



# ENVIRONMENTAL PRODUCT DECLARATION

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

**ORAE**

5 mm

Clear float glass

Version 1

Date of publication: 2023-12-21

Validity: 5 years

Date of validity: 2028-12-20

Scope of the EPD®: Europe



THE INTERNATIONAL EPD® SYSTEM

The International EPD® System  
Programme operator: EPD international AB  
[www.environdec.com](http://www.environdec.com)  
Registration number: S-P-09500



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# General information

## Company information

**Manufacturer:** Saint-Gobain Glass FRANCE, 12 place de l'Iris, 92096 La Défense

**Production plant:** SAINT-GOBAIN GLASS INDUSTRY –

- France: 249 Bd Drion, 59580 Aniche
- Spain: Av. Lugo, 112, 33401 Avilés, Asturias
- Germany: Solarstraße 1, 04860 Torgau

**Management system-related certification:** Glass products are manufactured in production plants with an integrated management system certified according to ISO 9001:2015, ISO 14001:2015 and OHSAS 18001:2009 standards.

**Owner of the declaration:** Saint-Gobain Glass Industry, Europe

**Product name and manufacturer represented:** ORAÉ® produced by SAINT-GOBAIN GLASS INDUSTRY

**EPD® prepared by:** Amelie Briend (Saint-Gobain), Marie-Charlotte Harquet (Saint-Gobain LCA central team) and Paolo Junior Mrad (Saint-Gobain LCA central team)

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**Geographical scope of the EPD®:** Europe, cradle to grave and module D

**EPD® registration number:** S-P-09500

**Declaration issued:** 2023\_12\_21, date of validity: 2028\_12\_20

## Programme information

**PROGRAMME:** The International EPD® System

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CEN standard EN 15804:2012 + A2:2019 serves as the Core Product Category Rules (PCR)

**Product category rules (PCR):** PCR 2019:14 Construction Products, version 1.2.5 and its c-PCR-009 Flat glass products used in buildings and other construction works (EN17074:2019).

**Prepared by:** IVL Swedish Environmental Research Institute, EPD International Secretariat

**UN CPC CODE:** 3711 - Unworked glass, flat glass and pressed or moulded glass for construction; glass mirrors

**PCR review was conducted by:** The Technical Committee of the International EPD® System. See [www.environdec.com](http://www.environdec.com) for a list of members.

**President:** Claudia A. Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat [www.environdec.com/contact](http://www.environdec.com/contact) - Contact via [info@environdec.com](mailto:info@environdec.com)

**Independent third-party verification of the declaration and data, according to ISO 14025:2006:**

EPD process certification     EPD verification

**Demonstration of verification:** an independent verification of the declaration was made, according to ISO 14025:2010. This verification was external and conducted by the following third party based on the PCR mentioned above.

**Third party verifier:** ELYS CONSEIL

Yannick LE GUERN - [yannick.leguern@elys-conseil.com](mailto:yannick.leguern@elys-conseil.com)

Approved by: The International EPD© System

**Procedure for follow-up of data during EPD validity involves third part verifier:**  Yes     No

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but registered in different EPD programmes may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison."

## Product information

### Product description and description of use

This Environmental Product Declaration (EPD<sup>®</sup>) describes the environmental impacts of 1 m<sup>2</sup> of clear float glass ORAÉ<sup>®</sup> to 5 mm with a light transmittance of maximum 90%, for an expected average service life of 30 years.

This EPD is an average of 3 glass production sites in Europe. All the sites producing the flat glass ORAÉ<sup>®</sup> are considered<sup>1</sup>. The average calculated is a weighted arithmetic mean.

ORAÉ<sup>®</sup> can be incorporated into a building, furniture or industrial application. The impacts of installation are not taken into account.

ORAÉ<sup>®</sup> is a float glass with a low embodied carbon thanks to a substantial R&D effort and the excellence of our industrial teams. ORAÉ<sup>®</sup> is offering exactly the same aesthetics than the regular clear float glass PLANICLEAR<sup>®</sup>.

ORAÉ<sup>®</sup> is a basic soda-lime silicate glass produced using the float procedure to be used in building, furniture & industrial applications. This glass is in conformity with the European Standard EN 572-2.

### Technical data/physical characteristics :

|  |             |
|--|-------------|
| Thickness (mm)                             | 5 mm        |
| <b>Visible parameters</b>                  |             |
| <b>Light transmittance (LT) %</b>          | <b>90</b>   |
| <b>External light reflection (RLE) (%)</b> | <b>8</b>    |
| <b>Energetic parameters</b>                |             |
| <b>Energy transmittance (ET) %</b>         | <b>85</b>   |
| <b>Energy absorbance (EA) %</b>            | <b>6</b>    |
| <b>Solar factor g</b>                      | <b>0.87</b> |

Table 1: Performance Data of ORAÉ<sup>®</sup> 5 mm

The performance data are given according to the EN 410-2011 standard.

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Countries considered for the production of ORAÉ<sup>®</sup>: Germany, Spain, France

## Declaration of the main product components and/or materials

The product is 100% glass CAS number 65997-17-3, EINECS number 266-046-0.

Description of the main components for 1 m<sup>2</sup> of ORAÉ® 5 mm.

| PARAMETER   | VALUE   |
|---|---------|
| Quantity of glass for 1 m <sup>2</sup> of product | 12.5 kg |
| Thickness   | 5 mm    |
| Packaging for the transportation and distribution | 0 kg    |
| Product used for the Installation                 | NA      |

There is no “Substance of Very High Concern” (SVHC) in concentration above 0.1% by weight, and neither do their packaging, following the European REACH regulation (Registration, Evaluation, Authorization and Restriction of Chemicals).

**Packaging and product used: None**

## Description of the main product components and/or materials:

All raw materials contributing more than 5% to any environmental impact are listed in the following table.

| Product components  | Weight (%)  | Post-consumer material weight (%) | Weight biogenic carbon kg C/kg |
|---------------------|-------------|-----------------------------------|--------------------------------|
| Sand                | 20 – 30 %   | NA                                | NA                             |
| Cullet              | 55 – 65 %*  | 1 - 3 %*                          | NA                             |
| Sodium carbonate    | 5 – 10 %    | NA                                | NA                             |
| Limestone           | 1 – 5 %     | NA                                | NA                             |
| Other               | < 1%        | NA                                | NA                             |
| <b>Sum</b>          | <b>100%</b> | <b>1-3%</b>                       |                                |
| Packaging materials | Weight (%)  | Weight (%)                        | Weight biogenic carbon kg C/kg |
| NA                  | NA          | NA                                | NA                             |

\* More information at page 20.

## LCA calculation information

|  |   |
|--|---|
| <b>TYPE OF EPD</b>                           | Cradle to grave and module D<br>Mandatory Stages = A1-A3 ; B1-B7 ; C1-C4 and D  |
| <b>FUNCTIONAL UNIT/DECLARED UNIT</b>         | 1 m <sup>2</sup> ORAÉ® 5 mm with a light transmittance of maximum 90%, for an expected average service life of 30 years.  |
| <b>SYSTEM BOUNDARIES</b>                     | Cradle to grave and module D<br>Mandatory Stages = A1-A3 ; B1-B7 ; C1-C4 and D  |
| <b>REFERENCE SERVICE LIFE (RSL)</b>          | According to PCR EN 17074:2019, the reference service life is 30 years  |
| <b>CUT-OFF RULES</b>                         | According to EN 15804+A2, the energy used for the installation of 1m <sup>2</sup> of glass and the transport glass racks are included in the cut-off-rules.   |
| <b>ALLOCATIONS</b>                           | Pre-consumer cullet from downstream processing has a contribution to overall income less than 1%. Thus, according to § 6.4.3.2 of the EN 15804+A2 standard, no impact other than pre-treatment before reintroduction into the glass furnace are considered. |
| <b>GEOGRAPHICAL COVERAGE AND TIME PERIOD</b> | The information was established over the year 2022<br>The information collected comes from the European sites producing ORAÉ® (SAINT-GOBAIN GLASS INDUSTRY: Aviles (Spain), Aniche (France), and Torgau (Germany)).   |
| <b>BACKGROUND DATA SOURCE</b>                | GaBi data were used to evaluate the environmental impacts. The data are representative of the years 2015-2019.  |
| <b>SOFTWARE</b>                              | GaBi 10   |

According to EN 15804+A2, EPD of construction products may not be comparable if they do not comply with this standard. According to ISO 21930:2017, EPD might not be comparable if they are from different programmes.

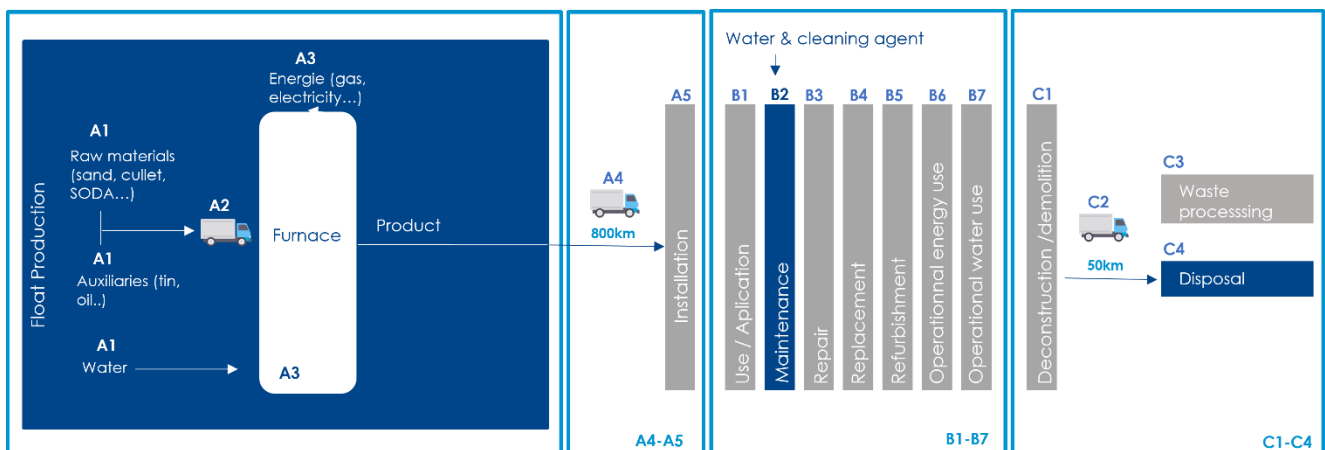
## LCA scope

System boundaries (X=included. MND=module not declared)

|                    | PRODUCT STAGE       |           |               | CONSTRUCTION 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                                |
| Module             | 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   |
| Geography          | EU-27               |           |               |                    |                                   |           |             |        |             |               |                        |                       |                            |           |                  |          |   |
| Specific data used | <90 % GWP-GHG       |           |               |                    |                                   |           |             |        |             |               |                        |                       |                            |           |                  |          |   |
| Variation products | Not relevant        |           |               |                    |                                   |           |             |        |             |               |                        |                       |                            |           |                  |          |   |
| Variation sites    | -7 to +1%           |           |               |                    |                                   |           |             |        |             |               |                        |                       |                            |           |                  |          |   |

According to the PCR, the variation for the GWP indicators (GWP-GHG) has been calculated for the different sites and compared to the product groups formed as averages (similar products from different plants). The variation between the different manufacturing sites and the average is from -7% to 1%. The variation of the sites comes from energy efficiency and the energy mix of the countries. For example, some plants use green electricity and can increase the variability.

## Life cycle stages



## **A1-A3, Product stage**

### **Description of the stage:**

For flat glass A1 to A3 represents the production of glass in the float from cradle to gate.

Description of the stage: the product stage of flat glass is subdivided into 3 modules A1, A2 and A3 respectively “Raw material supply”, “transport to manufacturer” and “manufacturing”.

### **Description of the scenarios and other additional technical information:**

#### **A1, Raw materials supply**

This includes the extraction and processing of all raw materials and energy which occur upstream from the manufacturing process.

#### **A2, Transport to the manufacturer**

The raw materials are transported to the manufacturing site. The modelling includes road, boat and/or train transportations of each raw material.

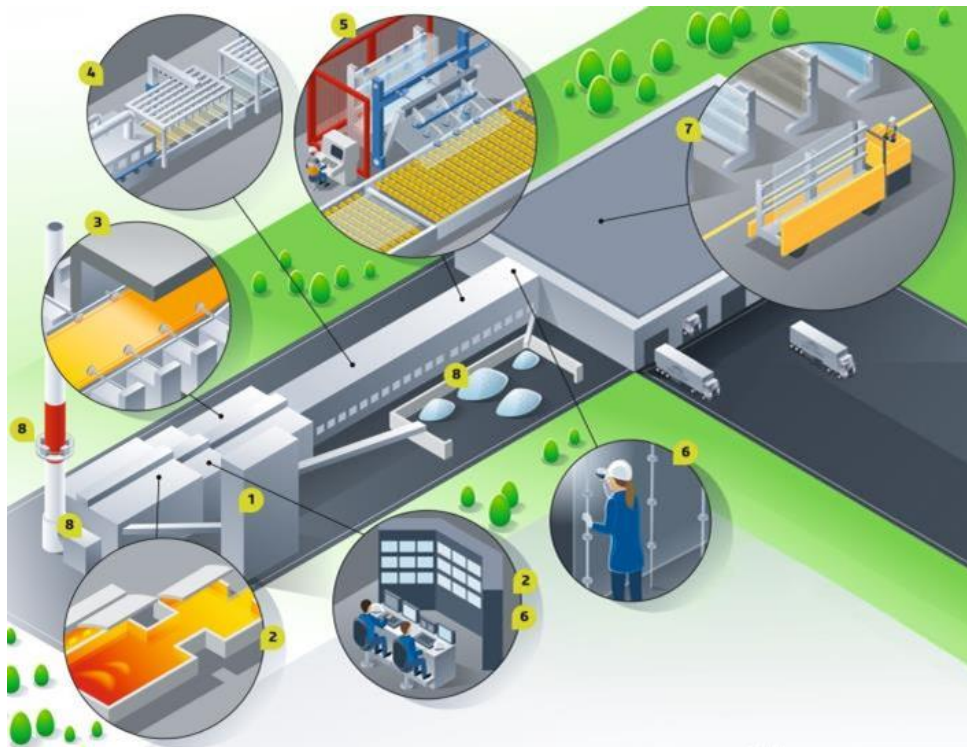
#### **A3, Manufacturing**

This module includes the manufacture of products and the manufacture of packaging. The production of packaging material is taken into account at this stage. The processing of any waste arising from this stage is also included.

The product stage includes the extraction and processing of raw materials and energies, transport to the manufacturer, manufacturing and processing of flat glass.

## Manufacturing process flow diagram

### System diagram:



1. **BATCH MIXER:** Mix of raw materials (silica, soda ash, lime, feldspar and dolomite) to which is added recycled glass (cullet) and other compounds depending on the desired color and properties.
2. **FUSION FURNACE:** Raw materials are melted at 1,550°C in a furnace.
3. **FLOAT:** The molten glass is fed into a bath of molten tin. The glass floats on this flat surface and is drawn off in a ribbon. Serrated wheels, or top rolls, pull and push the glass sideways depending on the desired thickness.
4. **ANNEALING LEHR:** The glass is lifted onto conveyor rollers and passes through a controlled cooling tunnel measuring more than 100 meters in length. Approximately 600°C at the start of this step, the glass exits the lehr at room temperature.
5. **CUTTING AND STACKING:** The glass is automatically cut lengthwise and crosswise. The sheets of glass are raised by vacuum frames that then place them on glass stillages.
6. **QUALITY:** Automatic inspections and regular samples are taken to check the quality of the glass at each step in the glassmaking process.
7. **STORAGE AND TRANSPORTATION:** The stillages are placed on storage racks in the warehouse.
8. **ENVIRONMENT:** Use of recycled cullet, installation of pollution abatement systems and closed-circuit management of water: every measure is taken to limit the consumption of energy, extraction of natural resources, production of waste and emissions into the atmosphere.

The flat glass is transported on dedicated racks, used many times. This racks are not considered according to the cut-off rules requirements.

### A4-A5, Construction process stage

**Description of the stage:** The construction process is divided into 2 modules: A4, transport to the building site and A5, installation in the building.

#### A4, Transport to the building site:

This module includes transport from the production gate to the building site. Transport is calculated on the basis of a scenario with the parameters described in the following table

| PARAMETER  | VALUE   |
|--|---|
| Fuel type and consumption of vehicle or vehicle type used for transport e.g. long distance truck, boat, etc. | Freight truck trailer with a 27t payload, diesel consumption 38 liters for 100 km |
| Distance   | 803 km  |
| Capacity utilisation (including empty returns)   | 100% of the capacity in volume  |
| Bulk density of transported products*  | 30 % of empty returns in mass   |
| Volume capacity utilisation factor   | 2500 kg/m3  |

#### A5, Installation in the building:

The accompanying table quantifies the parameters for installing the product at the building site. All installation materials and their waste processing are included.

| PARAMETER   | VALUE/DESCRIPTION   |
|---|---|
| Wastage of materials on the building site before waste processing, generated by the product's installation (specified by type)  | According to PCR EN 17074, no waste is considered   |
| 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) | None  |
| Ancillary materials for installation (specified by materials)   | According to PCR NF EN 17074, none ancillary materials considered   |
| Other resource use  | None  |
| Quantitative description of energy type (regional mix) and consumption during the installation process  | According to EN 15804+A1 , the energy needed during the installation is less than 0,1% of the total life cycle energy. It's include in the cut-off-rules. |
| Direct emissions to ambient air, soil and water   | None  |

#### 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

## B2, Maintenance:

| PARAMETER  | VALUE  |
|--|--|
| Maintenance process  | Water and cleaning agent                               |
| Maintenance cycle  | Annual average   |
| Ancillary materials for maintenance (e.g. cleaning agent, specify materials) | cleaning agent : 0,001 kg/m <sup>2</sup> of glass/year |
| Wastage material during maintenance (specify materials)                      | 0 kg   |
| Net fresh water consumption during maintenance                               | 0,2 kg/m <sup>2</sup> of glass/year                    |
| Energy input during maintenance  | None required during product lifetime                  |

### Description of the scenarios and additional technical information:

The product has a reference service life of 30 years. This assumes that the product will last in situ with no requirements for repair, replacement or refurbishment throughout this period. Therefore, it has no impact at this stage, except for maintenance.

According to PCR EN 17074, only the maintenance by cleaning glass with water and cleaning agent is included in this study.

## C1-C4, End of Life Stage

**Description of the stage:** this stage includes the next modules:

- C1, Deconstruction, demolition
- C2, Transport to waste processing
- C3, Waste processing for reuse, recovery and/or recycling
- C4, Disposal

End of life scenario used in this study is:

100% of glass is landfilled and the distance to the landfill site considered is 50 km.

### Description of the scenarios and additional technical information:

| PARAMETER  | VALUE/DESCRIPTION |
|--|-------------------|
| Thickness (mm)   | 5                 |
| Collection process specified by type                       | 12.5 kg           |
| Recovery system specified by type                          | 0 kg              |
| Disposal specified by type                                 | 12.5 kg           |
| Assumptions for scenario development (e.g. transportation) | 50 km to landfill |

## D, Reuse/recovery/recycling potential

Module D quantifies the potential costs and benefits of end-of-life recovery. The end-of-life scenario used is 100% landfill. The declared module D is null.

## LCA results

Product Environmental Footprint (PEF) method has been used as the impact model. Specific data has been supplied by the plant, and generic data come from GaBi and ecoinvent databases.

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

Raw materials and energy consumption, as well as transport distances have been taken directly from the manufacturing plant (Production data according 2022)

All result tables refer to a functional unit/declared unit of 1 m<sup>2</sup> of flat glass and an expected average service life of 30 years.

Disclaimer 1: 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 following indicators:








- Resource use, mineral and metals [kg Sb eq.]
- Resource use, energy carriers [MJ]
- Water deprivation potential [m<sup>3</sup> world equiv.]

Disclaimer 2: The following optional indicators are not declared:

- Ecotoxicity freshwater [CTUe]
- Particulate Matter emissions [Disease incidence]
- Cancer human health effects [CTUh]
- Ionizing radiation - human health [kBq U235 eq.]
- Non-cancer human health effects [CTUh]
- Land Use [Pt]











Disclaimer 3: It is recommended to use the results of modules A1-A3 (A1-A5 for services) without considering the results of module C.

## Environmental Impacts









| Environmental indicators  |   | PRODUCT STAGE | CONSTRUCTION STAGE |                 | USE STAGE |                |           |                |                  |                           |                          | END OF LIFE STAGE              |              |                     |             | REUSE, RECOVERY, RECYCLING   |
|---|---|---------------|--------------------|-----------------|-----------|----------------|-----------|----------------|------------------|---------------------------|--------------------------|--------------------------------|--------------|---------------------|-------------|------------------------------|
|   |   | 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 |
|    | Climate Change [kg CO2 eq.] <sup>2</sup>                    | 7,35E+00      | 4,90E-01           | 0               | 0         | 1,84E-01       | 0         | 0              | 0                | 0                         | 0                        | 0                              | 3,05E-02     | 0                   | 1,99E-01    | 0                            |
|   | Climate Change (fossil) [kg CO2 eq.]                        | 7,33E+00      | 4,81E-01           | 0               | 0         | 8,08E-02       | 0         | 0              | 0                | 0                         | 0                        | 0                              | 2,99E-02     | 0                   | 1,90E-01    | 0                            |
|   | Climate Change (biogenic) [kg CO2 eq.]                      | 1,36E-02      | 5,26E-03           | 0               | 0         | 3,05E-02       | 0         | 0              | 0                | 0                         | 0                        | 0                              | 3,28E-04     | 0                   | 8,00E-03    | 0                            |
|   | Climate Change (land use change) [kg CO2 eq.]               | 4,29E-03      | 3,99E-03           | 0               | 0         | 7,28E-02       | 0         | 0              | 0                | 0                         | 0                        | 0                              | 2,48E-04     | 0                   | 5,46E-04    | 0                            |
|    | Ozone depletion [kg CFC-11 eq.]                             | 5,88E-09      | 5,92E-17           | 0               | 0         | 4,39E-09       | 0         | 0              | 0                | 0                         | 0                        | 0                              | 3,68E-18     | 0                   | 7,03E-16    | 0                            |
|    | Acidification terrestrial and freshwater [Mole of H+ eq.]   | 3,55E-02      | 2,09E-03           | 0               | 0         | 4,99E-04       | 0         | 0              | 0                | 0                         | 0                        | 0                              | 1,30E-04     | 0                   | 1,36E-03    | 0                            |
|    | Eutrophication freshwater [kg P eq.]                        | 5,89E-05      | 1,50E-06           | 0               | 0         | 3,23E-05       | 0         | 0              | 0                | 0                         | 0                        | 0                              | 9,32E-08     | 0                   | 3,26E-07    | 0                            |
|   | Eutrophication marine [kg N eq.]                            | 7,83E-03      | 9,80E-04           | 0               | 0         | 5,33E-04       | 0         | 0              | 0                | 0                         | 0                        | 0                              | 6,10E-05     | 0                   | 3,50E-04    | 0                            |
|   | Eutrophication terrestrial [Mole of N eq.]                  | 8,50E-02      | 1,09E-02           | 0               | 0         | 1,38E-03       | 0         | 0              | 0                | 0                         | 0                        | 0                              | 6,78E-04     | 0                   | 3,85E-03    | 0                            |
|  | Photochemical ozone formation - human health [kg NMVOC eq.] | 2,22E-02      | 2,64E-03           | 0               | 0         | 3,22E-04       | 0         | 0              | 0                | 0                         | 0                        | 0                              | 1,64E-04     | 0                   | 1,06E-03    | 0                            |
|  | Resource use, mineral and metals [kg Sb eq.]                | 1,37E-06      | 3,53E-08           | 0               | 0         | 2,55E-06       | 0         | 0              | 0                | 0                         | 0                        | 0                              | 2,20E-09     | 0                   | 1,70E-08    | 0                            |
|   | Resource use, energy carriers [MJ] <sup>1</sup>             | 9,64E+01      | 6,55E+00           | 0               | 0         | 1,38E+00       | 0         | 0              | 0                | 0                         | 0                        | 0                              | 4,08E-01     | 0                   | 2,49E+00    | 0                            |
|  | Water deprivation potential [m <sup>3</sup> world equiv.]   | 1,62E+00      | 4,40E-03           | 0               | 0         | 3,27E-01       | 0         | 0              | 0                | 0                         | 0                        | 0                              | 2,74E-04     | 0                   | 1,99E-02    | 0                            |

<sup>2</sup> The total global warming potential (GWP-total) is the sum of GWP fossil, GWP biogenic, and GWP land use change.


# Resources Use

| Resources Use indicators   | PRODUCT STAGE | CONSTRUCTION STAGE |                 | USE STAGE |                |           |                |                  |                           |                          | END OF LIFE STAGE              |              |                     |             | D REUSE, RECOVERY, RECYCLING |
|--|---------------|--------------------|-----------------|-----------|----------------|-----------|----------------|------------------|---------------------------|--------------------------|--------------------------------|--------------|---------------------|-------------|------------------------------|
|  | 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 |
|  Use of renewable primary energy (PERE) [MJ]                                | 1,24E+01      | 3,68E-01           | 0               | 0         | 7,69E-01       | 0         | 0              | 0                | 0                         | 0                        | 0                              | 2,29E-02     | 0                   | 3,26E-01    | 0                            |
|  Primary energy resources used as raw materials (PERM) [MJ]                 | 0             | 0                  | 0               | 0         | 0              | 0         | 0              | 0                | 0                         | 0                        | 0                              | 0            | 0                   | 0           | 0                            |
|  Total use of renewable primary energy resources (PERT) [MJ]                | 1,24E+01      | 3,68E-01           | 0               | 0         | 7,69E-01       | 0         | 0              | 0                | 0                         | 0                        | 0                              | 2,29E-02     | 0                   | 3,26E-01    | 0                            |
|  Use of non-renewable primary energy (PENRE) [MJ]                           | 9,67E+01      | 6,56E+00           | 0               | 0         | 1,38E+00       | 0         | 0              | 0                | 0                         | 0                        | 0                              | 4,08E-01     | 0                   | 2,49E+00    | 0                            |
|  Non-renewable primary energy resources used as raw materials (PENRM) [MJ] | 0             | 0                  | 0               | 0         | 0              | 0         | 0              | 0                | 0                         | 0                        | 0                              | 0            | 0                   | 0           | 0                            |
|  Total use of non-renewable primary energy resources (PENRT) [MJ]         | 9,67E+01      | 6,56E+00           | 0               | 0         | 1,48E+00       | 0         | 0              | 0                | 0                         | 0                        | 0                              | 4,08E-01     | 0                   | 2,49E+00    | 0                            |
|  Input of secondary material (SM) [kg]                                    | 8,01E+00      | 0                  | 0               | 0         | 0              | 0         | 0              | 0                | 0                         | 0                        | 0                              | 0            | 0                   | 0           | 0                            |
|  Use of renewable secondary fuels (RSF) [MJ]                              | 4,49E-22      | 0                  | 0               | 0         | 0              | 0         | 0              | 0                | 0                         | 0                        | 0                              | 0            | 0                   | 0           | 0                            |
|  Use of non-renewable secondary fuels (NRSF) [MJ]                         | 5,27E-21      | 0                  | 0               | 0         | 0              | 0         | 0              | 0                | 0                         | 0                        | 0                              | 0            | 0                   | 0           | 0                            |
|  Use of net fresh water (FW) [m3]   | 2,23E-02      | 4,27E-04           | 0               | 0         | 7,61E-03       | 0         | 0              | 0                | 0                         | 0                        | 0                              | 2,66E-05     | 0                   | 6,27E-04    | 0                            |

## Waste Category & Output flows


| Waste Category & Output Flows   | PRODUCT STAGE | CONSTRUCTION STAGE |                 | USE STAGE |                |           |                |                  |                            |                          | END OF LIFE STAGE              |              |                     |             | D REUSE, RECOVERY, RECYCLING |
|---|---------------|--------------------|-----------------|-----------|----------------|-----------|----------------|------------------|----------------------------|--------------------------|--------------------------------|--------------|---------------------|-------------|------------------------------|
|   | A1 / A2 / A3  | A4 Transport       | A5 Installation | B1 Use    | B2 Maintenance | B3 Repair | B4 Replacement | B5 Refurbishment | B6 Operational maintenance | B7 Operational water use | C1 Deconstruction / demolition | C2 Transport | C3 Waste processing | C4 Disposal | D Reuse, recovery, recycling |
|  Hazardous waste disposed (HWD) [kg]       | 2,68E-07      | 3,05E-07           | 0               | 0         | 7,69E-11       | 0         | 0              | 0                | 0                          | 0                        | 0                              | 1,90E-08     | 0                   | 3,79E-08    | 0                            |
|  Non-hazardous waste disposed (NHWD) [kg]  | 1,60E-02      | 1,00E-03           | 0               | 0         | 6,47E-03       | 0         | 0              | 0                | 0                          | 0                        | 0                              | 6,25E-05     | 0                   | 1,25E+01    | 0                            |
|  Radioactive waste disposed (RWD) [kg]     | 6,45E-04      | 8,12E-06           | 0               | 0         | 2,84E-06       | 0         | 0              | 0                | 0                          | 0                        | 0                              | 5,06E-07     | 0                   | 2,83E-05    | 0                            |
|  Components for re-use (CRU) [kg]          | 0             | 0                  | 0               | 0         | 0              | 0         | 0              | 0                | 0                          | 0                        | 0                              | 0            | 0                   | 0           | 0                            |
|  Materials for Recycling (MFR) [kg]       | 0             | 0                  | 0               | 0         | 0              | 0         | 0              | 0                | 0                          | 0                        | 0                              | 0            | 0                   | 0           | 0                            |
|  Material for Energy Recovery (MER) [kg] | 0             | 0                  | 0               | 0         | 0              | 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                        | 0                              | 0            | 0                   | 0           | 0                            |
|  Exported thermal energy (EET) [MJ]      | 0             | 0                  | 0               | 0         | 0              | 0         | 0              | 0                | 0                          | 0                        | 0                              | 0            | 0                   | 0           | 0                            |

# Additional voluntary indicators from EN 15804 (according to ISO 21930:2017)

|   |  | PRODUCT STAGE | CONSTRUCTION STAGE |                 | USE STAGE |                |           |                |                  |                           | END OF LIFE STAGE        |                                |              | REUSE, RECOVERY RECYCLING |             |                              |
|---|--|---------------|--------------------|-----------------|-----------|----------------|-----------|----------------|------------------|---------------------------|--------------------------|--------------------------------|--------------|---------------------------|-------------|------------------------------|
| 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 | C1 Deconstruction / demolition | C2 Transport | C3 Waste processing       | C4 Disposal | D Reuse, recovery, recycling |
|  | Climate Change [kg CO2 eq.] <sup>3</sup> | 6,85E+00      | 4,74E-01           | 0,00E+00        | 0         | 7,92E-02       | 0         | 0              | 0                | 0                         | 0                        | 0                              | 2,95E-02     | 0                         | 1,86E-01    | 0,00E+00                     |

<sup>3</sup> 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. This indicator is thus almost equal to the GWP indicator originally defined in EN 15804:2012+A1:2013.

## Information on biogenic carbon content

|   |   | PRODUCT STAGE       |
|---|---|---------------------|
| <b>Biogenic Carbon Content</b>  |   | <b>A1 / A2 / A3</b> |
|  | Biogenic carbon content in product [kg]   | 0                   |
|  | Biogenic carbon content in packaging [kg] | 0                   |

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO<sub>2</sub>.

There is no biogenic carbon in glass product. Every thickness considered in this EPD have the same value to biogenic carbon 0 kg C. Moreover, there is no packaging considered for glass products.

## Electricity information

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

| TYPE OF INFORMATION  | DESCRIPTION  |
|--|--|
| <b>Location</b>  | Representative of Electricity purchased by Saint-Gobain Europe   |
| <b>Definition of the electricity</b>   | 88 % of the energy consumption is covered by the GOO<br>12 % of residual grid mix  |
| <b>Energy sources for electricity</b>  | Share of energy sources of renewable electricity<br>55 % Wind<br>28 % Hydro power<br>4 % Biomass<br>1 % Solar<br>Share of energy sources of residual mix<br>1.01 % Biomass<br>0.35 % Hard coal<br>0.98 % HFO<br>0.82 % Hydro<br>8.28 % Natural gas<br>82 % Nuclear<br>2.10 % Photovoltaic<br>4.49 % Wind |
| <b>Type of dataset</b>   | Cradle to gate from Gabi and ecoinvent databases   |
| <b>Source</b>  | Guarantee of Origin<br>Dataset GaBi EU-28  |
| <b>CO<sub>2</sub> emission kg CO<sub>2</sub> eq. / kW (residual mix)</b>         | 0.062 kg of CO <sub>2</sub> eq/kWh – Climate change – total indicator<br>Based on Climate Change - fossil indicator  |
| <b>CO<sub>2</sub> emission kg CO<sub>2</sub> eq. / kWh (Guarantee of Origin)</b> | 0.011 kg of CO <sub>2</sub> eq/kWh – Climate change – total indicator<br>Based on Climate Change - fossil indicator  |

## Health transparency

Concerning the indoor air quality, clear flat glass is an inert material that doesn't release any inorganic & organic compounds, in particular no VOC (volatile organic compounds).

## Additional information:

### Data quality

Inventory data quality is judged by geographical, temporal, and technological representativeness. To cover these requirements and to ensure reliable results, first-hand industry data crossed with LCA background datasets were used. The data was collected from internal records and reporting documents. After evaluating the inventory, according to the defined ranking in the LCA report, the assessment reflects good inventory data quality.

| Geographic representativity | Technical representativity | Temporal representativity |
|-----------------------------|----------------------------|---------------------------|
| 1,7                         | 3,0                        | 2,0                       |

## Saint-Gobain's environmental roadmap

At Saint-Gobain, we strive to build a more sustainable and inclusive world. Therefore, to establish our sustainability approach, we have set objectives to reach by 2030 in our key focus areas:

- Reducing CO<sub>2</sub> emissions by 33 % for scope 1 and scope 2, and 16 % for scope 3 compared to 2017 levels
- Advancing a circular economy model by decreasing non-valorised production residue by 80 %, increasing the avoidance of virgin raw materials by 30%, and using 100 % recyclable packaging with at least 30 % recycled or bio-sourced content
- Conducting life-cycle assessments for all our product ranges
- Decreasing industrial water withdrawal by 50 % and eliminating water discharge in areas with a high risk of water scarcity

## Saint-Gobain approach for Sustainable Construction

For us, over their whole life cycle, buildings should enhance people's health & wellbeing while having reduced footprint on the planet. They should offer better economic value and quality for the developers, owners and occupants.

The following information might be of help for green building certification programs:

### RECYCLED CONTENT

*(Required for LEED v4.1 Materials and Resources - Sourcing of raw materials)*

Recycled content: proportion, by mass, of recycled material in a product or packaging. Only pre-consumer and post-consumer materials shall be considered as recycled content.

Post-consumer material: material generated by households or commercial, industrial and institutional facilities in their role as end-users of the product which can no longer be used for its intended purpose. In practice, in the case of flat glass, all material coming from glass recycling collection schemes falls under this category, i.e. glass waste from end-of-life vehicles, construction and demolition waste, etc.

Pre-consumer material: material diverted from the waste stream during a manufacturing process. Excluded is reutilization of materials such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it.

In the case of flat glass, this waste originates from the processing or re-processing of glass that takes place before the final product reaches the consumer market. Pre-consumer waste flat glass is made of cut-offs, losses during laminating, bending and other processing, including the manufacture of insulating glass units or automotive windscreens.

Cullet generated in the furnace plant and which is reintroduced into the furnace cannot be considered as pre-consumer recycled content, since there was never an intent to discard it and therefore it would never have entered the solid waste stream.

|                      |      |
|----------------------|------|
| Pre-consumer cullet  | ~64% |
| Post-consumer cullet | < 1% |

Saint-Gobain Glass intends to continue the increase of recycled material in its products.

**RESPONSIBLE SOURCING**

(Required for BREEAM International new construction 2016 – MAT 03 Responsible sourcing)

All Saint-Gobain Glass Industry sites with a glassmaking furnace, are ISO 14001 certified.

All internal Saint-Gobain Glass quarries are certified ISO 14001 like, for example, SAINT-GOBAIN SAMIN (sand) in France. Many Saint-Gobain Glass raw material suppliers are certified ISO 14001. Our policy consists in encouraging the sourcing of raw materials extracted or made in sites certified ISO 14001 (or the equivalent).

For any other question / document / certification, please contact our local sales teams.

## References

1. ISO 14040:2006: Environmental Management-Life Cycle Assessment-Principles and framework.
2. ISO 14044:2006: Environmental Management-Life Cycle Assessment-Requirements and guidelines.
3. ISO 21930:2017 Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services.
4. ISO 14025:2006: Environmental labels and Declarations-Type III Environmental Declarations-Principles and procedures.
5. EN 15804:2012+A1:2013: Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products
6. EN 15804:2019+A2 - Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products
7. European Chemical Agency, Candidate List of substances of very high concern for Authorization.  
[http://echa.europa.eu/chem\\_data/authorisation\\_process/candidate\\_list\\_table\\_en.asp](http://echa.europa.eu/chem_data/authorisation_process/candidate_list_table_en.asp)
8. EPD International, General Program Instructions (GPI) for the international EPD® (version 4.0) [www.environdec.com](http://www.environdec.com)
9. ISO 21930: 2017 Sustainability in building construction – Environmental declaration of building products
10. PCR 2019:14 Construction products (EN 15804:2012: A2) version 1.2.5 and c-PCR-009 Flat glass products (EN 17074)
11. LCA report, Information for the Environmental Product Declaration of insulation products.