - 36 Pcs, adhesive nappy	58755	41,8
MUUMI BABY WALKERS 4-40 PACK, pants diaper	59205	37,2
MUUMI BABY WALKERS 5-38 PACK, pants diaper	59690	37,3
MUUMI BABY WALKERS 6-36 KPL, pant diaper	59425	37,3
MUUMI BABY WALKERS 7-34 KPL, pants diaper	59515	39,0

^{*)} The weight of the product shown here also includes the weight of the packaging and transport packaging.

Functional unit

In this calculation, the functional unit is one diaper product, and all calculation results are presented per product.

Scope of the scheme

All life cycle stages from cradle to grave are included in the calculation. However, in the case of disposable nappy products, the use phase is not relevant as the use phase is short-lived and the products are disposed of immediately after use. Therefore, the use phase is excluded from the calculation (*EPD, 2020*).

The life cycle stages included in the calculation are divided into the following three categories:

upstream processes before production (cradle-to-gate)

- Extraction and processing of natural resources
- Production of packaging materials
- Upstream processes in energy production
- Production of raw materials

Core processes (gate-to-gate)

- Transport of raw materials used in production
- Manufacture of products (includes processing of raw materials, cutting, shaping, gluing and packaging of finished products)
- Production of electricity for manufacturing
- Treatment of waste generated during production

Downstream processes after production (gate-to-grave)

- Transport of products to the average customer (retailer or distributor)
- Waste management of used products and packaging

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

- manufacture of machinery and equipment, buildings and other capital goods
- staff business travel
- staff travel between home and work
- research and development

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- pallets

Also excluded from the calculation are transport from wholesalers to individual retailers and from retailers to consumers, as no reliable data on transport modes and distances were available. The system boundary used for the calculation is shown in Figure 1.

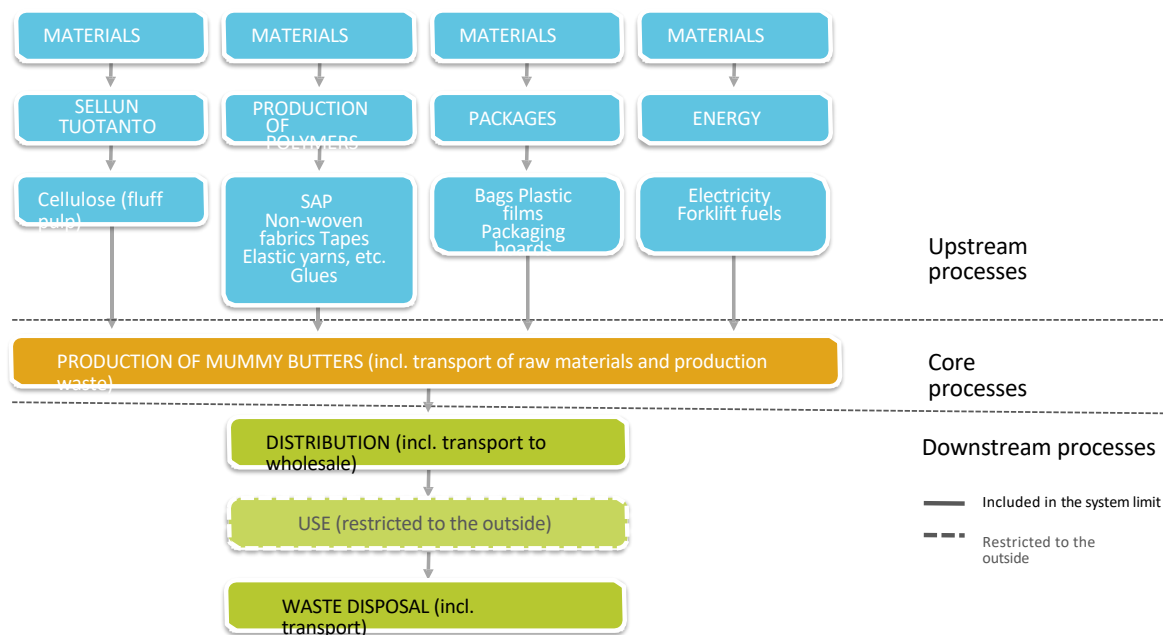


Figure 1. Delimitation of the system to be included in the calculation

For the core processes, the geographical scope concerns the Tammisaari plant, where Delipap's Moomin Baby diaper products are manufactured. The use and end-of-life of the products is limited to Finland, so that the downstream processes cover the Finnish territory.

The calculation includes all raw materials used in the production of the products (e.g. pulp, films, fabrics, superabsorbents and adhesives), so the coverage of the calculation in this respect is 100%.

Waste, i.e. nappy products that go to waste, is included in the calculation.

Baseline data and quality requirements for baseline data

Primary data shall be used in the calculation where available. Where primary data were not available, secondary data have been used for upstream and downstream processes.

The following emission factor data, which are considered representative for Finland, have been used in the calculation:

- [OpenCO2.net](https://openco2.net/) platform emissions database
- Transport: VTT, Lipasto database
- Plastics: Plastics Europe
- Waste treatment: statistics from Statistics Finland, waste statistics

In addition, the EcoInvent 3.7 database has been used as a reference.

Diapers are classified as municipal waste. Diapers are instructed to be disposed of with mixed waste, from which they are diverted to energy recovery or, to a lesser extent, to landfills (landfilling of organic waste is prohibited by the Landfill Regulation). According to Finnish waste statistics, in 2018 energy recovery accounted for 99% and landfilling for 1% of mixed waste (*Statistics Finland, 2020*). When calculating these percentages, material recovery, composting and digestion of mixed waste

(which together accounted for less than 2% of total mixed waste) have been excluded from the calculation, as these waste treatment methods are not suitable for nappy waste.

The nappy products are packed in biodegradable plastic packaging and plastic transport packaging. Packaging plastics are advised to be recycled, but currently the recycling rate in Finland is 27.5% (TEM, 2019). The remaining packaging plastics end up in energy recovery.

Temporal delimitation of data

The production data used in the calculation are for 2019.

Assumptions, in particular in relation to the use and disposal of products

The use phase is excluded from the calculation and the waste treatment methods are assumed to follow the average waste treatment methods in Finland for mixed waste (nappies) and plastics (packaging).

4. Inventory analysis (LCI)

Unit processes included in the calculation

The calculation includes all unit processes within the system boundary.

Upstream processes:

- Manufacture of packaging materials for diapers
- life-cycle impacts of energy production
- Manufacture of raw materials for sheathing

Core processes:

- transport of raw materials from their suppliers to the Tammissaari factory
- energy consumption during product manufacture at the Tammissaari factory
- waste from the production of nappies

Downstream processes:

- transport of nappies to wholesale
- waste management (including transport) of nappies and packaging

Greenhouse gas emissions to be included in the calculation

In addition to carbon dioxide (CO₂) emissions, the calculation includes methane (CH₄) and nitrous oxide (N₂O) emissions from raw materials and transport to the extent that data on these emissions were available. Characterisation factors have been used for the calculation over a 100-year time horizon.

Output data used in the calculation and their validation

The calculation was carried out on the basis of input data provided by Delipap. The output data and emission factor data from suppliers have been compared with data from public sources to assess their reliability. For the rest, the previously mentioned sources considered reliable have been used.

The impact of the scheme's capping on emissions

The impact of the excluded emission sources on the calculation results has been assessed by means of sensitivity analyses and it has been found that the calculation boundary covers 99% of the emissions from diaper products.

Allocation procedures

As the Tammissaari plant manufactures several different diaper products, allocation cannot be completely avoided. Allocation has been done on a mass basis.

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

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

The emissions from electricity production purchased by Delipap have been calculated on the basis of supplier-specific data. The electricity used at the plant is of certified hydroelectric origin.

There are no emission sources related to land use change and land use, based on the information received from suppliers.

Emissions from air travel and other business travel have not been included in the calculation according to the guidance in the PCR document (*EPD, 2020*) .

5. Impact Assessment (LCIA)

Calculation results

The carbon footprint calculation for each diaper product has been implemented using the [OpenCO2.net](https://openco2.net) platform's carbon footprint calculator. The following table summarises the results of the calculation.

Table 2: Summary of the carbon footprint calculation for Delipap's Moomin Baby diaper products (g CO₂ eq./eq. including emissions from fossil sources)

PRODUCT NAME AND PACKAGE SIZE	UP-STREAM	CORE PROCESSES	CRADLE-TO-GATE	DOWN-STREAM	TOTAL (g CO ₂ eq./pcs)
MUUMI BABY 1 25 KPL, adhesive tape	40,1	3,19	43,3	8,95	52,2
MUUMI BABY 2 58 KPL, adhesive tape	44,8	3,66	48,4	9,93	58,4
MUUMI BABY 3 50 KPL, adhesive tape	54,9	4,63	59,6	12,5	72,0
MUUMI BABY 4 46 KPL, adhesive tape	62,6	5,51	68,1	15,0	83,1
MUUMI BABY 5 44 KPL, adhesive tape	62,5	5,46	67,9	15,0	82,9
MUUMI BABY 6 36 KPL, adhesive tape	70,7	6,44	77,1	17,3	94,4
MUUMI BABY WALKERS 4 40 KPL, trouser diaper	63,9	4,93	68,9	15,9	84,7
MUUMI BABY WALKERS 5 38 KPL, trouser diaper	63,5	5,05	68,6	15,8	84,4
MUUMI BABY WALKERS 6 36 KPL, trouser diaper	63,5	5,05	68,5	15,9	84,4
MUUMI BABY WALKERS 7 34 KPL, trouser diaper	66,8	5,30	72,1	16,6	88,7

Impact assessment of biogenic emissions

Biogenic emissions from nappy products are excluded from the calculation because the bio-based carbon dioxide bound in nappy products is released when nappies are disposed of by incineration. However, the magnitude of biogenic emissions has been estimated by means of a sensitivity analysis.

For pulp, which is the most important bio-based raw material used in the production of diapers, information on the amount of biogenic carbon dioxide bound in the raw material has been obtained from the supplier. On this basis, the amount of carbon dioxide sequestered in the mantle products has been estimated at - 11.8...-28.0 g/unit depending on the mantle size (23.1...26.6% of emissions from fossil sources).

6. Interpretation of results

Main sources of emissions

The most significant source of emissions from Moomin Baby nappy products is the manufacture of the materials and raw materials used in them. The next most significant source of emissions is the disposal of the nappies (incineration of mixed waste).

Delipap's own operations have low emissions, as the production of diapers uses hydro-generated electricity and part of the waste generated during production is recycled. All remaining production waste is incinerated for energy.

Completeness, consistency and sensitivity checks of the calculation

All major emission sources have been included in the calculation, and based on the sensitivity analyses performed, 99% of the life-cycle emissions of the diaper products are included.

Although the calculation has used sources for emission factors that are considered reliable, there is uncertainty in the emission factor data with regard to secondary data. The reliability of the calculation can be further improved if the proportion of primary data can be increased. Where secondary data is used, the emission factors have been chosen on a conservative basis, so it is likely that emissions have been overestimated in some areas.

7. Critical evaluation

The calculation has been performed following the guidelines of [ISO 14067:2018](#) and taking into account the PCR document guidelines (*EPD, 2020*), which have been approved by EPD International AB.

The calculations have been carried out using the [OpenCO2.net](#) platform carbon footprint calculator, whose calculation methods and formulas have been extensively tested.

The calculation has been carried out by Sari Siitonen, PhD, eMBA, who has long experience in sustainable development and emissions accounting. The calculations have been reviewed by Delipap's expert team (DI Oskari Nuortie, Engineer Kirsi Heiskanen and MBA Emilia Nordström).

Sources:

[EPD, 2020, PCR, Absorbent Hygiene Products, 2011:14 Version 3.0, The International EPD® System \(Date 2020-02-11\)](#). Permission to use this document was obtained from EPD International AB on 22 April 2020.

[ISO 14067:2018 -standard: Greenhouse gases - Carbon footprint of products - Requirements and guidelines for quantification](#)

[TEM,2019, Chemical recovery solutions and markets for plastic waste, Ministry of Economic Affairs and Employment publications - Businesses - 2019:64 \(p. 76\)](#)

[Statistics Finland, 2020, Waste statistics: municipal waste generation 2018](#)