

ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH ISO 14025:2006
AND EN 15804:2012+A2:2019/AC:2021 FOR:

Pilkington **Mirai™** Annealed Glass
FROM

PILKINGTON GROUP LIMITED
Part of the NSG GROUP



EPD REGISTRATION NUMBER: S-P-11498

PUBLICATION DATE:
2024-01-24

VALID UNTIL 2029-01-23



Programme: The International EPD® System
Programme operator: EPD International AB
www.environdec.com



An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com

This Environmental Product Declaration has been verified by an independent third party.

PROGRAMME INFORMATION



EPD programme	The International EPD® System
EPD programme operator	EPD International AB - Box 210 60 - SE 100 31 Stockholm - Sweden www.environdec.com - info@environdec.com
EPD based on Product Category Rules	The CEN standard EN 15804 serves as the core PCR The International EPD® System's PCR 2019:14 Construction products (EN 15804:A2) (V1.3.2, 2023-12-08) c-PCR009 EN 17074:2019 Glass in building - Environmental product declaration - Product category rules for flat glass products
PCR review conducted by	The Technical Committee of the International EPD® System The Review Panel may be contacted via info@environdec.com
EPD verification	Independent verification of this EPD and data, according to ISO 14025:2006 via: <input type="checkbox"/> EPD process certification <input checked="" type="checkbox"/> EPD verification
Third party verifier	Ugo Pretato, Studio Fieschi & soci (Italy) - Recognized Individual Verifier
Approved by	The International EPD® System
Procedure for data follow-up during EPD validity	involves third party Verifier: yes <input type="checkbox"/> no <input checked="" type="checkbox"/>
Declaration No	S-P-11498
Date of publication	2024-01-24
EPD valid until	2029-01-23
EPD owner	Pilkington Group Limited Hall Lane - Lathom - Lancashire L40 5UF - United Kingdom www.pilkington.com
Product name	Pilkington Mirai™ Glass
UN CPC code	3711
Declared unit	One square metre (1m ²) of one millimetre (1mm) thickness
System boundaries	Cradle to grave with Module D
EPD geographical scope	Europe
LCA conducted by	EuGeos Limited - www.eugeos.co.uk
LCA software	openLCA
Background database	ecoinvent V3.8

This EPD provides environmental performance indicators for Pilkington **Mirai™** Glass manufactured by NSG. This is a cradle-to-grave and module D EPD in accordance with the requirements of EN 15804 and PCR EN 17074:2019.

The EPD is based on a life cycle assessment (LCA) study which used production data for 2022 and 2023 from NSG's manufacturing facilities in the UK. Background data were taken from the ecoinvent database (v3.8). The EPD presents details of the LCA, a description of the product life cycle it covers, values for the environmental indicators specified by EN 15804 and a brief explanation of those results.

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, or not compliant with EN 15804, 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. For further information about comparability, see EN 15804 and ISO 14025.



THE NSG GROUP

(NIPPON SHEET GLASS CO. LTD. AND ITS GROUP COMPANIES)

The NSG Group is the world's leading supplier of glass and glazing systems in the business areas of Architectural, Automotive and Creative Technology. In 2006 it acquired the leading global glass supplier, Pilkington, and today the Group has principal operations around the world and sales in over 100 countries.

Our glazing products are sold under the 'Pilkington' brand name.

Architectural manufactures and supplies architectural glass as well as glass for the solar energy and other sectors.

Automotive serves the original equipment (OE) and aftermarket replacement (AGR) glazing markets.

Creative Technology comprises several discrete businesses, including lenses and light guides for printers and scanners, and speciality glass fibre products such as glass cord for timing belts and glass flake.

In Europe, besides others, the following companies are subsidiaries of Pilkington Group Ltd. They manufacture and/or sell glass for the Architectural sector:

- Pilkington Austria GmbH
- Pilkington Danmark A/S
- Pilkington Deutschland AG
- Pilkington Floatglas AB
- Pilkington Glass Service SAS
- Pilkington Glasveredelung GmbH
- Pilkington IGP Sp. z o.o.
- Pilkington Italia SpA
- Pilkington Lahden Lasitehdas Oy
- Pilkington Nederland BV
- Pilkington Norge AS
- Pilkington Polska Sp. z o.o.
- Pilkington Sverige AB
- Pilkington United Kingdom Limited

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Product information



PILKINGTON MIRAI™ GLASS

This EPD applies to Pilkington **Mirai™** annealed glass, a clear soda lime silicate float glass (as defined in EN 572 Part 2) manufactured by NSG Group within its Architectural Glass (AG) Europe business unit.

Pilkington **Mirai™** annealed glass is available in 4, 6 and 8 mm in standard stock sizes and offers the same appearance, performance and quality as our standard float glass products. Performance characteristics such as light transmittance, thermal transmittance (U value) and acoustic properties can be calculated for any of our products via Pilkington Spectrum: <https://spectrum.pilkington.com/>.

Pilkington **Mirai™** Glass is classified CPC3711 under the UN CPC classification system v2.1.

MANUFACTURING

All glassmaking begins with the raw materials being melted in a furnace. In the float process, raw materials, along with glass cullet, are loaded into a furnace where they are melted and transformed into molten glass. This is fed onto the surface of an enclosed bath of molten tin. The molten glass floats on top of the tin, cooling and forming a ribbon of uniform, controllable thickness as it flows along the tin surface. The glass is then annealed to relieve stresses, and cut to sizes at the end of the process.

Pilkington **Mirai™** is manufactured at NSG's facilities in St Helens, UK; these production facilities are ISO 14001-certified. ISO 14001 certificates for NSG Group's AG Europe sites can be found at:

<https://www.pilkington.com/en-gb/uk/architects/standards-and-regs/iso-certificates>

PACKAGING & TRANSPORTATION

Glass products are normally transported on or in vehicles equipped with specialised racking, to which they are mechanically restrained by straps.

In the flat glass sector, polymer bead interleavants, which fall into the category of microplastics (as defined by the European Chemicals Agency, ECHA), are typically used to separate glass sheets. These interleavant materials are applied at low levels, e.g. 100 – 200mg/m² of polymer bead, and can be PMMA, polystyrene or polyethylene, with or without adipic acid, dependent on the specific requirements of each glass product.

Polymer bead interleavants and other packaging materials such as foam pads or cardboard spacers used in small quantities were omitted from the LCA.

INSTALLATION

Pilkington **Mirai™** is ready for installation. Following EN 17074, in this EPD, it is assumed that no waste other than packaging waste is generated at installation.

PRODUCT USE AND MAINTENANCE

Pilkington **Mirai™** consumes no energy in use. Once installed, it requires only cleaning and no other maintenance during the 30-year reference service life.

END-OF-LIFE

As waste, Pilkington **Mirai™** glass falls under European Waste Catalogue (EWC) code 17-02-02. Pilkington recommend that glass be segregated for separate collection and recycling.

RESIDUAL RISKS AND EMERGENCIES

There are no residual risks associated with the normal day-to-day use of the glass covered by this EPD in applications for which it is intended. Care must be taken to select materials in accordance with their declared properties and any other associated regulations governing their usage.

FURTHER PRODUCT INFORMATION

Detailed product information and datasheets can be found on our website: www.pilkington.com

LCA information



This section of the EPD records key features of the LCA on which it is based.

The LCA was carried out by EuGeos using open LCA software and production data for the 12-months September 2022 to August 2023 from NSG's float glass manufacturing facilities in St Helens, UK; background data were taken from the ecoinvent database (v3.8).

DECLARED UNIT

The declared unit is one square metre (1m²) of Pilkington **Mirai™** glass of one millimetre (1mm) thickness

CONTENT INFORMATION

Glass is an amorphous silicate material of variable composition, CAS number 65997-17-3. Pilkington **Mirai™** is soda-lime-silicate (SLS) glass. SLS glass is defined by several European Standards; the proportions by mass of its principal constituents are given in EN 572-1 as:

Silicon (Si)	32% - 35%	Calcium (Ca)	3.5% - 10.1%
Sodium (Na)	7.4% - 11.9%	Magnesium (Mg)	0% - 3.7%
Aluminium (Al)	0% - 1.6%	Others	<5%

Product components	Weight (kg)	Post-consumer material (weight - %)	Biogenic material (weight - % and kg C/kg)
SLS glass	2.5	assumed 0	0
TOTAL	2.5	assumed 0	0
Packaging materials	Weight (kg)	Weight (% vs product)	Weight biogenic carbon (kg C/kg)
Wood	0.13	<5	0.5
TOTAL	0.13	<5	0.5

At the time of data collection, no substance included in the Candidate List of Substances of Very High Concern for authorization under the REACH Regulations is present in the products covered by this EPD either above the threshold for registration with the European Chemicals Agency or above 0.1% (wt/wt).

REFERENCE SERVICE LIFE

A reference service life of 30 years is used for this EPD, as prescribed in EN 17074:2019.

GEOGRAPHICAL SCOPE

Modules A1 - A3 represent production at Pilkington's architectural glass manufacture and processing facilities in St Helens, UK; module A4 and A5 represent delivery and installation in Europe.

LCA SCOPE

This EPD covers the whole life cycle from cradle-to-grave and beyond. Following EN 17074, since the 30-year reference service life is applied, there are no burdens associated with modules B1, B3, B4, B5, B6 and B7. These modules are included with indicator values of zero in the result tables.

Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
Raw material supply	Transport	Manufacturing	Transport to the site	Assembly/ Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste treatment	Disposal	Reuse- recovery- recycling- potential
A 1	A 2	A 3	A 4	A 5	B 1	B 2	B 3	B 4	B 5	B 6	B 7	C 1	C 2	C 3	C 4	D
Modules declared X included in LCA - ND: module not declared																
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Geography																
GLO		GB	Europe		Europe							Europe				Europe
Specific data used																
70%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation - products																
0			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation - sites																
0			-	-	-		-	-	-	-	-	-	-	-	-	-

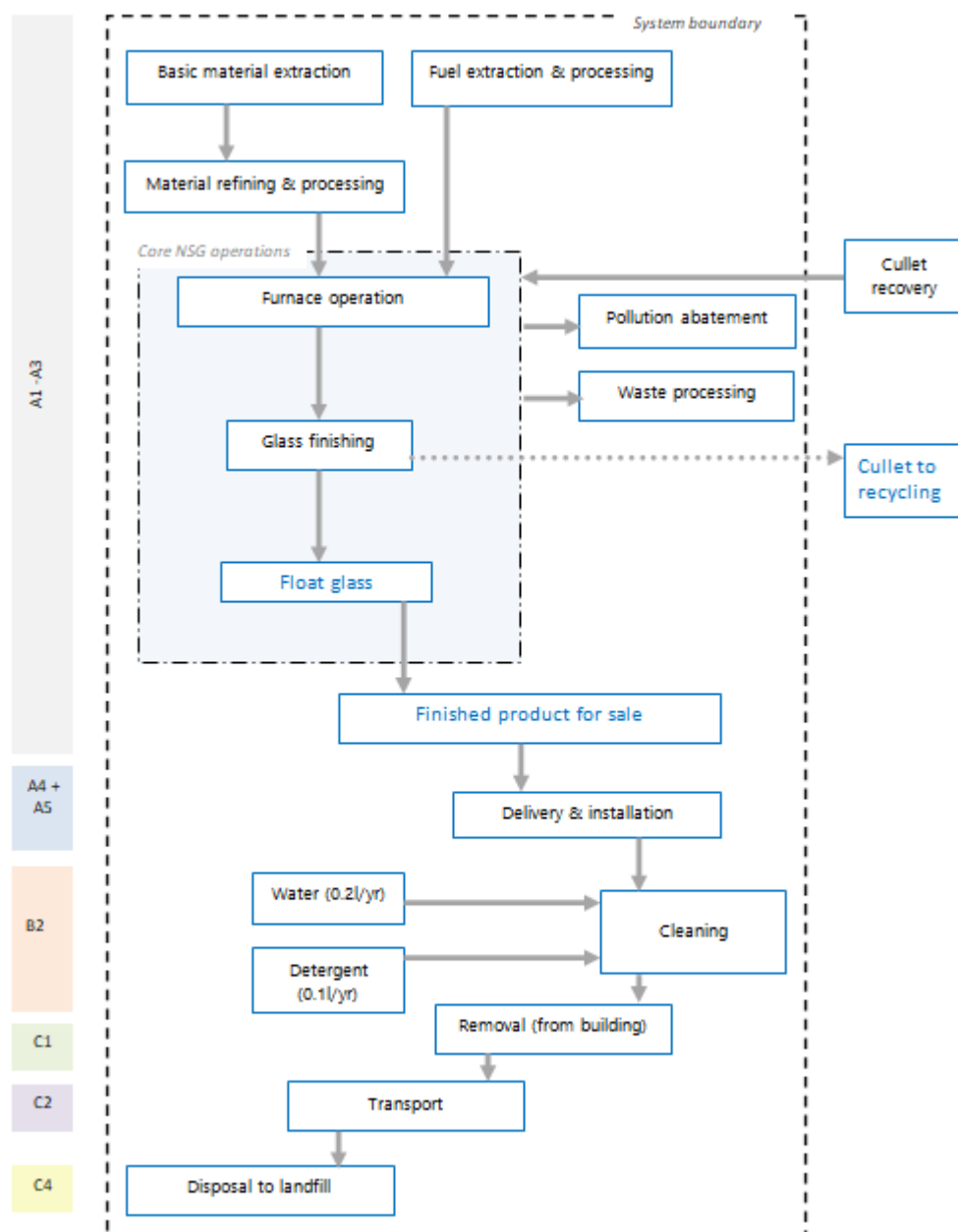
SYSTEM BOUNDARIES

The system boundary of the EPD is defined using the modular approach set out in EN 15804.

As well as the core processes which cover manufacture of float glass at NSG facilities in the UK, the system includes production of all raw materials and components from basic resources; transport of those materials at all stages up to users' sites, subsequent installation and end-of-life management; the production of fuels and energy carriers and their delivery to manufacturing sites; the treatment of all wastes.

The processing of recycled material inputs prior to them passing the end-of-waste state is outside the system boundary.

The product life cycle covered by this EPD is illustrated on the next page.



DATA SOURCES AND DATA QUALITY

TIME REPRESENTATIVENESS

Data characterising NSG's core processes (see above figure) were collected for a period 1/09/2022 to 31/08/2023.

These data were checked to ensure that sufficient materials and water are included within the inputs to account for all products, wastes and emissions.

BACKGROUND DATA

Background (generic) data were taken from the ecoinvent database (v3.8) updated in 2021; this fulfils the EN 15804 requirement that generic data used in the LCA have been updated within the last 10 years.

The quality of generic data has been reviewed and specific datasets developed where necessary better to reflect actual operations in NSG's supply chain.

Other data were judged fit for purpose. No environmental impact potential stemming from proxy data exceeds 10% of the total indicator value for any impact category.

CUT-OFF CRITERIA

The collected data encompassed all raw materials, packaging materials and process aids, as well as associated transport to the manufacturing site. Process energy and water use, emissions to air or water and direct production waste are included within the data.

According to EN 15804 and the PCR flows can be omitted (cut off) from a core process in the LCA up to a maximum of 1% of the total mass of material inputs or 1% of the total energy content of fuels and energy carriers. Some ancillary materials used in small quantities within the process and amounting, in combination, to <0.1% of total input materials were omitted from the LCA underpinning this EPD.

ALLOCATION

In the background data, the ecoinvent default allocation is applied to all processes except those in which secondary materials are used, where the "cut-off" allocation is applied. This ensures that secondary materials are free of upstream burdens that arise prior to their reaching the "end of waste" state, in accordance with Section 6.3.4.2 of EN 15804. Waste-derived liquid biofuel passes the end of waste state once the fuel is fit for use, following the Biodiesel Quality Protocol developed by UK Environment Agency and WRAP.

In the foreground system, where allocation cannot be avoided it is carried out on the basis of physical properties.

ASSUMPTIONS AND ESTIMATES

Inputs to and outputs from the system are accounted for over a 100-year time period; long-term emissions are therefore omitted from the impact assessment part of the LCA, except for biogenic carbon-containing flows, which are accounted for on an indefinite timeframe.

Pre-consumer and internal cullet used in glassmaking may be internal process scrap, scrap from secondary processing on the same site or at other sites of the same business, or waste from independent secondary processors. In the LCA, no burdens were allocated to pre-consumer or internal cullet, whether produced or used.

The "primary renewable energy used as material" indicator (PERM) is calculated applying a characterisation factor of 16MJ/kg for wood used as packaging. Surfactant consumed in module B2 is omitted as a simplification, so that both PENRM and PERM are zero for this module. "Primary energy as fuel" indicators (PENRE, PERE) are calculated as the total primary energy demand minus primary energy used as material; the primary energy content of biofuel is taken as 33MJ/litre based on supplier documentation; as a simplification, this is assumed to be 100% renewable. However liquid biofuel ("biodiesel") is a fatty acid methyl ester; the methyl group is introduced from market methanol and is assumed to contain fossil carbon, released as fossil CO₂ on combustion; fossil C represents 5% of the total carbon content of the fuel.

The electricity used is from wind power generation. The GWP-GHG indicator for the supplied electricity is 0.03kgCO₂e/kWh.

Module D calculations exclude any third-party recycling of packaging or process wastes arising in Modules A1-A5.

In Module A5, following EN 17074, it is assumed that no waste other than packaging waste is generated at installation.

Removal from the building is assumed to involve no mechanical processes, therefore no environmental burdens or benefits are associated with module C1.

Glass that is sent for landfill disposal requires and receives no treatment, therefore there are no activities in module C3 and the environmental indicator values are reported as zero.

Final disposal (module C4) is modelled as disposal of the entire declared unit in landfill.

Because 100% landfill of the product after removal from the building is assumed, there are no benefits or loads beyond the system boundary (Module D). All indicators for Module D are therefore reported as zero.

Transport to waste processing, waste treatment and final disposal are modelled using scenarios; the relevant parameters for the transport scenarios are shown in the table below.

Transport scenario	Transport	
	to site (A4)	to waste treatment (C2)
Parameters	Quantity & unit	
Vehicle type	lorry	lorry
Vehicle load capacity	16t	10t
Fuel type and consumption	diesel, 0.3 l/km	diesel, 0.1 l/km
Volume capacity utilisation factor	1	1
Capacity utilisation (including empty returns)	38%	33%
Distance to site	200 km	50 km
Bulk density of transported products	2500 kg/m ³	2500 kg/m ³

INTERPRETATION OF THE LCA RESULTS

The environmental indicator results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.

Indicator values obtained for resource depletion (ADPMM, ADPFF), stratospheric ozone depletion (ODP), eutrophication (EP) freshwater and water deprivation (WDP) potential should be used with caution; all are subject to uncertainties in data or method which limit the scope for their use as the basis for comparisons.

The uptake of biogenic CO₂ into the biogenic materials included in waste-derived biofuel is accounted for in module A1, with the emissions occurring in A3. Thus the equivalency of biogenic CO₂ inflows and outflows is maintained across the life cycle represented by Modules A1-C4 in this EPD. As for other flat glass products, the values for GWP-biogenic are of limited significance in terms of GWP-total and should be regarded as highly uncertain.

In this study, the FW indicator is strongly driven by generic data characterising upstream processes which may not represent well the actual activities in NSG's particular supply chain.

No untreated wastes leave the modelled system, which includes waste treatment activities as required by EN 15804. The waste indicators HWD, NHWD and TRWD presented in this EPD therefore represent waste flows *within* the modelled system.

The secondary materials (SM) indicator includes all secondary materials used in the modelled system and does not represent the recycled material content of the product.

The MER and MFR indicators also include flows leaving the background system.

ENVIRONMENTAL INDICATORS

This EPD contains environmental information in the form of quantitative indicator values for a number of parameters, which encompass calculated environmental impact potentials, resource and energy use, waste generation and material and energy outputs from the product system that may be reused, recycled or recovered into other, unspecified product life cycles. These parameters are listed below along with the abbreviations used for them in the tables of indicator values that follow.

Parameter	Abbreviation	Unit
Environmental impacts (mandatory) - core		
Climate change – GWP fossil	GWP-fossil	kg CO ₂ eq
Climate change – GWP biogenic	GWP-biogenic	kg CO ₂ eq
Climate change – GWP land transformation	GWP-luluc	kg CO ₂ eq
Climate change – GWP total	GWP-total	kg CO ₂ eq
Acidification potential	AP	mol H ⁺ eq
Eutrophication – freshwater	EP-freshwater	kg P eq
Eutrophication – marine	EP-marine	kg N eq
Eutrophication – terrestrial	EP-terrestrial	mol N eq
Photochemical ozone formation	POFP	kg NMVOC eq
Ozone depletion	ODP	kg CFC-11 eq
Depletion of abiotic resources – minerals & metals ¹	ADPMM	kg Sb eq
Depletion of abiotic resources – fossil fuels ¹	ADPFF	MJ, ncv
Water (user) deprivation potential ¹	WDP	m ³ world-eq deprived
Environmental impacts (mandatory) - additional		
Climate change - GWP fossil & land transformation ²	GWP-GHG	kg CO ₂ eq
Resource use		
Renewable primary energy as energy carrier	PERE	MJ
Renewable primary energy resources as material utilisation	PERM	MJ
Total renewable primary energy use (sum of the two parameters above)	PERT	MJ
Non-renewable primary energy as energy carrier	PENRE	MJ
Non-renewable primary energy resources as material utilisation	PENRM	MJ
Total non-renewable primary energy use (sum of the two parameters above)	PENRT	MJ
Use of secondary material	SM	kg
Use of renewable secondary fuels	RSF	MJ
Use of non-renewable secondary fuels	NRSF	MJ
Net use of fresh water	FW	m ³
Waste production		
Hazardous waste disposed	HWD	kg
Non-hazardous waste disposed	NHWD	kg
Radioactive waste disposed	TRWD	kg
Output flows		
Components for re-use	CRU	kg
Materials for recycling	MFR	kg
Materials for energy recovery	MER	kg
Exported energy - electrical	EEE	MJ
Exported energy - thermal	EET	MJ

1 - The results of this environmental impact indicator shall be used with care because either the uncertainties associated with the results are high or there is limited experience with the indicator

2 - This indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such, the indicator is identical to GWP-total except that the CF for biogenic CO₂ is set to zero.

ENVIRONMENTAL INDICATOR RESULTS (PER DECLARED UNIT)

Environmental indicator results for all declared modules are shown in the following tables for the declared unit of one square metre (1m²) one millimetre (1mm) thickness of Pilkington **Mirai™**. The A1-A3 modules are shown on an aggregated basis, as mandated by PCR 2019:14 §5.4.5; the results of modules A1-A3 should not be used without considering the results of module C.

CORE ENVIRONMENTAL IMPACTS (EN 15804 + A2) (MANDATORY)																
	Unit	A1 - A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP-fossil	kg CO ₂ eq	1.35E+00	4.54E-02	9.60E-04	0.00E+00	9.34E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.08E-02	0.00E+00	2.32E-02	0.00E+00
GWP-biogenic	kg CO ₂ eq	-2.42E-02	4.62E-05	5.35E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.87E-05	0.00E+00	2.30E-04	0.00E+00
GWP-luluc	kg CO ₂ eq	7.80E-04	1.61E-05	6.15E-07	0.00E+00	3.01E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.05E-06	0.00E+00	2.11E-05	0.00E+00
GWP-total	kg CO ₂ eq	1.33E+00	4.54E-02	5.45E-02	0.00E+00	1.23E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.08E-02	0.00E+00	2.35E-02	0.00E+00
ODP	kg CFC-11 eq	9.03E-08	1.08E-08	1.68E-10	0.00E+00	4.05E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.81E-09	0.00E+00	7.88E-09	0.00E+00
AP	mol H ⁺ eq	1.95E-02	1.90E-04	9.27E-06	0.00E+00	5.90E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.43E-05	0.00E+00	2.10E-04	0.00E+00
EP-freshwater	kg P eq	3.00E-04	2.82E-06	3.25E-07	0.00E+00	2.83E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.34E-06	0.00E+00	2.35E-06	0.00E+00
EP-marine	kg N eq	4.49E-03	5.77E-05	1.84E-05	0.00E+00	4.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.54E-05	0.00E+00	7.40E-05	0.00E+00
EP-terrestrial	mol N eq	5.28E-02	6.30E-04	4.18E-05	0.00E+00	1.70E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.75E-04	0.00E+00	8.10E-04	0.00E+00
POFP	kg NMVOC eq	1.27E-02	2.00E-04	1.18E-05	0.00E+00	5.30E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.50E-05	0.00E+00	2.30E-04	0.00E+00
ADPMM	kg Sb eq	1.37E-05	1.03E-07	2.70E-09	0.00E+00	1.18E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.19E-08	0.00E+00	7.51E-08	0.00E+00
ADPFF	MJ, ncv	1.38E+01	7.23E-01	1.57E-02	0.00E+00	1.97E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.21E-01	0.00E+00	5.95E-01	0.00E+00
WDP	m³ world-eq deprived	1.36E+00	3.41E-03	1.60E-04	0.00E+00	4.99E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.43E-03	0.00E+00	2.69E-02	0.00E+00
ADDITIONAL ENVIRONMENTAL IMPACT (EN 15804 + A2) (MANDATORY)																
GWP-GHG	kg CO ₂ eq	1.36E+00	4.53E-02	4.45E-03	0.00E+00	1.23E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.08E-02	0.00E+00	2.34E-02	0.00E+00

RESOURCE USE

	Unit	A1 - A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PERE	MJ	3.85+01	8.99E-03	3.00E-04	0.00E+00	1.13E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.43E-03	0.00E+00	6.66E-03	0.00E+00
PERM	MJ	2.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	4.05E+01	8.99E-03	3.00E-04	0.00E+00	1.13E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.43E-03	0.00E+00	6.66E-03	0.00E+00
PENRE	MJ	1.38E+01	7.23E-01	1.57E-02	0.00E+00	1.97E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.21E-01	0.00E+00	5.95E-01	0.00E+00
PENRM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	1.38E+01	7.23E-01	1.57E-02	0.00E+00	1.97E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.21E-01	0.00E+00	5.95E-01	0.00E+00
SM	kg	5.91E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	2.67E+01	1.70E-04	0.00E+00	0.00E+00	1.05E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.45E-05	0.00E+00	6.30E-05	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m³	2.30E-02	8.61E-05	4.35E-06	0.00E+00	1.37E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.58E-05	0.00E+00	6.50E-04	0.00E+00

WASTE

	Unit	A1 - A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
HWD	kg	1.56E+00	1.43E-02	7.50E-04	0.00E+00	1.34E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.95E-03	0.00E+00	1.21E-02	0.00E+00
NHWD	kg	1.55E-01	6.59E-02	7.53E-02	0.00E+00	8.88E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.60E-02	0.00E+00	2.51E+00	0.00E+00
TRWD	kg	1.36E-03	1.32E-05	2.64E-07	0.00E+00	6.09E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.25E-06	0.00E+00	7.86E-06	0.00E+00

OUTPUT FLOWS

	Unit	A1 - A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	4.91E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MER	kg	4.66E-03	0.00E+00	1.23E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EET	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

PILKINGTON MIRAJ™

Additional environmental information



ENVIRONMENTAL IMPACTS (EN 15804+A1:2013)

For information, indicator values calculated using the methods prescribed in the earlier version of EN 15804 (EN 15804+A1:2013) are provided in the table below for the declared unit of one square metre (1m²) of Pilkington **Mirai™** (1mm thick); modules A1-A3 are shown on an aggregated basis.

ENVIRONMENTAL IMPACTS (EN 15804 + A1:2013)																
Unit		A1 - A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP	kg CO ₂ -eq	1.33E+00	4.50E-02	2.85E-03	0.00E+00	1.19E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.06E-02	0.00E+00	2.29E-02	0.00E+00
ODP	kg CFC11-eq	9.03E-08	1.08E-08	1.68E-10	0.00E+00	4.05E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.81E-09	0.00E+00	7.88E-09	0.00E+00
AP	kg SO ₂ -eq	1.57E-02	1.50E-04	7.53E-06	0.00E+00	4.50E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.62E-05	0.00E+00	1.60E-04	0.00E+00
EP	kg PO ₄ ³⁻ -eq	2.59E-03	3.17E-05	1.10E-04	0.00E+00	3.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.43E-05	0.00E+00	3.66E-05	0.00E+00
POCP	kg ethene-eq	8.00E-04	5.76E-06	7.63E-07	0.00E+00	3.73E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.67E-06	0.00E+00	5.40E-06	0.00E+00
ADPE	kg Sb-eq	1.37E-05	1.03E-07	2.70E-09	0.00E+00	1.18E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.19E-08	0.00E+00	7.51E-08	0.00E+00
ADPF	MJ	1.38E+01	7.23E-01	1.57E-02	0.00E+00	1.97E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.21E-01	0.00E+00	5.95E-01	0.00E+00

GWP = Global warming potential

ODP = Depletion potential of the stratospheric ozone layer

AP= Acidification potential of land and water

EP = Eutrophication potential

POCP = Formation potential of tropospheric ozone photochemical oxidants

ADPE = Abiotic depletion potential for non-fossil resources

ADPF = Abiotic depletion potential for fossil resources

GHG REDUCTION TARGETS

NSG Group's SBTi reduction target is aligned with a well below 2°C global warming scenario.

By 2030, NSG Group commits to reduce absolute GHG emissions (Scope 1, Scope 2 and Scope 3) by 30% compared to the 2018 baseline level.

Committed to support the mitigation of risks of climate change, NSG Group continues to actively investigate and implement the following measures:

- Converting the energy source in glass manufacturing processes from heavy fuel oil to natural gas and/or other alternative low carbon fuel sources.
- Implementing various measures to reduce CO₂ emissions associated with the glass manufacturing process, including; LED lighting, heating & ventilation, high efficiency motors and inverters and waste heat recovery systems
- Expanding the use of renewable energy
- Developing and supplying glass products which contribute to the reduction of CO₂ emissions in their use from energy saving or energy generation.

According to "*Glazing Potential*", an independent study commissioned by Glass for Europe, the trade association of European flat glass manufacturers of which NSG Group is an active member, 94 million tonnes of CO₂ could be saved in 2030 if all of Europe's buildings were equipped with high-performance glazing.

CARBON NEUTRALITY

NSG Group announced a commitment to achieve carbon neutrality by 2050. The target covers all scopes of NSG GHG emissions with no exclusions.

The first key milestone towards carbon neutrality has been set for the end of our financial year in 2024 (April 2024).

The second key milestone will be the achievement of the verified SBT in 2030. We expect to publish further SBTi commitments over the coming years, to establish further milestones for absolute emission reductions.

For our latest information please visit: www.nsg.com/en/sustainability

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https://glassforeurope.com/wp-content/uploads/2019/05/Glazing_potential_brochure_2019.pdf

ISO 14001:2015 - Environmental management systems – Requirements with guidance for use

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Glossary



The International EPD® System: a programme for Type III environmental declarations, maintaining a system to verify and register EPDs as well as keeping a library of EPDs and PCRs in accordance with ISO 14025. (www.environdec.com)

Life cycle assessment (LCA): LCA studies the environmental aspects and quantifies the potential impacts (positive or negative) of a product (or service) throughout its entire life. ISO standards ISO 14040 and ISO 14044 set out conventions for conducting LCA.

REACH Regulation: REACH is the European Regulation on Registration, Evaluation, Authorisation and Restriction of Chemicals. It entered into force in 2007, replacing the former legislative framework for chemicals in the EU.

SBTi: The Science Based Targets initiative. A programme to drive ambitious climate action in the private sector by enabling organisations to set science-based emissions reduction targets (<https://sciencebasedtargets.org/>)