



ENVIRONMENTAL PRODUCT DECLARATION

In accordance with ISO 14025:2006 and
EN 15804:2012+A2:2019

Gyproc® Protect F Klima



| | |
|-------------------------------|--|
| Program operator: | The Norwegian EPD Foundation |
| Product Category Rule: | NPCR 010:2022 Part B for building boards (v.4) |
| Declaration number: | NEPD-5167-4476-EN |
| Registration number: | NEPD-5167-4476-EN |
| Issue date: | 19.10.2023 |
| Valid to: | 19.10.2028 |
| Owner of declaration: | Saint-Gobain Byggevarer AS, Gyproc |

General information

Product name

Gyproc® Protect F Klima
(GF 15 Klima, GFE 15 Klima)

Program operator

The Norwegian EPD Foundation,
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Web: www.epd-norge.no

Declaration number:

NEPD-5167-4476-EN

ECO Platform reference number

Product Category Rules:

Core PCR: EN 15804:2012+A2:2019
NPCR 010:2019 Part B for building boards

Statement of liability

The owner of the declaration shall be liable for the underlying information and evidence. EPD Norway shall not be liable with respect to manufacturer information, life cycle assessment data and evidence.

Declared unit

1 m² of manufactured plasterboard

Functional unit

1 m² of installed Gyproc® Protect F Klima with a reference service life of 60 years

Verification

Independent verification of calculation data, environmental data, and test of computer program was carried out by Martin Erlandsson.
CEN Standard EN 15804:2012+A2:2019 serves as core PCR. Independent verification of the declaration and data has been done according to ISO 14025:2010



Martin Erlandsson, IVL
Independent verifier approved by EPD-Norge

☐ Internal ☒ External

Owner of the declaration

Saint-Gobain Byggevarer AS, Gyproc

Contact person: Gravnås, Stian

Phone: +47 908 84 762

E-mail: stian.gravnas@saint-gobain.com

Manufacturer: Saint-Gobain Byggevarer AS, Gyproc

Place of production: Fredrikstad, Norway

Geographical use: Norway and other Nordic countries

Management system

NS-EN ISO 9001, NS-EN ISO 14001,
NS-EN ISO 45001, NS-EN ISO 50001

Organization number: NO 940 198 178

Issue date: 19.10.2023

Valid to: 19.10.2028

Year of study: 2022 + 2023

The EPD is based on 3 months average data for electricity and water consumption, production yield and share of recycled gypsum. This is done due to a change in energy source from LNG to electricity, which gives a change in GWP. A conservative approach has been taken, see page 3. The EPD will be updated when one year of data is available.

Comparability

EPD of construction products may not be comparable if they don't comply with EN 15804:2012+A2:2019 and seen in a building context, see also EN 15942.

The EPD has been worked out by

Eva Hellgren (Gyproc Nordic) and Saint-Gobain LCA central team using GaBi version 10.6



Company-specific data has been verified by Tom Tegnander, Saint-Gobain Byggevarer AS, Gyproc

Approved by



Håkon Hauan
Managing Director of EPD-Norge

Product information

Product description and description of use

This Environmental Product Declaration (EPD®) describes the environmental impacts of 1m² of installed gypsum board Gyproc® Protect F Klima with a weight of 12,7 kg/m².

Gyproc® Protect F Klima is a plasterboard primarily used in interior building applications where normal to high levels of fire resistance is required and for protection to structural steel. It can be used in light weight building systems of 1-3 layers on steel or timber framing where normal structural strength and sound insulation are specified.

Gyproc® Protect F Klima provides significantly improved fire protection properties compared to a standard gypsum board. It shrinks less during a fire and sustains its basic properties better due to a thicker core reinforced with glass fibers, minerals and other additives for dimensional stability and improved core cohesion at high temperatures.

Thickness: 15,4 mm

Width : 1200 mm (GF 15) and 900 mm (GFE 15)

For more information: www.gyproc.no/produkter/gyproc-protect-f-klima-gf-15-klima

Technical data

| Parameter | Value / Description |
|---|---------------------------------|
| EN Classification | DFI-15,4 (EN 520:2004+A1:2009) |
| Reaction to fire | A2-s1, d0 (EN 520:2004+A1:2009) |
| Water vapour resistance factor, μ | < 0,10 (EN 10456:2007) |
| Thermal conductivity | 0,25 W/mK (EN 10456:2007) |

Product specification

| Product components | Value / Description |
|---|--|
| Weight of 1 m² plasterboard | 12,7 kg |
| Thickness | 15,4 mm |
| Surfacing | Paper liner: 0,33 kg/m ² |
| Packaging material | Gypsum Culls: 0,02 kg/kg |
| | PE film: 0,0006 kg/kg |
| | Paper label: 0,000009 kg/kg |
| Products used for installation | Jointing compounds: 0,33 kg/m ² |
| | Jointing tape: 0,004 kg/m ² |

Market

Gyproc® Protect F Klima is manufactured and sold in Norway. It can also be distributed to, and sold in, other countries like Sweden, Finland and Denmark.

Reference Service Life (RSL), product

60 years. When installed correct, the product is assumed to have at least the same RSL as the building.

Reference Service Life (RSL), building

60 years.

LCA calculation information

| Parameter | Value / Description |
|--|--|
| Type of EPD | Cradle to grave and module D |
| Functional unit | 1 m ² of installed board with a weight of 12,7 kg/m ² and an expected average service life of 60 years. Note that the declared product and therefor the functional unit do not include any upper surface material like paint or likewise and therefore not potentially add as part of maintenance (B2). |
| System boundaries | Cradle to grave + Module D = A + B + C +D |
| Cut-off rules | All raw materials and additives and all energy has been included. The following has been excluded: Flows related to human activities such as employee transport The construction of plants, production of machines and transportation systems |
| Allocations | Allocation criteria are based on mass. The polluter pays principle as well as the modularity principle have been followed. |
| Geographical coverage and time period | Scope: Norway Data is collected from one production site Fredrikstad located in Norway The EPD is based on less than one year of data measured in 2023 for energy. A conservative approach has been taken. The EPD will be updated when one year of data is available. |
| Data quality | The data was collected from the specific manufacturing site Fredrikstad, using measurements, internal records and reporting documents. The manufacturing process at Fredrikstad has been fully electrified since March 2023. The EPD is based on: <ul style="list-style-type: none"> • average consumptions of water and electricity • average production yield, • average share of recycled gypsum All measured from April 1 st 2023 – June 30 th 2023. For other data input, a full year of data from 2022 has been collected and adjusted to the lower yield. This is a conservative approach, as this approach gives higher input values and therefore a higher impact in the result. Data for Packaging- and raw materials supplier, including distances has been collected for 2022. A follow up routine has been established with the third part verifier. The requirements and terms for justification for using less than one year of data has been provided and discussed with EPD-Norge and the verifier to ensure a correct approach and method. After evaluating the inventory, according to the defined ranking in the LCA report, the assessment reflects good inventory data quality. |
| Background data source | Databases GaBi 2022 and ecoinvent v.3.8 |
| Software | GaBi 10.6 |
| Product CPC code | 37530, Articles of plaster or of composition based on plaster |

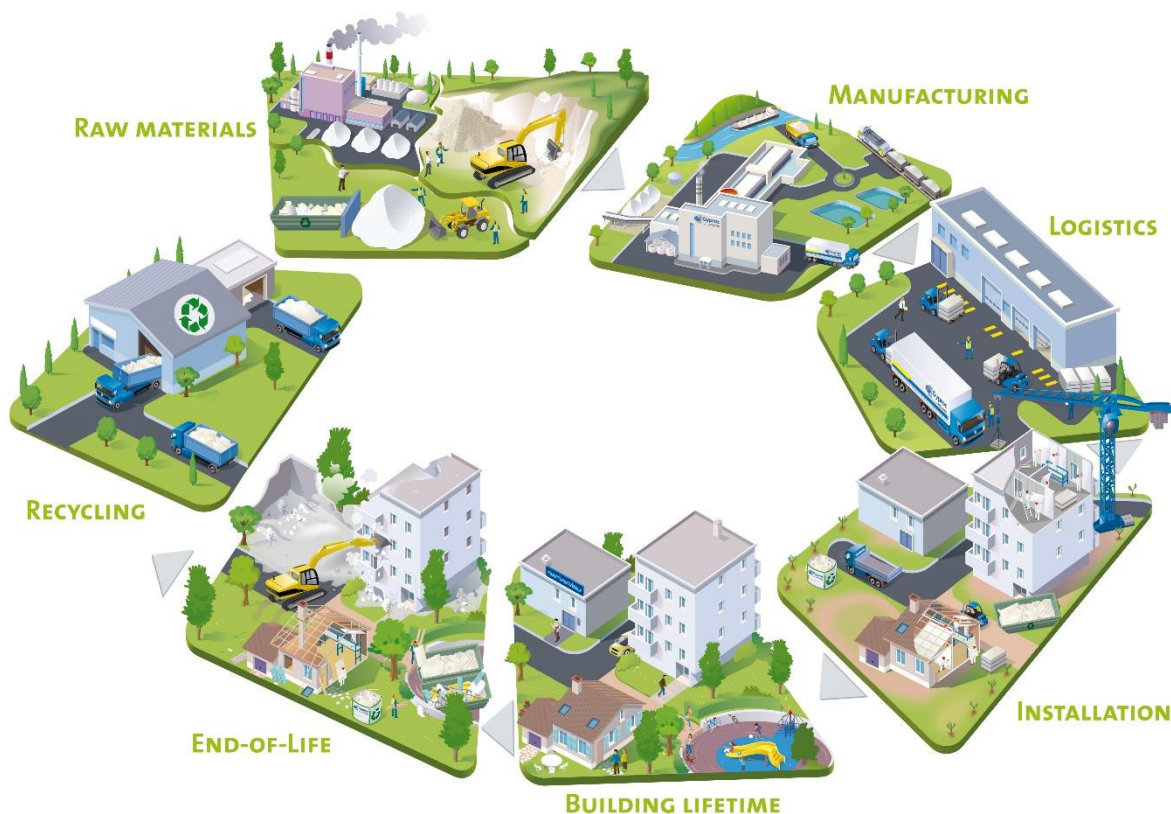
LCA scope

The following stages and modules have been included for this product.

| Module | PRODUCT STAGE | | | CONSTRUC- TION STAGE | | USE STAGE | | | | | | | END OF LIFE STAGE | | | | BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY |
|---------------------|---------------------|-----------|---------------|-------------------------|--------------------------------------|-----------|-------------|--------|-------------|---------------|------------------------|-----------------------|-------------------------------|-----------|------------------|----------|--|
| | Raw material supply | Transport | Manufacturing | Transport | Construction-Installation process | Use | Maintenance | Repair | Replacement | Refurbishment | Operational energy use | Operational water use | De-construction demolition | Transport | Waste processing | Disposal | Reuse-recovery |
| | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
| Modules declared | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |

(X=included. MND=module not declared)

Life cycle stages



A1-A3, Product stage

A1, Raw materials supply

This module includes the extraction and transformation of raw materials and packaging.

A2, Transport to the manufacturer

This module includes the transportation (truck, boat and rail) of raw materials and packaging to the manufacturing site. Calculations have been based on specific distances provided by the logistic department.

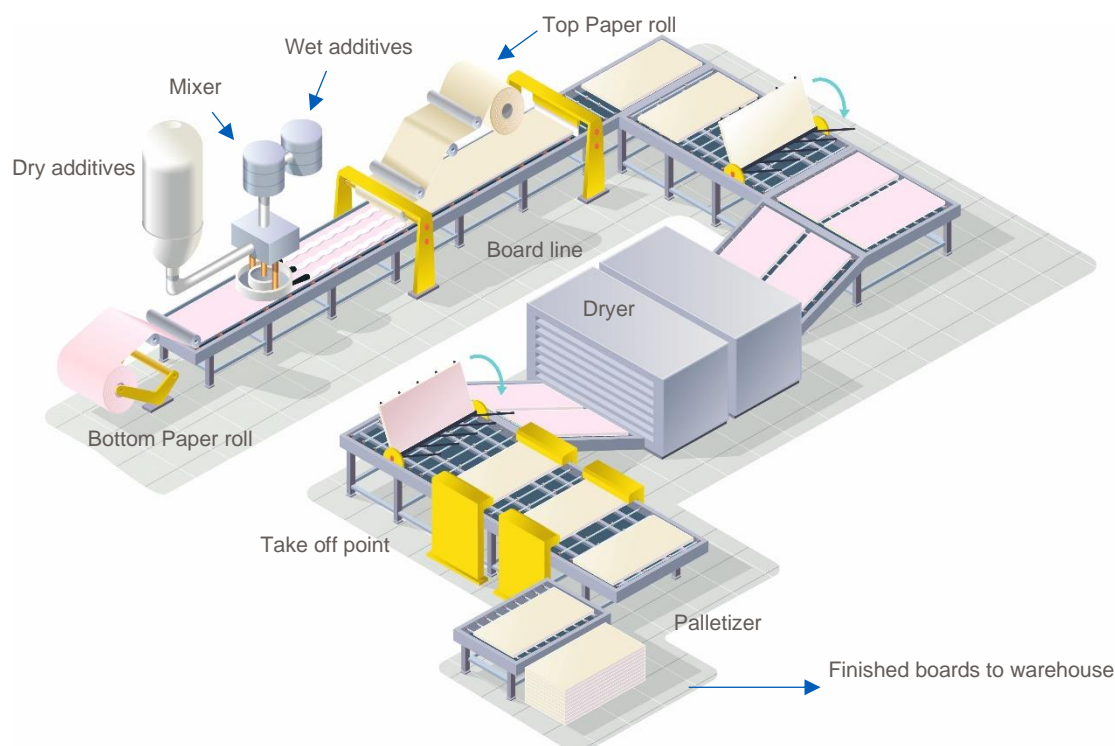
A3, Manufacturing

This module includes the manufacturing of products and the processing of any waste arising during the manufacturing process.

During the manufacturing process, 100% renewable electricity bought with Guarantee of Origin (GO) has been used. The amount of electricity purchases with GO's correspond to 100% of the electricity consumed at the manufacturing site, leaving 0% to be covered by Norwegian National grid mix.

| Parameter | Consumption covered (%) | Value, GWP total | Description |
|--------------------------------|-------------------------|--------------------------------------|--|
| Electricity mix (Go's) | 100% | 0,00621 kg CO ₂ eq. / kWh | 100% Hydro power - Thinkstep 2018 dataset and Guarantee of Origin certificate. |
| Electricity mix (national mix) | 0% | 0,0329 kg CO ₂ eq. / kWh | Thinkstep 2018 dataset |

Manufacturing process flow diagram



Manufacturing in detail:

The raw materials are homogenously mixed to form a gypsum slurry that is spread via multiple hose outlets onto a paper liner on a moving conveyor belt. A second paper liner is fed onto the production line from above to form the plasterboard. The plasterboard continues along the production line where it is finished, dried, and cut to size.

A4-A5, Construction process stage

A4, Transport to the building site

This module includes the transport from the manufacturing site to the building site. Transport is calculated based on a scenario with the parameters described in the following table.

| Parameter | Value / Description |
|---|---|
| Fuel type and consumption of vehicle or vehicle type used for transport e.g. long distance truck, boat, etc. | Freight truck, maximum load weight of 30 t, real load of 22 t and consumption of 0.38 liters per km |
| Distance | 300 km |
| Capacity utilization (including empty returns) | 56% (30% empty returns) |
| Bulk density of transported products* | 825 kg/m ³ |
| Volume capacity utilization factor | < 1 |

A5, Installation in the building

This module includes the installation materials and the management and processing of waste generated during the installation. The parameters are presented in the following table.

| Parameter | Value / Description |
|---|--|
| Ancillary materials for installation (specified by materials) | Jointing compound 0,33 kg/m ² board, jointing tape 1,23 m/m ² board. |
| Water used during installation | 0,158 liters/m ² |
| Other resource use | None |
| Quantitative description of energy type (regional mix) and consumption during the installation process | 0,0 MJ/m ² electricity |
| Scrap rate at installation | 5% for plasterboard and ancillary materials 100% for packaging Plasterboard: 0,64 kg (100% recycling) |
| Wastage of materials on the building site before waste processing, generated by the product's installation (specified by type) | Jointing Compound: 0,0165 kg (100% landfill) Jointing Tape: 0,0002 kg (100% landfill) Gypsum culls: 0,02 kg (100% landfill) PE film: 0,0006 kg (50/50% incineration with/without recovery) Paper label: 0,000009 kg (50/50% incineration with/without recovery) |
| Output materials (specified by type) as results of waste processing at the building site e.g., of collection for recycling, for energy recovering, disposal (specified by route) | Plasterboard: 0,64 kg (100% recycling) Jointing Compound: 0 kg (recycling), 0,0165 kg (landfill) Jointing Tape: 0 kg (recycling), 0,0002 kg (landfill) PE film: 0,0003 kg (incineration w. recovery), 0,0003 kg (incineration no recovery) Paper label: 0,0000045 kg (incineration w. recovery), 0,0000045 kg (incineration no recovery) Gypsum culls: 0 kg (recycling), 0,02 kg (landfill) |
| Direct emissions to ambient air, soil, and water | None |

The transport of packaging and product is modelled like transport in C2.

B1-B7, Use stage (excluding potential savings)

Description of the stage: The use stage is divided into the following modules:

- B1, Use
- B2, Maintenance
- B3, Repair
- B4, Replacement
- B5, Refurbishment
- B6, Operational energy use
- B7, Operational water use

The product has a reference service life of 60 years. It is assumed that the product will last in situ with no requirements for maintenance, repair, replacement, or refurbishment throughout this period. Therefore, it has no impact at this stage.

C1-C4, End of Life Stage

Description of the stage: This stage includes the following modules:

- C1, Deconstruction, demolition: The de-construction and/or dismantling of the product is considered part of the demolition of the entire building, but a small amount of energy has been located to the studied product.
- C2, Transport to waste processing
- C3, Waste processing for reuse, recovery and/or recycling
- C4, Disposal, including provision and all transport, provision of all materials, products and related energy and water use

Two End-of-life scenarios have been declared for the plasterboard and paper liner: 100% recycling and 100% landfill.

| Parameter | Value / Description |
|--|--|
| Energy for de-construction/demolition | 0,05 MJ/m ² . The de-construction of the product is considered to be part of the demolition of the entire building |
| Collection process specified by type | Plasterboard and paper liner: <ul style="list-style-type: none"> • Scenario 1: 100% recycling • Scenario 2: 100% landfill Both scenarios: Other deconstruction waste is 100% collected with mixed deconstruction and demolition waste for landfill |
| Recovery system specified by type | Scenario 1: 12,7 kg is recycled Scenario 2: 0 kg is recycled |
| Disposal specified by type | Scenario 1: 0,33 kg to landfill Scenario 2: 13,03 kg to landfill |
| Assumptions for scenario development (e.g. transportation) | Freight truck, maximum load weight of 27.9 t, real load of 24 t and consumption of 0.38 liters per km Distance to recycling facilities: 300 km Distance to landfill: 50 km Distance to incineration facilities: 50 km |

D, Reuse/recovery/recycling potential

Module D considers the benefits and loads beyond the system boundary resulting from recycling and energy recovery processes.

Module D includes:

- the benefits and loads from the net flows of recycled gypsum and paper liner leaving the product system and substituting primary materials
- the benefits from the net flows of energy related to packaging sent to incineration with energy recovery and substituting steam and electricity production

LCA results

As specified in EN 15804:2012+A2:2019 and the Product-Category Rules, the environmental impacts are declared and reported using the baseline characterization factors from the ILCD. Specific data has been supplied by the plant, and generic data come from GaBi and ecoinvent databases.

All emissions to air, water, and soil, and all materials and energy used have been included.

The estimated impact results are only relative statements which do not indicate the end points of the impact categories, exceeding threshold values, safety margins or risks.

All figures refer to a declared unit of 1m² of installed gypsum board Gyproc® Protect F Klima with a weight of 12,7 kg/m² and a useful life of 60 years. It has been manufactured in Fredrikstad, Norway.

Electricity








The main result presented is calculated with national electricity grid mix.

An additional set of results based on GO's can be found in "Additional Information".

Transport to other countries

Information and conversion factors for transport to other countries can be found under "Additional Information".








Environmental Impacts - National electricity grid mix

| Environmental indicators | | PRODUCT STAGE | CONSTRUCTION STAGE | | USE STAGE | | | | | | |
|---|--|---------------|--------------------|-----------------|-----------|----------------|-----------|----------------|------------------|---------------------------|--------------------------|
| | | A1 / A2 / A3 | A4 Transport | A5 Installation | B1 Use | B2 Maintenance | B3 Repair | B4 Replacement | B5 Refurbishment | B6 Operational energy use | B7 Operational water use |
|  | Climate Change (total) [kg CO ₂ eq.] ^(a) | 4,52E-01 | 2,35E-01 | 5,72E-01 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Climate Change (fossil) [kg CO ₂ eq.] | 1,09E+00 | 2,30E-01 | 1,33E-01 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Climate Change (biogenic) [kg CO ₂ eq.] | -6,42E-01 | 2,96E-03 | 4,39E-01 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Climate Change (land use change) [kg CO ₂ eq.] | 1,03E-03 | 1,30E-03 | 1,68E-04 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Ozone depletion [kg CFC-11 eq.] | 2,47E-08 | 1,39E-14 | 1,99E-09 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Acidification terrestrial and freshwater [Mole of H ⁺ eq.] | 6,12E-03 | 2,91E-04 | 4,68E-04 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Eutrophication freshwater [kg P eq.] | 3,65E-05 | 6,94E-07 | 9,84E-06 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Eutrophication marine [kg N eq.] | 2,48E-03 | 1,06E-04 | 2,23E-04 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Eutrophication terrestrial [Mole of N eq.] | 2,55E-02 | 1,23E-03 | 1,88E-03 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Photochemical ozone formation - human health [kg NMVOC eq.] | 5,77E-03 | 2,57E-04 | 5,99E-04 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Resource use, mineral and metals [kg Sb eq.] ¹ | 1,55E-06 | 1,94E-08 | 1,05E-07 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Resource use, energy carriers [MJ] ¹ | 1,50E+01 | 3,11E+00 | 1,34E+00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Water deprivation potential [m ³ world equiv.] ¹ | 5,61E-01 | 2,09E-03 | 6,74E-02 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

¹ Disclaimer 2: The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator

^(a) The total global warming potential (GWP-total) is the sum of GWP fossil. GWP biogenic and GWP land use change











Environmental Impacts - National electricity grid mix

| Environmental indicators | | 100% recycling | | | | | 100% landfill | | | | |
|---|--|-----------------------------------|--------------|---------------------|-------------|----------------------------------|-----------------------------------|--------------|---------------------|-------------|----------------------------------|
| | | END OF LIFE STAGE | | | | REUSE, RECOVERY, RECYCLING | END OF LIFE STAGE | | | | REUSE, RECOVERY, RECYCLING |
| | | C1 Deconstruction / demolition | C2 Transport | C3 Waste processing | C4 Disposal | | C1 Deconstruction / demolition | C2 Transport | C3 Waste processing | C4 Disposal | |
|  | Climate Change (total) [kg CO ₂ eq.] ^(a) | 5,26E-02 | 2,31E-01 | 6,34E-01 | 6,64E-03 | 5,08E-02 | 5,26E-02 | 3,93E-02 | 0,00E+00 | 9,24E-01 | -3,47E-02 |
| | Climate Change (fossil) [kg CO ₂ eq.] | 5,26E-02 | 2,27E-01 | 7,17E-02 | 5,07E-03 | 5,04E-02 | 5,26E-02 | 3,86E-02 | 0,00E+00 | 7,52E-02 | -4,16E-02 |
| | Climate Change (biogenic) [kg CO ₂ eq.] | 7,12E-05 | 2,92E-03 | 5,62E-01 | 1,56E-03 | 3,55E-04 | 7,12E-05 | 4,97E-04 | 0,00E+00 | 8,49E-01 | 5,75E-03 |
| | Climate Change (land use change) [kg CO ₂ eq.] | 5,55E-06 | 1,28E-03 | 9,87E-05 | 1,46E-05 | 6,50E-05 | 5,55E-06 | 2,17E-04 | 0,00E+00 | 9,18E-05 | 1,16E-03 |
|  | Ozone depletion [kg CFC-11 eq.] | 1,12E-08 | 1,37E-14 | 1,42E-08 | 1,88E-17 | 2,08E-10 | 1,12E-08 | 2,34E-15 | 0,00E+00 | 2,64E-08 | 1,89E-08 |
|  | Acidification terrestrial and freshwater [Mole of H ⁺ eq.] | 5,46E-04 | 2,82E-04 | 4,55E-04 | 3,64E-05 | 2,20E-04 | 5,46E-04 | 4,80E-05 | 0,00E+00 | 6,85E-04 | 8,10E-04 |
|  | Eutrophication freshwater [kg P eq.] | 1,63E-06 | 6,83E-07 | 7,95E-06 | 8,71E-09 | 6,69E-06 | 1,63E-06 | 1,16E-07 | 0,00E+00 | 5,98E-06 | 1,76E-04 |
| | Eutrophication marine [kg N eq.] | 2,42E-04 | 1,02E-04 | 1,68E-04 | 9,36E-06 | 6,75E-05 | 2,42E-04 | 1,73E-05 | 0,00E+00 | 2,32E-04 | 3,00E-04 |
| | Eutrophication terrestrial [Mole of N eq.] | 2,65E-03 | 1,18E-03 | 1,75E-03 | 1,03E-04 | 6,27E-04 | 2,65E-03 | 2,02E-04 | 0,00E+00 | 2,54E-03 | 1,83E-03 |
|  | Photochemical ozone formation - human health [kg NMVOC eq.] | 7,29E-04 | 2,49E-04 | 5,18E-04 | 2,83E-05 | 1,88E-04 | 7,29E-04 | 4,24E-05 | 0,00E+00 | 8,38E-04 | 6,01E-04 |
|  | Resource use, mineral and metals [kg Sb eq.] ² | 2,70E-08 | 1,91E-08 | 4,62E-07 | 4,55E-10 | 5,93E-08 | 2,70E-08 | 3,26E-09 | 0,00E+00 | 1,50E-07 | 1,01E-06 |
| | Resource use, energy carriers [MJ] ¹ | 7,18E-01 | 3,06E+00 | 1,17E+00 | 6,65E-02 | 8,90E-01 | 7,18E-01 | 5,21E-01 | 0,00E+00 | 1,96E+00 | 9,50E-02 |
|  | Water deprivation potential [m ³ world equiv.] ¹ | 1,77E-03 | 2,05E-03 | 2,91E-02 | 5,31E-04 | 1,46E-02 | 1,77E-03 | 3,50E-04 | 0,00E+00 | 8,48E-02 | 1,26E-01 |

² Disclaimer 2: The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator











^(a) The total global warming potential (GWP-total) is the sum of GWP fossil. GWP biogenic and GWP land use change

Resources Use - National electricity grid mix

| Resources Use indicators | PRODUCT STAGE | CONSTRUCTION STAGE | | USE STAGE | | | | | | |
|---|---------------|--------------------|-----------------|-----------|----------------|-----------|----------------|------------------|---------------------------|--------------------------|
| | A1 / A2 / A3 | A4 Transport | A5 Installation | B1 Use | B2 Maintenance | B3 Repair | B4 Replacement | B5 Refurbishment | B6 Operational energy use | B7 Operational water use |
|  Use of renewable primary energy (PERE) [MJ] | 4,82E+01 | 1,77E-01 | 2,57E+00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  Primary energy resources used as raw materials (PERM) [MJ] * | 5,75E+00 | 0 | 3,90E-02 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  Total use of renewable primary energy resources (PERT) [MJ] | 5,40E+01 | 1,77E-01 | 2,61E+00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  Use of non-renewable primary energy (PENRE) [MJ] | 1,47E+01 | 3,12E+00 | 1,33E+00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  Non-renewable primary energy resources used as raw materials (PENRM) [MJ] * | 6,52E-01 | 0 | -1,11E-01 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  Total use of non-renewable primary energy resources (PENRT) [MJ] | 1,54E+01 | 3,12E+00 | 1,22E+00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  Input of secondary material (SM) [kg] | 1,67E+00 | 0 | 8,51E-02 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  Use of renewable secondary fuels (RSF) [MJ] | 2,31E-24 | 0 | 1,18E-25 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  Use of non-renewable secondary fuels (NRSF) [MJ] | 2,713E-23 | 0 | 1,39E-24 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  Use of net fresh water (FW) [m³] | 7,36E-02 | 2,00E-04 | 4,66E-03 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |









* For this study, both the product and its packaging are reported in the indicators "Use of renewable primary energy resources used as raw materials" ("PERM") and "Use of non-renewable primary energy resources used as raw materials" ("PENRM"). PERM and PENRM are reported as negative values when materials are recycled or recovered, but not when landfilled.

Resources Use - National electricity grid mix


| Resources Use indicators | | 100% recycling | | | | | 100% landfill | | | | |
|---|---|-----------------------------------|--------------|---------------------|-------------|----------------------------------|-----------------------------------|--------------|---------------------|-------------|----------------------------------|
| | | END OF LIFE STAGE | | | | REUSE, RECOVERY, RECYCLING | END OF LIFE STAGE | | | | REUSE, RECOVERY, RECYCLING |
| | | C1 Deconstruction / demolition | C2 Transport | C3 Waste processing | C4 Disposal | | C1 Deconstruction / demolition | C2 Transport | C3 Waste processing | C4 Disposal | |
|  | Use of renewable primary energy (PERE) [MJ] | 4,06E-03 | 1,74E-01 | 1,78E-01 | 8,71E-03 | 2,61E-01 | 4,06E-03 | 2,96E-02 | 0 | 3,32E-02 | 1,25E+00 |
|  | Primary energy resources used as raw materials (PERM) [MJ] * | 0 | 0 | -5,51E+00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Total use of renewable primary energy resources (PERT) [MJ] | 4,06E-03 | 1,74E-01 | -5,33E+00 | 8,71E-03 | 2,61E-01 | 4,06E-03 | 2,96E-02 | 0 | 3,32E-02 | 1,25E+00 |
|  | Use of non-renewable primary energy (PENRE) [MJ] | 7,18E-01 | 3,07E+00 | 1,17E+00 | 6,65E-02 | 8,92E-01 | 7,18E-01 | 5,22E-01 | 0 | 1,96E+00 | 9,33E-02 |
|  | Non-renewable primary energy resources used as raw materials (PENRM) [MJ] * | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Total use of non-renewable primary energy resources (PENRT) [MJ] | 7,18E-01 | 3,07E+00 | 1,16E+00 | 6,65E-02 | 8,92E-01 | 7,18E-01 | 5,22E-01 | 0 | 1,96E+00 | 9,52E-02 |
|  | Input of secondary material (SM) [kg] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Use of renewable secondary fuels (RSF) [MJ] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Use of non-renewable secondary fuels (NRSF) [MJ] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Use of net fresh water (FW) [m³] | 4,11E-05 | 1,97E-04 | 6,78E-04 | 1,68E-05 | 3,35E-04 | 4,11E-05 | 3,35E-05 | 0 | 1,98E-03 | -1,37E-04 |

* For this study, both the product and its packaging are reported in the indicators "Use of renewable primary energy resources used as raw materials" ("PERM") and "Use of non-renewable primary energy resources used as raw materials" ("PENRM"). PERM and PENRM are reported as negative values when materials are recycled or recovered, but not when landfilled.

Waste Category & Output flows - National electricity grid mix

| Waste Category & Output Flows | | PRODUCT STAGE | CONSTRUCTION STAGE | | USE STAGE | | | | | | |
|---|--|---------------|--------------------|-----------------|-----------|----------------|-----------|----------------|------------------|---------------------------|--------------------------|
| | | A1 / A2 / A3 | A4 Transport | A5 Installation | B1 Use | B2 Maintenance | B3 Repair | B4 Replacement | B5 Refurbishment | B6 Operational energy use | B7 Operational water use |
|  | Hazardous waste disposed (HWD) [kg] | 9,30E-06 | 1,49E-11 | 6,12E-07 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Non-hazardous waste disposed (NHWD) [kg] | 7,80E-02 | 4,47E-04 | 2,19E-01 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Radioactive waste disposed (RWD) [kg] | 6,93E-04 | 3,84E-06 | 1,78E-05 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Components for re-use (CRU) [kg] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Materials for Recycling (MFR) [kg] | 2,85E-02 | 0 | 6,37E-01 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Material for Energy Recovery (MER) [kg] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Exported electrical energy (EEE) [MJ] | 0 | 0 | 2,47E-02 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Exported thermal energy (EET) [MJ] | 0 | 0 | 4,40E-02 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Waste Category & Output flows - National electricity grid mix

| Waste Category & Output Flows | | 100% recycling | | | | | 100% landfill | | | | |
|---|--|-----------------------------------|--------------|---------------------|-------------|----------------------------------|-----------------------------------|--------------|---------------------|-------------|----------------------------------|
| | | END OF LIFE STAGE | | | | REUSE, RECOVERY, RECYCLING | END OF LIFE STAGE | | | | REUSE, RECOVERY, RECYCLING |
| | | C1 Deconstruction / demolition | C2 Transport | C3 Waste processing | C4 Disposal | | C1 Deconstruction / demolition | C2 Transport | C3 Waste processing | C4 Disposal | |
|  Hazardous waste disposed (HWD) [kg] | | 1,97E-06 | 1,47E-11 | 2,70E-06 | 1,01E-09 | 5,62E-08 | 1,97E-06 | 2,50E-12 | 0 | 2,75E-06 | 2,99E-06 |
|  Non-hazardous waste disposed (NHWD) [kg] | | 4,12E-03 | 4,39E-04 | 6,62E-02 | 3,35E-01 | -8,43E-05 | 4,12E-03 | 7,48E-05 | 0 | 1,30E+01 | 7,33E-02 |
|  Radioactive waste disposed (RWD) [kg] | | 4,98E-06 | 3,78E-06 | 8,48E-06 | 7,57E-07 | 1,23E-04 | 4,98E-06 | 6,43E-07 | 0 | 1,34E-05 | -6,93E-05 |
|  Components for re-use (CRU) [kg] | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  Materials for Recycling (MFR) [kg] | | 0 | 0 | 1,27E+01 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  Material for Energy Recovery (MER) [kg] | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  Exported electrical energy (EEE) [MJ] | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  Exported thermal energy (EET) [MJ] | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Information on biogenic carbon content

| Biogenic Carbon Content at factory gate | | Value (express per FU) |
|---|---|------------------------|
|  | Biogenic carbon content in product [kg] | 1,73E-01 |
|  | Biogenic carbon content in packaging [kg] | 4,67E-05 |

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO₂.

The biogenic carbon content in product mainly comes from maize starch, dextrose and paper liner.

The biogenic carbon content in the packaging is very low, and it mainly comes from the paper label.

Additional Norwegian requirements

Electricity information

The table below presents the information for the physical national grid mix:

| Type of information | Description |
|--|--|
| Location | Electricity purchased by Saint-Gobain Construction Products Norway. |
| Share of electricity covered by Guarantee of Origin | 0% of the energy consumption is covered by the GO |
| Energy sources for electricity | Share of energy sources: Hydro 95,19% Wind 2,64% Natural gas 1,76% Waste 0,23% Hard coal 0,12% Fuel oil 0,02% Biomass 0,01% Biogas 0,01% |
| Type of dataset | Cradle to gate from Gabi and ecoinvent databases |
| Source | Dataset Gabi NO: Electricity grid mix |
| CO₂ emission kg CO₂ eq. / kWh | 0,0329 kg of CO ₂ eq/kWh - Climate Change - total indicator |

The table below presents the information for the renewable electricity based on Guarantee of Origin certificates (GOs):

| Type of information | Description |
|--|---|
| Location | Electricity purchased by Saint-Gobain Construction Products Norway. |
| Share of electricity covered by Guarantee of Origin | 100% of the energy consumption is covered by the GO |
| Energy sources for electricity | Share of energy sources: 100% Hydro power |
| Type of dataset | Cradle to gate from Gabi and ecoinvent databases |
| Source | Dataset Gabi EU-28: Electricity from hydro power |
| CO₂ emission kg CO₂ eq. / kWh | 0,00621 kg of CO ₂ eq/kWh - Climate Change - total indicator |

Additional impact indicator (GWP-IOBC / GWP-GHG)

| | PRODUCT STAGE | CONSTRUCTION STAGE | | USE STAGE | | | | | | | END OF LIFE STAGE | | | | REUSE, RECOVERY, RECYCLING |
|---|---------------|--------------------|-----------------|-----------|----------------|-----------|----------------|------------------|---------------------------|--------------------------|--------------------------------|--------------|---------------------|-------------|------------------------------|
| Indicators | A1 / A2 / A3 | A4 Transport | A5 Installation | B1 Use | B2 Maintenance | B3 Repair | B4 Replacement | B5 Refurbishment | B6 Operational energy use | B7 Operational water use | C1 Deconstruction / demolition | C2 Transport | C3 Waste processing | C4 Disposal | D Reuse, recovery, recycling |
| With National Electricity Grid Mix | | | | | | | | | | | | | | | |
| GWP-IOBC* / GWP-GHG* [kg CO ₂ eq.] | 1,10E+00 | 2,32E-01 | 6,53E-01 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100% recycling | | | | |
| | | | | | | | | | | | 5,26E-02 | 2,29E-01 | 8,20E-02 | 5,10E-03 | 5,08E-02 |
| | | | | | | | | | | | 100% landfill | | | | |
| | | | | | | | | | | | 5,26E-02 | 3,89E-02 | 0 | 4,51E-01 | -3,47E-02 |
| With Electricity purchased with Guarantee of Origin | | | | | | | | | | | | | | | |
| GWP-IOBC* / GWP-GHG* [kg CO ₂ eq.] | 8,69E-01 | 2,32E-01 | 6,42E-01 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100% recycling | | | | |
| | | | | | | | | | | | 5,26E-02 | 2,29E-01 | 8,20E-02 | 5,10E-03 | 5,08E-02 |
| | | | | | | | | | | | 100% landfill | | | | |
| | | | | | | | | | | | 5,26E-02 | 3,89E-02 | 0 | 4,51E-01 | -3,47E-02 |

*The indicator includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product.

Hazardous substances

The product contains no substances given by the REACH Candidate list or the Norwegian priority list.

Indoor environment

Gyproc® Protect F Klima has a M1 classification and Danish Indoor Climate Label (emission class 1).

Carbon footprint

The GWP-IOBC value can be found on page 16.








Additional Information

Transport to other countries

The results of stage A4 presented in the tables above refers to Norway. As the product is exported to other countries, conversion factors for each country have been provided. To get the impact for transport to these countries, the A4 figures shall be multiplied with the relevant factor.

| Country | Transport and distance | Factor |
|---------|-------------------------------|--------|
| Norway | Truck (300 km) | 1,0 |
| Denmark | Truck (600 km) | 2,0 |
| Finland | Truck (800 km), Ship (400 km) | 2,9 |
| Sweden | Truck (500 km) | 1,7 |




Environmental Impacts – 100 % renewable electricity with GO's

| | | PRODUCT STAGE | CONSTRUCTION STAGE | | USE STAGE | | | | | | |
|---|--|---------------|--------------------|-----------------|-----------|----------------|-----------|----------------|------------------|---------------------------|--------------------------|
| Environmental indicators | | A1 / A2 / A3 | A4 Transport | A5 Installation | B1 Use | B2 Maintenance | B3 Repair | B4 Replacement | B5 Refurbishment | B6 Operational energy use | B7 Operational water use |
|  | Climate Change (total) [kg CO ₂ eq.] ^(a) | 2,24E-01 | 2,35E-01 | 5,61E-01 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Climate Change (fossil) [kg CO ₂ eq.] | 8,66E-01 | 2,30E-01 | 1,22E-01 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Climate Change (biogenic) [kg CO ₂ eq.] | -6,43E-01 | 2,96E-03 | 4,39E-01 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Climate Change (land use change) [kg CO ₂ eq.] | 1,01E-03 | 1,30E-03 | 1,67E-04 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Ozone depletion [kg CFC-11 eq.] | 2,47E-08 | 1,39E-14 | 1,99E-09 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Acidification terrestrial and freshwater [Mole of H ⁺ eq.] | 5,97E-03 | 2,91E-04 | 4,61E-04 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Eutrophication freshwater [kg P eq.] | 3,60E-05 | 6,94E-07 | 9,81E-06 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Eutrophication marine [kg N eq.] | 2,43E-03 | 1,06E-04 | 2,20E-04 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Eutrophication terrestrial [Mole of N eq.] | 2,49E-02 | 1,23E-03 | 1,85E-03 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Photochemical ozone formation - human health [kg NMVOC eq.] | 5,64E-03 | 2,57E-04 | 5,92E-04 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Resource use, mineral and metals [kg Sb eq.] ³ | 1,55E-06 | 1,94E-08 | 1,05E-07 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Resource use, energy carriers [MJ] ¹ | 1,18E+01 | 3,11E+00 | 1,18E+00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Water deprivation potential [m ³ world equiv.] ¹ | 7,94E-01 | 2,09E-03 | 7,93E-02 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

³ Disclaimer 2: The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator

^(a) The total global warming potential (GWP-total) is the sum of GWP fossil. GWP biogenic and GWP land use change











Environmental Impacts – 100 % renewable electricity with GO's

| Environmental indicators | | 100% recycling | | | | | 100% landfill | | | | |
|---|--|--------------------------------|--------------|---------------------|-------------|----------------------------------|--------------------------------|--------------|---------------------|-------------|----------------------------------|
| | | END OF LIFE STAGE | | | | REUSE, RECOVERY, RECYCLING | END OF LIFE STAGE | | | | REUSE, RECOVERY, RECYCLING |
| | | C1 Deconstruction / demolition | C2 Transport | C3 Waste processing | C4 Disposal | | C1 Deconstruction / demolition | C2 Transport | C3 Waste processing | C4 Disposal | |
|  | Climate Change (total) [kg CO ₂ eq.] ^(a) | 5,26E-02 | 2,31E-01 | 6,34E-01 | 6,64E-03 | 5,08E-02 | 5,26E-02 | 3,93E-02 | 0,00E+00 | 9,24E-01 | -3,47E-02 |
| | Climate Change (fossil) [kg CO ₂ eq.] | 5,26E-02 | 2,27E-01 | 7,17E-02 | 5,07E-03 | 5,04E-02 | 5,26E-02 | 3,86E-02 | 0,00E+00 | 7,52E-02 | -4,16E-02 |
| | Climate Change (biogenic) [kg CO ₂ eq.] | 7,12E-05 | 2,92E-03 | 5,62E-01 | 1,56E-03 | 3,55E-04 | 7,12E-05 | 4,97E-04 | 0,00E+00 | 8,49E-01 | 5,75E-03 |
| | Climate Change (land use change) [kg CO ₂ eq.] | 5,55E-06 | 1,28E-03 | 9,87E-05 | 1,46E-05 | 6,50E-05 | 5,55E-06 | 2,17E-04 | 0,00E+00 | 9,18E-05 | 1,16E-03 |
|  | Ozone depletion [kg CFC-11 eq.] | 1,12E-08 | 1,37E-14 | 1,42E-08 | 1,88E-17 | 2,08E-10 | 1,12E-08 | 2,34E-15 | 0,00E+00 | 2,64E-08 | 1,89E-08 |
|  | Acidification terrestrial and freshwater [Mole of H ⁺ eq.] | 5,46E-04 | 2,82E-04 | 4,55E-04 | 3,64E-05 | 2,20E-04 | 5,46E-04 | 4,80E-05 | 0,00E+00 | 6,85E-04 | 8,10E-04 |
|  | Eutrophication freshwater [kg P eq.] | 1,63E-06 | 6,83E-07 | 7,95E-06 | 8,71E-09 | 6,69E-06 | 1,63E-06 | 1,16E-07 | 0,00E+00 | 5,98E-06 | 1,76E-04 |
| | Eutrophication marine [kg N eq.] | 2,42E-04 | 1,02E-04 | 1,68E-04 | 9,36E-06 | 6,75E-05 | 2,42E-04 | 1,73E-05 | 0,00E+00 | 2,32E-04 | 3,00E-04 |
| | Eutrophication terrestrial [Mole of N eq.] | 2,65E-03 | 1,18E-03 | 1,75E-03 | 1,03E-04 | 6,27E-04 | 2,65E-03 | 2,02E-04 | 0,00E+00 | 2,54E-03 | 1,83E-03 |
|  | Photochemical ozone formation - human health [kg NMVOC eq.] | 7,29E-04 | 2,49E-04 | 5,18E-04 | 2,83E-05 | 1,88E-04 | 7,29E-04 | 4,24E-05 | 0,00E+00 | 8,38E-04 | 6,01E-04 |
|  | Resource use, mineral and metals [kg Sb eq.] ⁴ | 2,70E-08 | 1,91E-08 | 4,62E-07 | 4,55E-10 | 5,93E-08 | 2,70E-08 | 3,26E-09 | 0,00E+00 | 1,50E-07 | 1,01E-06 |
| | Resource use, energy carriers [MJ] ¹ | 7,18E-01 | 3,06E+00 | 1,17E+00 | 6,65E-02 | 8,90E-01 | 7,18E-01 | 5,21E-01 | 0,00E+00 | 1,96E+00 | 9,50E-02 |
|  | Water deprivation potential [m ³ world equiv.] ¹ | 1,77E-03 | 2,05E-03 | 2,91E-02 | 5,31E-04 | 1,46E-02 | 1,77E-03 | 3,50E-04 | 0,00E+00 | 8,48E-02 | 1,26E-01 |

⁴ Disclaimer 2: The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator











^(a) The total global warming potential (GWP-total) is the sum of GWP fossil. GWP biogenic and GWP land use change

Resources Use – 100 % renewable electricity with GO's

| | | PRODUCT STAGE | CONSTRUCTION STAGE | | USE STAGE | | | | | | |
|---|---|------------------|-----------------------|-----------------|-----------|----------------|-----------|----------------|------------------|---------------------------|--------------------------|
| Resources Use indicators | | A1 / A2 / A3 | A4 Transport | A5 Installation | B1 Use | B2 Maintenance | B3 Repair | B4 Replacement | B5 Refurbishment | B6 Operational energy use | B7 Operational water use |
|  | Use of renewable primary energy (PERE) [MJ] | 4,60E+01 | 1,77E-01 | 2,45E+00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Primary energy resources used as raw materials (PERM) [MJ] * | 5,75E+00 | 0 | 3,90E-02 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Total use of renewable primary energy resources (PERT) [MJ] | 5,17E+01 | 1,77E-01 | 2,49E+00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Use of non-renewable primary energy (PENRE) [MJ] | 1,16E+01 | 3,12E+00 | 1,17E+00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Non-renewable primary energy resources used as raw materials (PENRM) [MJ] * | 6,52E-01 | 0 | -1,11E-01 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Total use of non-renewable primary energy resources (PENRT) [MJ] | 1,22E+01 | 3,12E+00 | 1,05E+00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Input of secondary material (SM) [kg] | 1,67E+00 | 0 | 8,51E-02 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Use of renewable secondary fuels (RSF) [MJ] | 2,31E-24 | 0 | 1,18E-25 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Use of non-renewable secondary fuels (NRSF) [MJ] | 2,713E-23 | 0 | 1,39E-24 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Use of net fresh water (FW) [m³] | 2,16E-02 | 2,00E-04 | 2,00E-03 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |









* For this study, both the product and its packaging are reported in the indicators "Use of renewable primary energy resources used as raw materials" ("PERM") and "Use of non-renewable primary energy resources used as raw materials" ("PENRM"). PERM and PENRM are reported as negative values when materials are recycled or recovered, but not when landfilled.

Resources Use – 100 % renewable electricity with GO's

| Resources Use indicators | | 100% recycling | | | | | 100% landfill | | | | |
|---|---|-----------------------------------|--------------|---------------------|-------------|----------------------------------|-----------------------------------|--------------|---------------------|-------------|----------------------------------|
| | | END OF LIFE STAGE | | | | REUSE, RECOVERY, RECYCLING | END OF LIFE STAGE | | | | REUSE, RECOVERY, RECYCLING |
| | | C1 Deconstruction / demolition | C2 Transport | C3 Waste processing | C4 Disposal | | C1 Deconstruction / demolition | C2 Transport | C3 Waste processing | C4 Disposal | |
|  | Use of renewable primary energy (PERE) [MJ] | 4,06E-03 | 1,74E-01 | 1,78E-01 | 8,71E-03 | 2,61E-01 | 4,06E-03 | 2,96E-02 | 0 | 3,32E-02 | 1,25E+00 |
|  | Primary energy resources used as raw materials (PERM) [MJ] * | 0 | 0 | -5,51E+00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Total use of renewable primary energy resources (PERT) [MJ] | 4,06E-03 | 1,74E-01 | -5,33E+00 | 8,71E-03 | 2,61E-01 | 4,06E-03 | 2,96E-02 | 0 | 3,32E-02 | 1,25E+00 |
|  | Use of non-renewable primary energy (PENRE) [MJ] | 7,18E-01 | 3,07E+00 | 1,17E+00 | 6,65E-02 | 8,92E-01 | 7,18E-01 | 5,22E-01 | 0 | 1,96E+00 | 9,33E-02 |
|  | Non-renewable primary energy resources used as raw materials (PENRM) [MJ] * | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Total use of non-renewable primary energy resources (PENRT) [MJ] | 7,18E-01 | 3,07E+00 | 1,16E+00 | 6,65E-02 | 8,92E-01 | 7,18E-01 | 5,22E-01 | 0 | 1,96E+00 | 9,52E-02 |
|  | Input of secondary material (SM) [kg] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Use of renewable secondary fuels (RSF) [MJ] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Use of non-renewable secondary fuels (NRSF) [MJ] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Use of net fresh water (FW) [m³] | 4,11E-05 | 1,97E-04 | 6,78E-04 | 1,68E-05 | 3,35E-04 | 4,11E-05 | 3,35E-05 | 0 | 1,98E-03 | -1,37E-04 |

* For this study, both the product and its packaging are reported in the indicators "Use of renewable primary energy resources used as raw materials" ("PERM") and "Use of non-renewable primary energy resources used as raw materials" ("PENRM"). PERM and PENRM are reported as negative values when materials are recycled or recovered, but not when landfilled.

Waste Category & Output flows - 100 % renewable electricity with GO's





| Waste Category & Output Flows | | PRODUCT STAGE | CONSTRUCTION STAGE | | USE STAGE | | | | | | |
|---|--|---------------|--------------------|-----------------|-----------|----------------|-----------|----------------|------------------|---------------------------|--------------------------|
| | | A1 / A2 / A3 | A4 Transport | A5 Installation | B1 Use | B2 Maintenance | B3 Repair | B4 Replacement | B5 Refurbishment | B6 Operational energy use | B7 Operational water use |
|  | Hazardous waste disposed (HWD) [kg] | 9,30E-06 | 1,49E-11 | 6,12E-07 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Non-hazardous waste disposed (NHWD) [kg] | 7,11E-02 | 4,47E-04 | 2,19E-01 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Radioactive waste disposed (RWD) [kg] | 1,41E-04 | 3,84E-06 | -1,04E-05 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Components for re-use (CRU) [kg] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Materials for Recycling (MFR) [kg] | 2,85E-02 | 0 | 6,37E-01 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Material for Energy Recovery (MER) [kg] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Exported electrical energy (EEE) [MJ] | 0 | 0 | 2,47E-02 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Exported thermal energy (EET) [MJ] | 0 | 0 | 4,40E-02 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Waste Category & Output flows - 100% renewable electricity with GO's

| Waste Category & Output Flows | | 100% recycling | | | | | 100% landfill | | | | |
|---|--|--------------------------------|--------------|---------------------|-------------|----------------------------|--------------------------------|--------------|---------------------|-------------|----------------------------|
| | | END OF LIFE STAGE | | | | REUSE, RECOVERY, RECYCLING | END OF LIFE STAGE | | | | REUSE, RECOVERY, RECYCLING |
| | | C1 Deconstruction / demolition | C2 Transport | C3 Waste processing | C4 Disposal | | C1 Deconstruction / demolition | C2 Transport | C3 Waste processing | C4 Disposal | |
|  | Hazardous waste disposed (HWD) [kg] | 1,97E-06 | 1,47E-11 | 2,70E-06 | 1,01E-09 | 5,62E-08 | 1,97E-06 | 2,50E-12 | 0 | 2,75E-06 | 2,99E-06 |
|  | Non-hazardous waste disposed (NHWD) [kg] | 4,12E-03 | 4,39E-04 | 6,62E-02 | 3,35E-01 | -8,43E-05 | 4,12E-03 | 7,48E-05 | 0 | 1,30E+01 | 7,33E-02 |
|  | Radioactive waste disposed (RWD) [kg] | 4,98E-06 | 3,78E-06 | 8,48E-06 | 7,57E-07 | 1,23E-04 | 4,98E-06 | 6,43E-07 | 0 | 1,34E-05 | -6,93E-05 |
|  | Components for re-use (CRU) [kg] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Materials for Recycling (MFR) [kg] | 0 | 0 | 1,27E+01 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Material for Energy Recovery (MER) [kg] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Exported electrical energy (EEE) [MJ] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Exported thermal energy (EET) [MJ] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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