FUTURE | GLASS

ENVIRONMENTAL FOOTPRINT INSTITUTE

Environmental Product Declaration

Under the general rules of the Environmental Footprint Institute and PCR P-3100: Construction products in general (Accordance with ISO 14040, ISO 14044, ISO 14025 and EN 15804:2012+A2:2019/AC:202) for:

SINGLE GLASS UNIT:

Program:	Environmental Footprint Institute
Product group classification:	UN CPC 37370
Reference number:	250706EPD CR:P-3100
Issue date:	11-07-2025
Validity date:	10-07-2030
Geographical scope:	An Environmental Product Declaration (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.environmentalfootprintinstitute.org
Geographical scope:	Manufactured in Ras Al Khaimah (UAE) and distributed globally.

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1. Introduction

This report contains the environmental performance of the manufacturing process of the Single Glass Unit produced by Future Architectural Glass LLC. This Environmental Product Declaration (EPD) has been developed using the Life Cycle Assessment (LCA) methodology. The environmental impact values calculated are expressed per **1m²** of Single Glass Unit.

The assessed life cycle includes all phases in the manufacturing process of the Single Glass Unit within a "cradle to gate with options" scope. This LCA covers the transportation of raw materials, production, distribution of the final product to the customer, and end-of-life stages.

This EPD has been conducted according to the Environmental Footprint Institute regulations, and it has been certified and registered with The Environmental Footprint Institute. The EPD regulation is a system for the international use of Type III Environmental Declarations, according to ISO 14025:2006. Both the system and its applications are described in the Programmer's General Indications (PGI). This report has been prepared following the specifications provided in the European standard EN 15804:2012+A2:2019/AC:2021.

2. Company Information

2.1 About FUTURE GLASS

Future Architectural Glass, LLC (Future Glass) is a joint venture between a multinational & diversified Singapore corporation and a leading Indian glass conglomerate. The company has established itself as UAE's premium glass processor having the entire gamut of European machinery and systems to process any type of interior and exterior glass.

Since 1976, the group has been serving the needs of the architectural glass market by providing the latest products suiting the dynamic needs of architects/consultants. We started operations as a glass trading and distribution firm and ever since have expanded our products and services to include safety glass manufacturing and providing specialty glass solutions.

In the last four decades, we have diversified into several products lines encompassing exciting exteriors glazing products, comfortable interior glazing, specialty design applications and high-performance green building product solutions.

Our specialized products development unit is dedicated to understanding the changing needs of the architectural glass market and introducing innovative glass and glazing solutions for enhanced comfort, safety and performance. Spread over more than 20 countries worldwide, our strong client base is an indicator of our global reach and the trust we share with our customers.

Our ever-expanding presence with offices in UAE, India & Singapore helps us serve the varied needs of client promptly and efficiently. With multiple manufacturing bases in UAE & India, we are able to optimize resources and utilize the location advantage to the benefits of our global clientele.

2.2 Sustainable practices

FUTURE GLASS is committed to integrating sustainable practices into its operations and product offerings. The company holds numerous certifications, including ISO9001, ISO14001, ISO45001, ISO50001, SASO, CE certification of EU, UKCA certification of UK, and the GREEN CERTIFICATE, reflecting its adherence to international quality, environmental, and energy management standards.

In its pursuit of sustainability, FUTURE GLASS. actively adopts eco-friendly materials, reduces resource consumption, and minimizes waste in its production processes. By productizing "art, culture, and concept," the company not only enhances consumers' quality of life but also prioritizes environmental responsibility. It strives to inspire designers, support sustainable innovation, and establish itself as a world-class brand that values both creativity and environmental stewardship.

3. Product Information

3.1 Analyzed Product

Future Glass Tempered Glass is a high-strength safety glass engineered through a controlled thermal treatment process. Manufactured using premium Guardian Glass, it undergoes a specialized heat-strengthening procedure developed by Future Glass to enhance its durability, mechanical strength, and performance. During production, the glass is heated to its softening point and then rapidly cooled, inducing a compressive stress layer on its surfaces. This thermal process significantly improves the mechanical properties of the glass, resulting in a toughened product with superior resistance to impact and thermal stress.

Composed of soda lime silicate clear float glass that complies with BS EN 572-1 and BS EN 572-2 standards, Future Glass Tempered Glass has a nominal thickness of 6mm. It is fully toughened in accordance with BS EN 12150 and undergoes heat soak testing to BS EN 14179 to mitigate the risk of spontaneous breakage due to nickel sulfide inclusions. The glass features raised edges as standard, with smooth ground or polished edge options available based on project requirements.

This high-performance glass meets the safety classification of Class 1(C)1 under BS EN 12600 and demonstrates a minimum characteristic bending strength of 120 N/mm^2. It can withstand a surface compressive stress of at least 90 MPa and tolerate temperature differentials of up to 200°C, ensuring outstanding thermal shock resistance. The risk of spontaneous breakage is minimized to less than 1 in 10,000 when both toughened and heat soak tested. With a high light transmittance of 89% or greater for clear glass, it maintains excellent optical clarity while ensuring safety. Upon breakage, the glass fragments in a pattern compliant with BS EN 12150-1, forming small, blunt pieces that reduce the risk of injury.

Future Glass Tempered Glass is ideal for a wide range of demanding applications including glass doors, curtain walls, façades, interior partitions, furniture, and installations exposed to heat or temperature variations. The available product range covers thicknesses from 4mm to 19mm, with this Environmental Product Declaration (EPD) specifically representing the 6mm tempered variant.

FUTURE GLASS SINGLE-GLASS UNIT

3.2 Technical Specifications

Visible Light				Solar Energy				Thermal Properties		Light to Solar Gain (LSG)
Transmittance	Reflectance		Transmittance	Reflectance		Solar Heat Gain Coefficient (SHGC)	Shading	U-Value		
Visible (τv %)	ρv % out	ρv % in	Solar (τe %)	ρe % out	ρe % in		Coefficient (sc)	Winter Night ($W/m^2 \cdot K$)	Summer Day ($W/m^2 \cdot K$)	
89	**8**	**8**	**81**	**8**	**8**	**0.84**	**0.97**	**5.813**	**5.269**	**1.06**

3.3 Structural Performance

Load Resistance: Single Glass Unit shall be designed to withstand the specified design loads and deflection criteria appropriate to the specific application:

- **For balustrades and barriers:** In accordance with BS 6180
- **For overhead glazing:** In accordance with BS 5516
- **For general glazing applications:** In accordance with BS 6262

Deflection Limits: Maximum allowable deflection to be limited in accordance with the relevant application standard.

Post-breakage Performance: Upon breakage, glass shall fragment into numerous small pieces with relatively dulled edges, meeting the requirements of BS EN 12150-1.

3.4 Safety Performance

- **Impact Resistance:** Glass units shall comply with BS EN 12600 Class 1(C)1, indicating the highest level of safety performance for human impact.
- **Thermal Stress Resistance:** Glass units shall be capable of withstanding thermal stresses resulting from partial shading, temperature fluctuations, and localized heat sources.
- **Heat Soak Testing:** All units shall be heat soak tested in accordance with BS EN 14179 to minimize the risk of spontaneous breakage due to nickel sulfide inclusions.

3.5 Durability

- **Environmental Resistance:** The glass shall withstand exposure to UV radiation, moisture, and temperature fluctuations without significant degradation in performance or appearance.
- **Service Life:** Minimum 15-year design life under normal conditions of use.

3.6 Fire Performance

- **Reaction to Fire:** Glass components shall achieve Class A1 classification to BS EN 13501-1.

4. LCA Information

4.1 Declared Unit

The Declared Unit of the Life Cycle Assessment is one square meter ($1m^2$) of the 6mm Single Glass Unit, produced and distributed by Future Architectural Glass LLC at their plant in Ras Al Khaimah, UAE. All direct and indirect environmental impacts, as well as resource usage, are reported relative to this unit. The mass of the area considered is on average 14.8 kg.

Name	Value	Unit
Functional Unit	1	m^2
Mass	14.8	kg

4.2 System boundaries

This EPD covers all product stages from "cradle to gate with options," meaning this LCA includes Production stage A1-A3, Transportation A4, Installation A5, End-of-life stages C1-C4, and Resource recovery stage D in accordance with EN 15804 + A2/AC:2021.

The system boundaries of this environmental study encompass not only the processes controlled by FUTURE GLASS but also include upstream and downstream activities, such as fuel extraction, material production, and electricity generation, which are not directly managed by the company.

All related direct and indirect environmental impacts associated with these elements have been calculated and are included in the LCAs within this EPD.

Possible scopes of the LCA defined in the European standard EN 15804:2012+A2:2019 are:

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction & demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling potential
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	ND	ND	ND	ND	ND	ND	ND	X	X	X	ND	X
Geography	GLO	GLO	UAE	GLO	UAE	-	-	-	-	-	-	-	UAE	GLO	GLO	GLO	GLO
Specific data used	>90%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	<10%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	N/A			-	-	-	-	-	-	-	-	-	-	-	-	-	-

X = Included, ND=Module not declared

Modules from B1 to B7 are not declared (X refers to considered stage, ND refers to not declared stage). In the following schemes, the modules are linked to the real phases of the manufacturing and distribution process.

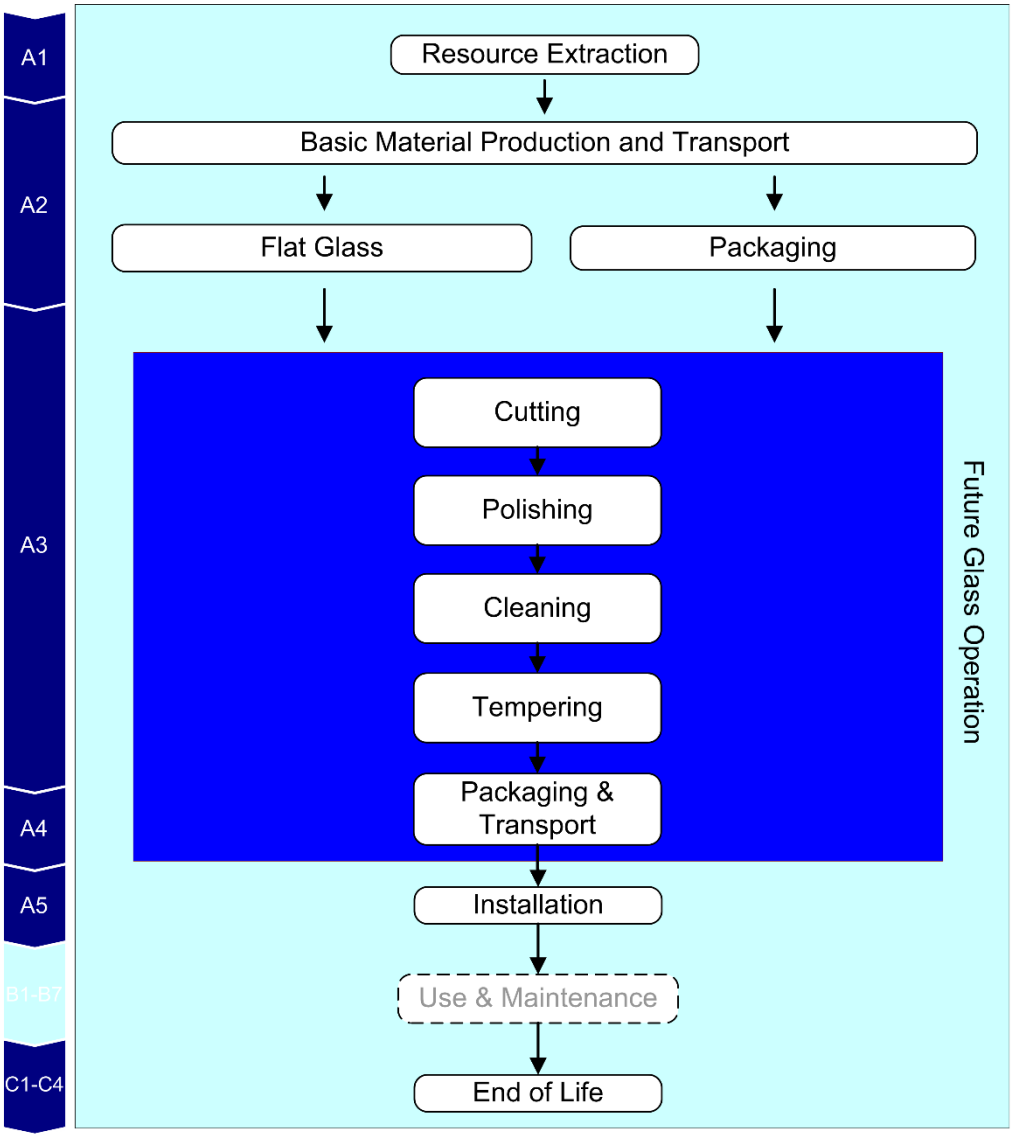
4.3 Time Representativeness

Manufacturing facility-specific data from FUTURE GLASS is based on a 1-year average for process data (Reference time: Jan 2023 to Dec 2023). The following rules for the time scope of data were applied: <10 years for background data and <2 years for manufacturer's data.

4.4 LCA Software and Database

Version 3.18.0.5 of software Air.e LCA™ with Ecoinvent™ 3.10.0 database has been used for LCA modeling and impacts calculations. EN15804 system model is used in this LCA. The scope of this EPD is "cradle to gate with options". Possible scopes of the LCA defined in EN 15804:2012+A1:2014

4.5 Product Stage



A1. Raw Material Extraction

This module includes the extraction and transformation of raw materials needed to produce flat glass (soda-lime glass), as well as packaging materials to produce the Single Glass Insulating Units.

A2. Transport

This stage accounts for the transportation of raw materials to the manufacturing plant.

A3. Manufacturing

The manufacturing process consists of multiple stages:

- **Cutting**
- **Polishing**
- **Cleaning**
- **Tempering**

- **Packaging**

This module includes water and energy (electricity) consumption for manufacturing processes, and a separate scenario for managing packaging waste is modeled based on the geographic location of the installation.
There is an average 0.24% loss of glass during the glass cutting processes steps (e.g., broken, trims). These losses have been determined by production weight. Glass waste is sent to a recycling center.

A4. Transport
This stage involves the transportation of Glass Units to the construction site via Air, Road and Sea.

A5. Installation of the Product
Installation in the building, Module A5, constitutes an assembly of the finished system for the glass units. This comprises attachment of the framework to the installation of the glass. Material losses are all accounted for in module A3. It is assumed that only hand power tools are used. Electricity use of 0.09kWh per declared unit is assumed for hand power tools such as drills and screwdrivers.

B1 to B7: User Stage – (Not Declared)
The stage modules (B1 to B7) are not declared in this EPD as they are highly dependent on site-specific factors such as cleaning frequency, cleaning methods, and the intended application of the Glass units. While glass units are durable and typically require minimal maintenance, potential impacts related to cleaning (e.g., use of detergents and water) or repair (in case of damage) are highly variable and outside the scope of this assessment. Further data on these stages can be developed based on specific project requirements.

C1. Deconstruction/Demolition
The demolition phase (Module C1) involves the disassembly and removal of the installed glass units from the building. It is assumed that only hand power tools such as drills and screwdrivers are used, with an estimated electricity consumption of 0.09 kWh per declared unit. No additional material losses occur during demolition, as all waste and breakage are accounted for in the subsequent waste processing stages (Modules C2-C3). The process is considered to generate minimal environmental impact beyond the operational energy use.

C2. Transport (Waste)
This stage includes the transport of waste Glass units and packaging to disposal sites. An average transport distance of 50 km is assumed.

C3. Waste Processing
The end-of-life treatment scenario for materials in C3 stage is considered, including the disposal and recycling processes. Metal scraps such as Nails, Steel belt and Wire Buckle are 100% recycled, contributing to the reduction in production. Plastic waste undergoes incineration, with 100% being incinerated, contributing to energy recovery.

D. Benefits and Loads

Module D considers the potential environmental loads and benefits associated with the recycling, reuse, and energy recovery of materials after the product's end-of-life. These processes are modelled to reflect realistic waste management scenarios, and the resulting avoided environmental impacts are included based on the substitution of primary raw materials or conventional energy sources.

Flat glass recovered from the glass units is assumed to be sent for recycling. The recycled content is used in the production of new flat glass, reducing the need for virgin raw materials and lowering energy demand in the melting process. The avoided emissions from primary glass production are calculated using data sourced from the Ecoinvent 3.10 database, reflecting industry-average values.

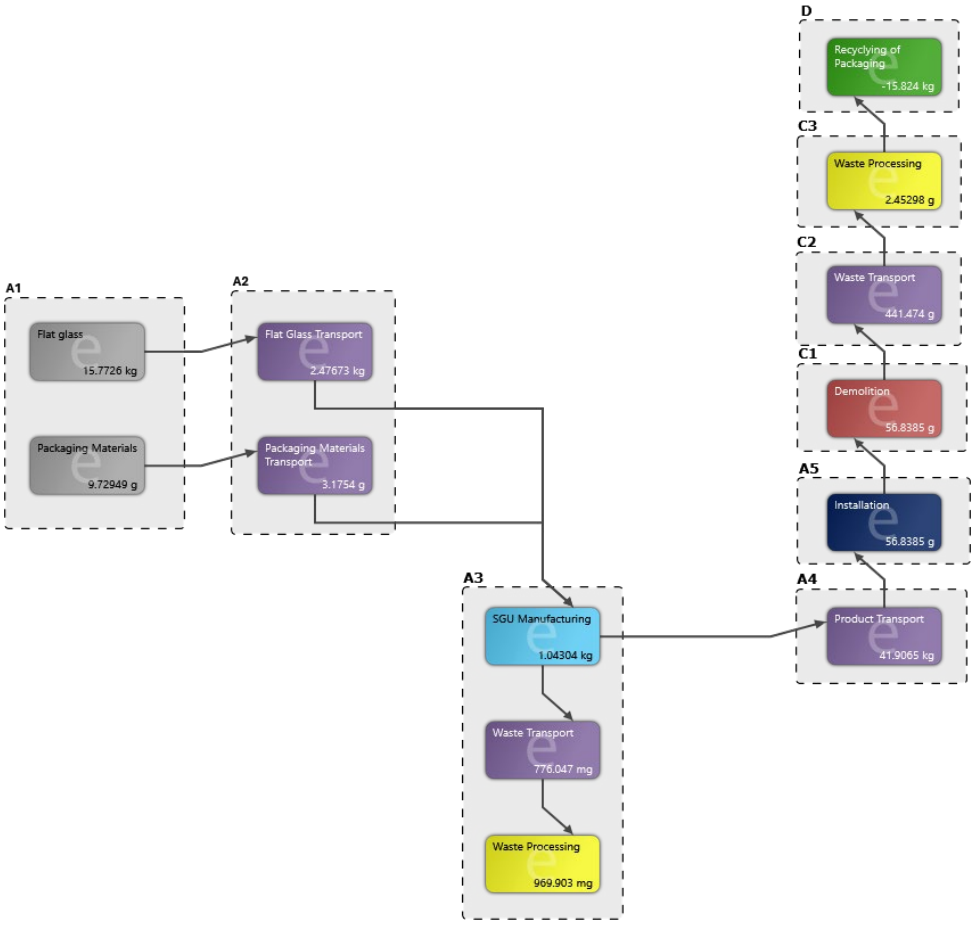
Metal components including nails, steel belts, and wire buckles—are collected as scrap and recycled. Recycling of these materials replaces primary metal production and reduces the environmental burdens associated with ore extraction and refining. Emission savings from this substitution are modelled using Ecoinvent datasets, ensuring consistency with recognized LCA standards.

Wood packaging materials are assumed to be reused, extending their lifecycle and preventing the environmental impact of manufacturing new wood-based materials. This reuse is accounted for as an avoided burden in the assessment.

Softboard used in packaging is assumed to be recycled at end-of-life. This recycled material displaces virgin softboard production and contributes to reduced emissions, again modelled based on Ecoinvent 3.10 data.

Plastic packaging waste undergoes municipal incineration, contributing to energy recovery. Based on the material's Lower Heating Value (LHV) and average incineration efficiency, an estimated 0.0021 kWh of energy per declared unit is recovered. This recovered energy is assumed to offset electricity from the UAE grid and heat from gas-fired systems, resulting in net environmental benefits. These energy recovery impacts are modelled in accordance with Ecoinvent 3.10 assumptions.

All material and energy flows contributing to Module D have been modelled and visualized using Air.e LCA software, which ensures consistency, traceability, and compliance with EPD standards. The tool enables transparent documentation of recycling rates, energy substitution values, and emission factors used in the assessment.


A1
Flat glass
15.7726 kg
Packaging Materials
9.72949 g
A2
Flat Glass Transport
2.47673 kg
Packaging Materials Transport
3.1754 g
A3
SGU Manufacturing
1.04304 kg
Waste Transport
776.047 mg
Waste Processing
969.903 mg
A4
Product Transport
41.9065 kg
A5
Installation
56.8385 g
C1
Demolition
56.8385 g
C2
Waste Transport
441.474 g
C3
Waste Processing
2.45298 g
D
Recycling of Packaging
-15.824 kg

4.6 Content declaration

The following list includes the main components and materials used in the manufacturing of Single Glass Insulating Units.

Material	Quantity per Functional Unit /Kg	Percentage
Flat Glass	14.8	100%

Packaging materials	Weight, kg	Weight-% (versus the product)	Weight biogenic carbon, kg C/kg
Wood	0.125	0.84 %	<0.01
Softboard	0.000056	0.0004 %	<0.01
Plastic printing rolls	0.00049	0.0033 %	0
Nails	0.00054	0.0036 %	0
Steel belt	0.0015	0.0101 %	0
Wire buckle	0.00023	0.0016 %	0
Yellow packaging strip	0.0005	0.0034 %	0
TOTAL	**0.128**	**0.87 %**	**<0.01**

5. LCA Modeling

5.1 Calculation Methodology

This EPD represents a Type III Environmental Declarations according to ISO 14025:2006. The Life Cycle Assessment (LCA) has been developed following the ISO 14040 International Standard. The environmental impacts calculation method reported in this EPD follows the EF 3.1(ILCD). The report has been done following the specifications given in the European standard EN 15804:2012+A2:2019/AC:2021, as Product Category Rules.

5.2 Emission Factors

Emission factors and environmental impacts of elements in life cycles that are not directly controlled by FUTURE GLASS. have been analyzed using external studies and external emissions factors databases like Ecoinvent™ due to the lack of direct data. The next paragraphs describe the calculation rules and criteria applied in the calculation of the environmental performance of this type of element in the LCA.

5.3 Raw Materials and Chemicals

Datasets from Ecoinvent™ 3.10 with emission factors for raw materials have been characterized and adjusted to reflect the specific manufacturing processes of FUTURE GLASS, as well as the geographical

locations of suppliers. Additionally, wherever available, supplier-specific emission data has been extracted from their Environmental Product Declarations (EPDs) to enhance accuracy.

For Future Glass production, all inputs have been accounted for in the Life Cycle Assessment (LCA), except for a negligible 1% input that is non-hazardous, contributes less than 0.5% to the total product mass, and has no significant impact on overall environmental performance. This exclusion aligns with the cut-off criteria specified in the methodology, as the material falls below the defined threshold and does not significantly affect the overall assessment.

Datasets from Ecoinvent™ 3.10 with emission factors for generic raw materials have been further refined using supplier-specific data where available, ensuring that the assessment aligns with the actual environmental impact of the materials used by FUTURE GLASS.

5.4 Electricity

A specific dataset with the Life Cycle Inventory (LCI) corresponding to the 2023 electricity mix in UAE has been used for this LCA.

5.5 Fuels Production and Consumption

Specific datasets with emission factors corresponding to fuel combustion in the FUTURE GLASS plant and machinery have been developed for these LCAs. Indirect emissions resulting from the production and transportation of diesel is also included in the calculation of environmental impact values, using default values from the Ecoinvent™ database.

5.6 Transport to the use site Stage – A4

All products are transported from the manufacturing facility in Ras Al Khaimah to Dubai Port, including domestic distribution within the UAE, covering a total road distance of 551 kilometers. Subsequent international transport includes 2,360 kilometers by sea and 3,381 kilometers by air. This transportation scenario is based on the actual distribution of glass units sold between January and December 2023. The logistics model incorporates multiple modes of transport, including road freight using lorries with a capacity of 16–32 metric tons (EURO 4 standard), maritime shipping, and air freight.

5.7 Calculation Rules

Version 3.18.0.5 of software Air.e LCA™ with Ecoinvent™ 3.10 database has been used for LCA modeling and impacts calculations.

Minor components are not directly related to the product, with less than 1% impact, such as office supplies, has been excluded from the assessment. All transports of components have been included in the LCA considering real distances travelled by materials used from January 2023 and December 2023. Transport of raw materials needed to produce Glass Units is estimated in a global scale according to Ecoinvent™ criteria.

The main means of transport for material purchases have been included in the analysis. Road distances are calculated using Google Maps. Additionally, transport of raw materials from the sea to the

manufacturing site in Ras Al Khaimah, UAE has also been considered, with the distance for sea transport and air transport included in the transportation scenario.

Cut-off rules: more than 99% of the materials and energy consumption have been included. The Polluter Pays Principle, and the Modularity Principle have been followed.

5.8 By Products Assignment

Economic allocation was applied, and the allocation was performed according to the PCR. Economic allocation was based on the income of each product. There is no List of by-Products used in this EPD.

6. Environmental Performance

6.1 Potential Environment Impacts

In the following tables, the environmental performance of the declared units "1 m^2 of the Single Glass Unit" is presented for the FUTURE GLASS product, totalized and for each sub-phase of the life cycle.

During the assessment, it was not possible to identify significant differences in the consumption of electricity, water, diesel, raw materials, and chemicals during the manufacturing process of Glass Units. Therefore, the calculations are based on total production versus total consumption to produce the product.

Environmental impacts are calculated using the EF 3.1 (ILCD) methodology in accordance with the EN 15804 standard.

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

6.2 Core Environmental Impact Indicators

Results per declared unit									
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-fossil	kg CO_2 eq.	1.92E+01	4.19E+01	5.68E-02	5.68E-02	4.41E-01	2.42E-03	-1.57E+01	1.92E+01
GWP-biogenic	kg CO_2 eq.	1.08E-01	2.92E-03	4.47E-06	4.47E-06	7.61E-05	3.37E-05	-1.10E-01	1.08E-01
GWP-luluc	kg CO_2 eq.	5.31E-03	3.31E-03	2.87E-06	2.87E-06	2.06E-04	5.36E-08	-4.19E-03	5.31E-03
GWP-total	kg CO_2 eq.	1.93E+01	4.19E+01	5.68E-02	5.68E-02	4.41E-01	2.45E-03	-1.58E+01	1.93E+01
ODP	kg CFC 11 eq.	2.75E-07	6.45E-07	1.32E-09	1.32E-09	5.89E-09	1.13E-12	-1.70E-07	2.75E-07
AP	mol H^+ eq.	1.78E-01	1.74E-01	8.84E-05	8.84E-05	2.34E-03	8.13E-07	-1.54E-01	1.78E-01
EP-freshwater	kg P eq.	1.92E-03	7.18E-04	9.54E-07	9.54E-07	4.07E-05	2.50E-08	-1.75E-03	1.92E-03
EP-marine	kg N eq.	3.20E-02	6.81E-02	2.19E-05	2.19E-05	9.07E-04	4.06E-07	-2.55E-02	3.20E-02
EP-terrestrial	mol N eq.	3.75E-01	7.42E-01	2.28E-04	2.28E-04	9.86E-03	3.36E-06	-3.03E-01	3.75E-01
POCP	kg NMVOC eq.	1.08E-01	2.42E-01	1.52E-04	1.52E-04	3.14E-03	8.83E-07	-8.40E-02	1.08E-01
ADP-minerals & metals*	kg Sb eq.	1.20E-04	1.34E-05	6.13E-08	6.13E-08	1.85E-06	9.99E-10	-1.12E-04	1.20E-04
ADP-fossil*	MJ	2.26E+02	5.88E+02	9.44E-01	9.44E-01	6.38E+00	8.89E-04	-1.74E+02	2.26E+02
WDP*	m^3	3.91E+00	1.17E+00	4.24E-03	4.24E-03	3.43E-02	1.22E-04	-3.67E+00	3.91E+00
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption								

* ***Disclaimer:*** *The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.*
*"Reading example: 1.57E-03 = 1.57*10-3 = 0.00157"*

6.3 Environmental impacts – GWP-GHG

Results per declared unit									
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-GHG[1]	kg CO_2 eq.	1.93E+01	4.19E+01	5.68E-02	5.68E-02	4.41E-01	2.45E-03	-1.58E+01	1.93E+01

[1]This indicator includes all greenhouse gases excluding biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product as defined by IPCC AR 5 (IPCC 2013). This indicator Is almost equal to the GWP indicator originally defined in EN 15804:2012+A2:2019/AC:2021.

6.4 Use of Natural Resources

Results per declared unit									
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	7.90E+00	2.01E+00	1.64E-03	1.64E-03	1.00E-01	7.02E-05	-7.60E+00	7.90E+00
PERM	MJ	1.58E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.58E+00	1.58E+00
PERT	MJ	9.48E+00	2.01E+00	1.64E-03	1.64E-03	1.00E-01	7.02E-05	-9.17E+00	9.48E+00
PENRE	MJ	2.08E+02	5.35E+02	8.89E-01	8.89E-01	6.06E+00	-3.55E-02	-1.64E+02	2.08E+02
PENRM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.64E-02	0.00E+00	0.00E+00
PENRT	MJ	2.08E+02	5.35E+02	8.89E-01	8.89E-01	6.06E+00	8.46E-04	-1.64E+02	2.08E+02
SM	kg	4.84E-02	4.84E-02	9.51E-05	9.51E-05	3.19E-03	1.11E-06	-3.69E-02	4.84E-02
FW	m^3	9.39E-02	2.83E-02	1.00E-04	1.00E-04	8.46E-04	2.88E-06	-8.81E-02	9.39E-02
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy re-sources; SM = Use of secondary material; FW = Use of net fresh water								

6.5 End of Life - Waste

Results per declared unit									
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste disposed	kg	4.57E-01	2.61E-01	4.67E-04	4.67E-04	1.24E-02	4.48E-05	-4.13E-01	4.57E-01
Non-hazardous waste disposed	kg	1.13E+01	5.02E+00	7.31E-03	7.31E-03	2.41E-01	1.22E-03	-1.05E+01	1.13E+01
Radioactive waste disposed	kg	6.49E-05	3.92E-05	2.31E-08	2.31E-08	1.43E-06	7.28E-10	-6.03E-05	6.49E-05

6.6 Output flow indicators

Results per declared unit									
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
Components for re-use	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
Material for recycling	kg	1.88E-03	1.99E-03	6.94E-06	6.94E-06	5.43E-05	2.22E-03	-1.64E-03	1.88E-03
Materials for energy recovery	kg	6.69E-05	5.46E-06	1.10E-08	1.10E-08	6.56E-07	1.33E-10	-6.51E-05	6.69E-05
Exported energy, electricity	MJ	2.30E-02	1.82E-02	8 .07E-06	8.07E-06	4.94E-04	2.53E-07	-2.14E-02	2.30E-02
Exported energy, thermal	MJ	3.31E-01	1.11E-02	1.79E-05	1.79E-05	6.92E-04	2.53E-07	-3.26E-01	3.31E-01

6.7 Biogenic Carbon Content (for all products listed)

Results per declared unit		
Indicator	**Unit**	**A1-A3**
Biogenic carbon content in product	kg	6.18E-02
Biogenic carbon content in packaging	kg	0.00E+00

6.8 Interpretation of LCA Study Results

In general terms, as is shown in the table of core environmental impact indicators, A1- A3 module has the higher impact, representing above 55% of the whole impact. A4 module has 38% impact. C2 module has little impact too, representing at most 1.2% respectively of the whole impact. Finally, Module D represents savings of 49.2% of the total impact.

7. Verification

Diffusion Institution	The Environmental Footprint Institute Calle CIRCE 49A Madrid 28022 Spain www.environmentalfootprintinstitute.org
EPD Registration Number	250702EPD CR:P-3100
Published	
Valid until	
Product Category Rules	PCR P-3100: Construction products in general (EN-15804)
Product Group Classification	UN CPC 37370
Reference year for Data	January 2023 – December 2023
Geographical Scope	Global

Product category rules (PCR): Under the general rules of the Environmental Footprint Institute and PCR P-3100: Construction products in general (EN-15804)
PCR review was conducted by: The Environmental Footprint Institute.
Independent verification of the declaration and data, according to ISO 14025:2006 and ISO 14040: ☐ EPD Process Certification (internal) ☒ EPD Verification (external)
Third party verifier: Mr. Ivan Jimenez Accredited by: The Environmental Footprint Institute.

8. Mandatory Statements

Explanatory material can be obtained from EPD owner and/or LCA author. Contact information can be found below. The owner of the declaration shall be liable for the underlying information and evidence. The LCA Author shall not be liable with respect to manufacturer information, life cycle assessment data and evidence. The verifier and The Environmental Footprint Institute do not make any claim or present any responsibility about the legality of the product. EPDs within the same product category but from different programs may not be comparable.

9. Contact Information

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Programme Operator	**THE ENVIRONMENTAL FOOTPRINT INSTITUTE** Calle Circe 49A Madrid, Spain www.environmentalfootprintinstitute.com info@environmentalfootprintinstitute.com

10. References

- Ecoinvent database (v3.10) - www.ecoinvent.ch
- EN 15804:2012 + A1:2013 and EN 15804:2012 + A2:2019 - Sustainability of construction works - Environmental Product Declarations - Core rules for the product category of construction products.
- EN ISO 14025: EN ISO 14025:2011-10 Environmental labels and declarations - Type III environmental declarations - Principles and procedures
- EN ISO 14040: EN ISO 14040:2009-11 Environmental management - Life cycle assessment - Principles and framework
- EN ISO 14044: EN ISO 14044:2006-10 Environmental management - Life cycle assessment - Requirements and guidelines
- Air.e LCA Tool v3.17


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