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:

LAMI LAMI TRIPLE GLAZED INSULATED GLASS UNIT:

Program:	Environmental Footprint Institute
Product group classification:	UN CPC 37370
Reference number:	250701EPD 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.

Table of Contents

1. Introduction 4
2. Company Information 4
2.1 About FUTURE GLASS 4
2.2 Sustainable practices 5
3. Product Information 5
3.1 Analyzed Product 5
3.2 Technical Specifications 6
3.3 Technical Performance 6
3.4 Thermal Performance 6
3.5 Air and Gas Tightness 7
3.6 Durability 7
3.7 Acoustic Performance 7
3.8 Safety and Security 7
4. LCA Information 8
4.1 Declared Unit 8
4.2 System boundaries 8
4.3 Time Representativeness 9
4.4 LCA Software and Database 9
4.5 Product Stage 10
4.6 Content declaration 14
5. LCA Modeling 14
5.1 Calculation Methodology 14
5.2 Emission Factors 15
5.3 Raw Materials and Chemicals 15
5.4 Electricity 15
5.5 Fuels Production and Consumption 15
5.6 Transport to the use site Stage – A4 15
5.7 Calculation Rules 16
5.8 By Products Assignment 16
6. Environmental Performance 16
6.1 Potential Environment Impacts 16

6.2 Core Environmental Impact Indicators 17
6.3 Environmental impacts – GWP-GHG 18
6.4 Use of Natural Resources 18
6.5 End of Life - Waste 19
6.6 Output flow indicators 19
6.7 Biogenic Carbon Content (for all products listed) 19
6.8 Interpretation of LCA Study Results 19
7. Verification 20
8. Mandatory Statements 21
9. Contact Information 21
10. References 22

1. Introduction

This report contains the environmental performance of the manufacturing process of the Lami Lami Triple 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 Lami Lami Triple Glass Unit.

The assessed life cycle includes all phases in the manufacturing process of the Lami Lami Triple 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 ISO 9001, ISO 14001, ISO 45001, ISO 50001, 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

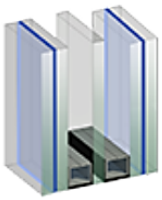
3.1 Analyzed Product

A Triple Glazed Insulated Glass Unit (IGU) is an advanced glazing system engineered for exceptional thermal insulation, acoustic comfort, and enhanced safety. This unit incorporates three panes of high-performance Guardian Clear Glass, with each outer pane constructed using ecoLam™ laminated glass. The ecoLam™ configuration consists of 6mm heat-strengthened clear, mid iron, or low iron glass, bonded with a 1.52mm PVB interlayer, and paired with another 6mm heat-strengthened glass, resulting in a total laminated pane thickness of 13.52mm. These laminated panes meet BS EN 14449 safety standards and provide superior structural performance and impact resistance.

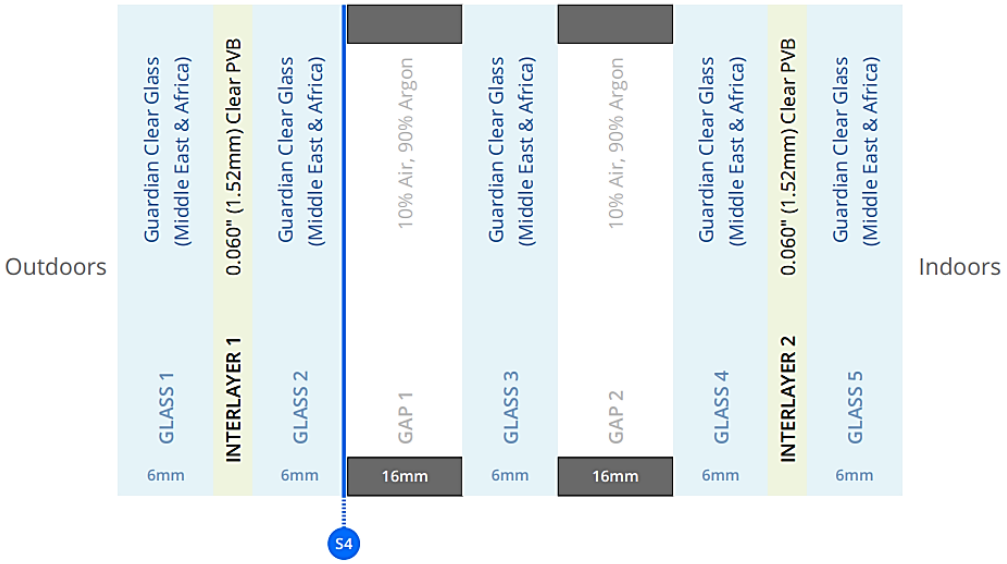
The middle pane is a 6mm heat-strengthened clear glass to BS EN 1863-1, serving as the central insulating layer between two 16mm argon-filled cavities. These cavities are filled with 90% argon gas, equipped with Technoform Warm Edge Spacers, Dowsil 3362 sealant, and molecular sieve desiccants, ensuring low thermal conductivity and preventing moisture ingress.

A Guardian SunGuard® SN 70 T low-emissivity coating is applied on surface #4, delivering advanced solar control and energy efficiency while allowing high visible light transmission. This triple silver or double silver coating helps reduce solar heat gain, thereby enhancing indoor comfort and contributing to reduced energy consumption in buildings.
The unit is structurally sealed using a dual-seal system: a primary seal of Polyisobutylene (PIB) for gas retention and a secondary seal of Dowsil 3362 silicone or equivalent for durability and moisture resistance.

With an overall nominal thickness of 65.04mm, this Laminated–Laminated Triple Glazed IGU delivers exceptional safety, security, noise reduction, and thermal performance. It is ideally suited for modern architectural applications that demand sustainability, energy efficiency, and occupant comfort.



Glazing Weight:
77.9 kg/m²



Coatings

S4 **SURFACE 4 COATING** SunGuard® SN 70 T (Middle East & Africa)

FUTURE GLASS LAMI LAMI TRIPLE GLAZED 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 ($W/m^2 \cdot K$)	
58	**16**	**19**	**25**	**24**	**20**	**0.32**	**0.37**	**1.003**	**0.844**	**1.82**

3.3 Technical Performance

- **Centre-pane U-value:** 0.6 W/m^2K (maximum)
- **Solar Heat Gain Coefficient (g-value):** 0.35-0.50
- **Visible Light Transmittance (VLT):** 60-70%
- **Sound Reduction Index (Rw):** 39-42 dB
- **Safety Classification:** Class 1(B)1 to BS EN 12600 (for laminated glass components)
- **Security Rating:** P2A to BS EN 356 (minimum)

3.4 Thermal Performance

- **Heat Transfer Coefficient:** IGUs shall achieve a center-pane U-value of 0.6 W/m^2K (maximum) when tested in accordance with BS EN 673.

- **Solar Control:** IGUs shall achieve a g-value of 0.35-0.50 and VLT of 60-70% when tested in accordance with BS EN 410.

3.5 Air and Gas Tightness

- **Gas Leakage Rate:** Initial gas concentration shall be maintained with less than 1% loss per year in accordance with BS EN 1279-3.
- **Moisture Penetration:** IGUs shall pass moisture penetration tests as defined in BS EN 1279-2.

3.6 Durability

- **Service Life:** Minimum 15-year design life under normal conditions of use.
- **Environmental Cycling:** Units shall pass environmental cycling tests as defined in BS EN 1279-2.
- **Interlayer Durability:** Laminated glass interlayers shall maintain integrity in accordance with BS EN ISO 12543-4.

3.7 Acoustic Performance

- **Sound Insulation:** Units shall achieve a sound reduction index (Rw) of 39-42 dB when tested in accordance with BS EN ISO 10140 and rated in accordance with BS EN ISO 717-1.

3.8 Safety and Security

- **Impact Resistance:** Laminated glass components shall achieve Class 1(B)1 classification to BS EN 12600.
- **Security Performance:** Laminated glass components shall achieve a minimum P2A rating to BS EN 356.
- **Structural Performance:** IGUs shall be designed to withstand the design wind loads and other applicable structural loads in accordance with BS EN 1991-1-4 and National Annex.
- **Post-breakage Behavior:** Laminated glass shall maintain its integrity and retain glass fragments after breakage.

4. LCA Information

4.1 Declared Unit

The Declared Unit of the Life Cycle Assessment is one square meter **(1m^2)** of the Lami Lami Triple 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 he considered area is on average **77.9 kg.**

Name	Value	Unit
Functional Unit	1	m^2
Mass	77.9	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	X	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.

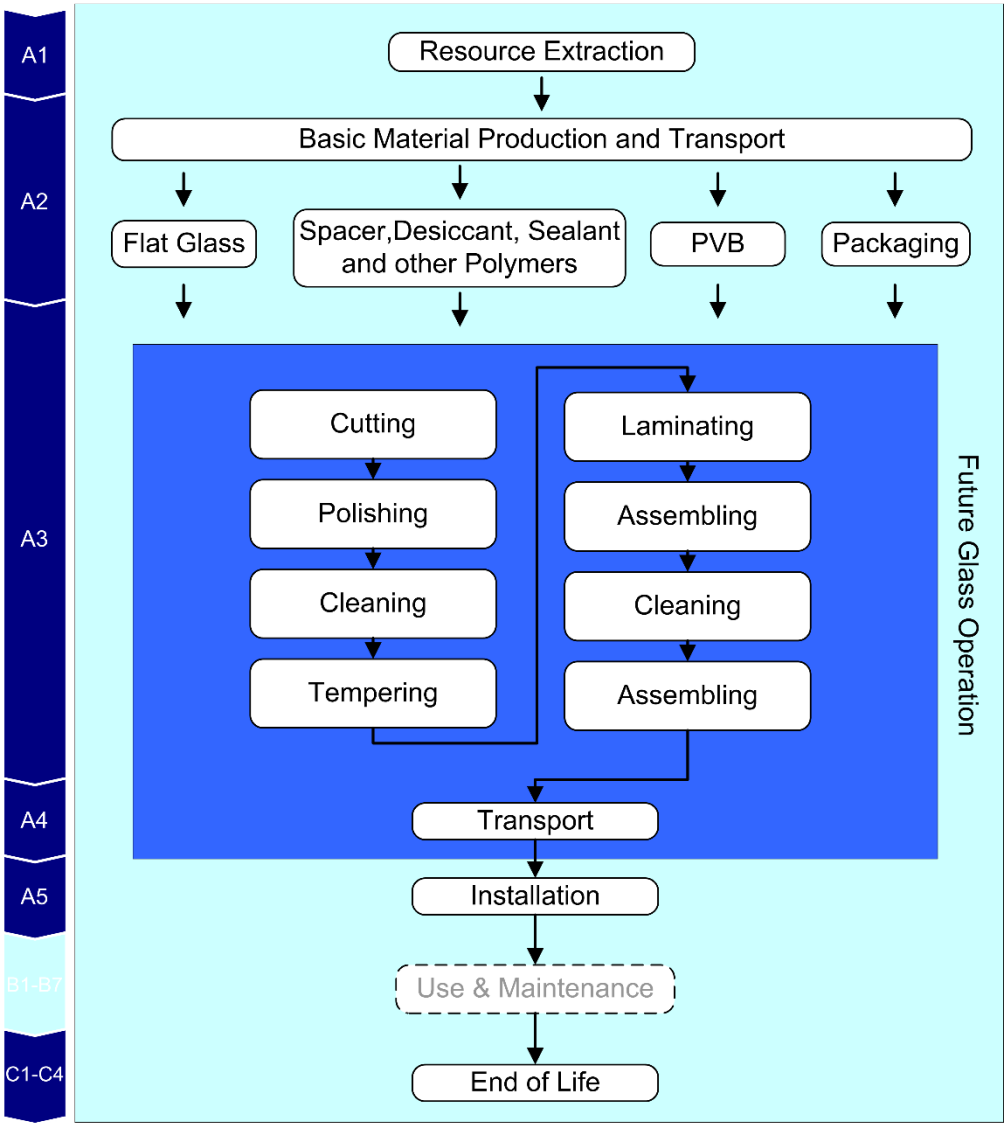
4.3 Time Representativeness

Manufacturing facility-specific data from FUTURE GLASS are 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), all the chemicals used for the coatings, the PVB for the laminating interlayer, as well as raw materials to produce the Lami Lami Triple 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**
- **Laminating**
- **Assembling**
- **Cleaning**
- **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 0.25% loss of glass during the glass cutting processes steps (e.g., broken, trims) as well as 5.56% for PVB and 0.56% for spacer. These losses have been determined by production weight. Glass waste is sent to a recycling center while sealant and spacer residues are sent to waste treatment plant.

A4. Transport
This stage involves the transportation of Glass Units to the construction site via 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 use stage modules (B1 to B7) are not declared in this EPD, as they are highly dependent on building-specific conditions such as location, orientation, and maintenance practices. Triple glass units are passive components with no operational energy use, and they typically require minimal maintenance over their service life. Environmental impacts during use—such as those related to periodic cleaning—are considered negligible or too variable to be reliably quantified within the scope of this assessment. Therefore, the use stage is excluded from this EPD.

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–C4). 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 Spacer, Nails, Steel belt and Wire are 100% recycled, contributing to the reduction in production. Plastic waste undergoes incineration, with 100% being incinerated, contributing to energy recovery.

C4. Disposal

At the end of their lifecycle, PVB and Desiccant wastes are disposed of in construction and demolition landfills.

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 triple 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 spacers, 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.

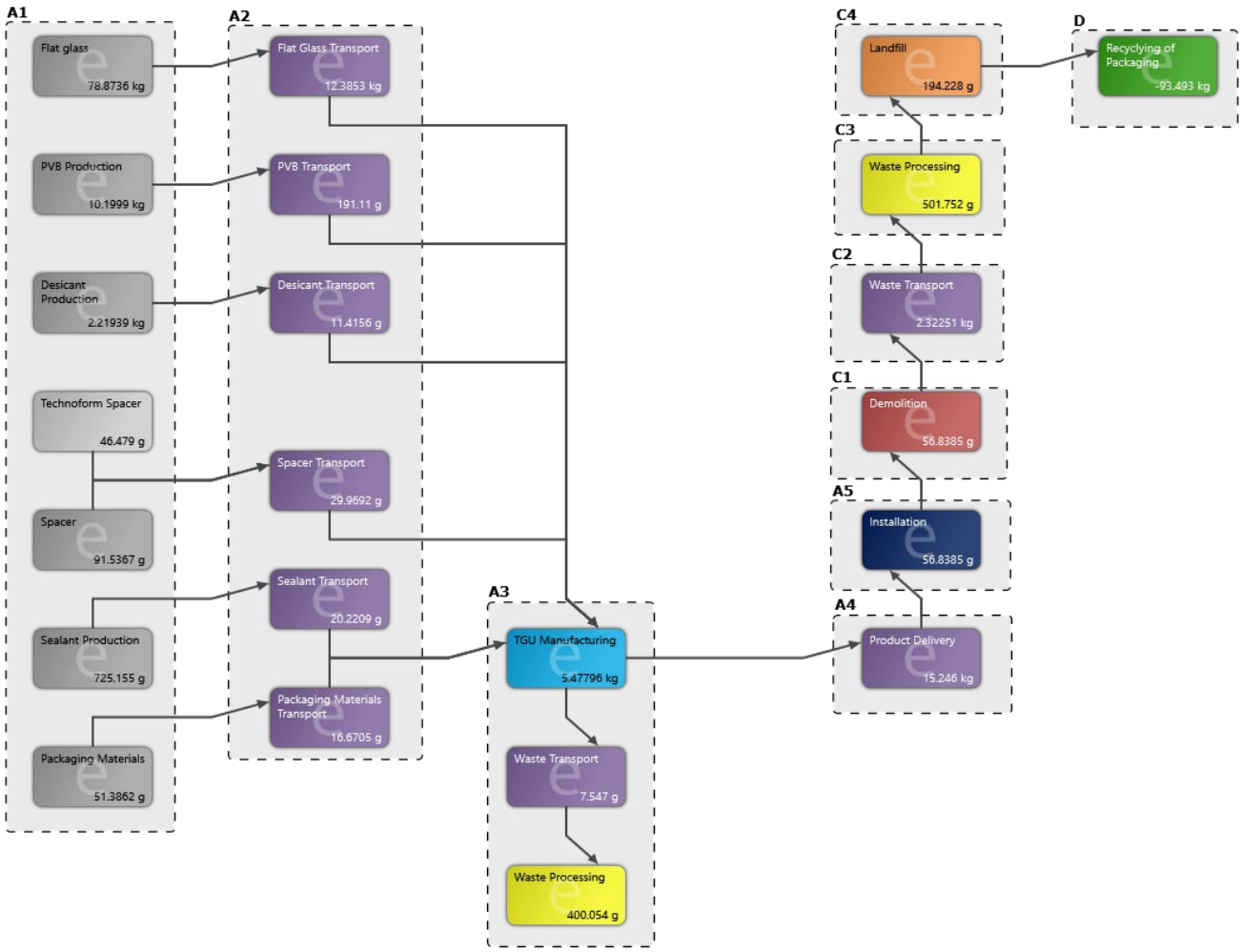
Wood packaging materials are assumed to be reused, extending their lifecycle and preventing the environmental impact of manufacturing new wood-based materials. This reuse is accounted for as an avoided burden in the assessment.

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 0.399 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.



4.6 Content declaration

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

Material	Quantity per Functional Unit /Kg	Percentage
Glass	74.0	95.04%
Polyvinyl Butyral (PVB)	2.8	3.60%
Spacer	0.398	0.51%
Sealant	0.2	0.26%
Desiccant	0.4	0.51%
Corner piece	0.022	0.03%
Butyl	0.04	0.05%
Total	**77.9**	**100%**

Packaging materials	Weight, kg	Weight-% (versus the product)	Weight biogenic carbon, kg C/kg
Wood	0.656	0.8425 %	<0.01
Softboard	0.000294	0.0004 %	<0.01
Plastic printing rolls	0.00258	0.0033 %	0
Nails	0.00282	0.0036 %	0
Steel belt	0.0081	0.0104 %	0
Wire buckle	0.00122	0.0016 %	0
Yellow packaging strip	0.00271	0.0035 %	0
TOTAL	**0.6737**	**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 have 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

The glass units are supplied to customers, and the A4 phase has been modeled in two stages. In the first stage, the products are shipped 24,684 km by sea to their destination. In second stage, all products are transported from the manufacturing site in Ras Al Khaimah to Dubai Port, covering a 100 km road distance. The transportation scenario is based on glass units sold between January 2023 and December 2023. The modes of transport considered include freight by lorry (16-32 metric tons, EURO 4) for road transport and shipping for sea transport.

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 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 Lami Lami Triple 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 for the production of 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.	1.10E+02	1.56E+01	5.68E-02	5.68E-02	2.32E+00	4.96E-01	1.94E-01	-9.24E+01
GWP-biogenic	kg CO_2 eq.	5.55E-01	2.69E-03	4.47E-06	4.47E-06	4.00E-04	6.09E-03	1.74E-04	-1.11E+00
GWP-luluc	kg CO_2 eq.	3.44E-02	9.49E-03	2.87E-06	2.87E-06	1.09E-03	1.06E-05	1.87E-05	-3.31E-02
GWP-total	kg CO_2 eq.	1.10E+02	1.57E+01	5.68E-02	5.68E-02	2.32E+00	5.02E-01	1.94E-01	-9.35E+01
ODP	kg CFC 11 eq.	2.01E-06	2.18E-07	1.32E-09	1.32E-09	3.10E-08	2.27E-10	8.94E-10	-9.95E-07
AP	mol H^+ eq.	9.46E-01	3.66E-01	8.84E-05	8.84E-05	1.23E-02	1.60E-04	2.49E-04	-8.32E-01
EP-freshwater	kg P eq.	1.28E-02	6.33E-04	9.54E-07	9.54E-07	2.14E-04	4.68E-06	3.61E-06	-1.34E-02
EP-marine	kg N eq.	1.72E-01	8.45E-02	2.19E-05	2.19E-05	4.77E-03	8.09E-05	1.14E-03	-1.42E-01
EP-terrestrial	mol N eq.	2.00E+00	9.39E-01	2.28E-04	2.28E-04	5.19E-02	6.72E-04	1.01E-03	-1.65E+00
POCP	kg NMVOC eq.	5.97E-01	2.63E-01	1.52E-04	1.52E-04	1.65E-02	1.76E-04	3.85E-04	-4.63E-01
ADP-minerals & metals*	kg Sb eq.	7.02E-04	2.08E-05	6.13E-08	6.13E-08	9.73E-06	1.83E-07	7.71E-08	-6.68E-04
ADP-fossil*	MJ	1.44E+03	1.99E+02	9.44E-01	9.44E-01	3.36E+01	1.71E-01	8.10E-01	-1.06E+03
WDP*	m^3	3.37E+01	7.19E-01	4.24E-03	4.24E-03	1.80E-01	2.50E-02	-4.42E-01	-2.31E+01
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.	1.10E+02	1.57E+01	5.68E-02	5.68E-02	2.32E+00	5.02E-01	1.94E-01	-9.35E+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	4.90E+01	1.49E+00	1.64E-03	1.64E-03	5.28E-01	9.34E-03	1.05E-02	-5.90E+01
PERM	MJ	8.30E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-8.27E+00
PERT	MJ	5.73E+01	1.49E+00	1.64E-03	1.64E-03	5.28E-01	9.34E-03	1.05E-02	-6.72E+01
PENRE	MJ	1.22E+03	1.68E+02	8.89E-01	8.89E-01	3.19E+01	6.88E-02	-5.96E+01	-1.01E+03
PENRM	MJ	1.09E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.04E+01	0.00E+00
PENRT	MJ	1.33E+03	1.68E+02	8.89E-01	8.89E-01	3.19E+01	6.88E-02	7.07E-01	-1.01E+03
SM	kg	3.05E-01	9.56E-02	9.51E-05	9.51E-05	1.68E-02	1.24E-04	2.54E-04	-6.46E-01
FW	m^3	8.02E-01	1.76E-02	1.00E-04	1.00E-04	4.45E-03	5.87E-04	-1.03E-02	-5.65E-01
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	3.57E+00	3.08E-01	4.67E-04	4.67E-04	6.51E-02	8.13E-03	1.31E-03	-6.60E+00
Non-hazardous waste disposed	kg	7.36E+01	4.41E+00	7.31E-03	7.31E-03	1.27E+00	2.42E-01	1.39E+01	-1.12E+02
Radioactive waste disposed	kg	4.73E+05	2.22E-05	2.31E-08	2.31E-08	7.53E-06	9.27E-08	1.71E-07	-6.00E-04

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	1.26E-02	2.48E-02	6.94E-06	6.94E-06	2.85E-04	4.02E-01	1.18E-05	-2.52E-02
Materials for energy recovery	kg	3.53E-04	3.56E-06	1.10E-08	1.10E-08	3.45E-06	1.33E-08	5.00E-08	-3.88E-04
Exported energy, electricity	MJ	1.67E-01	2.15E-02	8.07E-06	8.07E-06	2.60E-03	2.84E-05	6.70E-05	-2.14E-01
Exported energy, thermal	MJ	1.71E+00	6.35E-03	1.79E-05	1.79E-05	3.64E-03	9.83E-06	8.62E-05	-1.71E+00

6.7 Biogenic Carbon Content (for all products listed)

Results per declared unit		
Indicator	**Unit**	**A1-A3**
Biogenic carbon content in product	kg	3.24E-01
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-A2 and A3 modules have the higher impact, representing above 50.4% of the whole impact. A4 module has a less impact. C2 and C4 modules have little impact too, representing at most 0.01% and 0.05% respectively of the whole impact. Finally, Module D represents savings of 0.6% of the total impact.

7. Verification

Diffusion Institution	The Environmental Footprint Institute Calle CIRCE 49A Madrid 28022 Spain www.environmentalfootprintinstitute.org
EPD Registration Number	250701EPD 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

EPD Owner	**FUTURE ARCHITECTURAL GLASS LLC** Plot # P278-P284 Al Ghail Industrial Area PO Box: 8600, Ras Al Khaimah, UAE T.P. +971 7 258 9274 / +971 7 258 9071 FUTURE | GLASS www.faglass.com
LCA Author	**A. UDHAYANILA** **CHILTERN TMC CONSULTANT** 15, C-5, Mezzanine Floor, Unique World Business Center, Hamsah - A Building, Al Karama, Dubai, U.A.E T.P. +971 42698356 E mail – info@chilterntmc.com Chiltern TMC Guiding Your Path to Sustainable Success www.chilterntmc.com
Programme Operator	**THE ENVIRONMENTAL FOOTPRINT INSTITUTE** Calle Circe 49A Madrid, Spain www.environmentalfootprintinstitute.com info@environmentalfootprintinstitute.com ENVIRONMENTAL FOOTPRINT INSTITUTE

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


| Glazing Options