Environmental Product Declaration

Guardian Glass Unprocessed (Flat) Glass

Brazil Flat Glass Products

Guardian Glass is dedicated to continually improving the science and process of its core competency, flat glass manufacturing.

Guardian Glass is committed to the efficient use of natural resources while operating in a way that protects the safety, health, and well-being of its employees, customers, the environment, and society.

As a manufacturing leader of high performance, energy-efficient glass products for commercial, residential, interior, transportation, solar, and specialty applications, Guardian Glass makes products that help improve people's lives. By allowing abundant natural light into homes, offices, and vehicles, glass products can help contribute to occupants' well-being and low-emissivity glass helps reduce energy consumption for heating and cooling.

By publishing this EPD, Guardian Glass intends to support architects and designers who strive to enhance the environmental profiles of the buildings they design through the products they specify. The goal is to provide them with the information needed to achieve credits in global building rating systems.

UL CERTIFIED
ENVIRONMENTAL PRODUCT DECLARATION
UL.COM/EPD

This declaration is an environmental product declaration (EPD) in accordance with ISO 14025 and ISO 21930:2017. EPDs rely on a Life Cycle Assessment (LCA) to provide information on a number of environmental impacts of products over their life cycle. Exclusions: EPDs do not indicate that any environmental or social performance benchmarks are met, and there may be impacts that they do not encompass. LCAs do not typically address the site-specific environmental impacts of raw material extraction, nor are they meant to assess human health toxicity. EPDs can complement but cannot replace tools and certifications that are designed to address these other impacts and/or set performance thresholds – e.g. Type 1 certifications, health assessments and declarations, environmental impact assessments, etc. Accuracy of Results: EPDs regularly rely on estimations of impacts, thus the level of accuracy for any estimated effect may for differ between product lines and reported impacts. Comparability: EPDs are not comparative assertions and are either not comparable or have limited comparability when they cover different life cycle stages, are based on different product category rules or are missing relevant environmental impacts. EPDs from different programs may not be comparable (ISO 14025).

EPD PROGRAM AND PROGRAM OPERATOR NAME, ADDRESS, LOGO, AND WEBSITE	UL Solutions 2211 Newmarket Pkwy, Marietta, GA 30067 USA
GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER	UL Environment: General Program Instructions v2.7. 2022.
MANUFACTURER NAME AND HEADQUARTERS ADDRESS	Guardian Glass Global Headquarters 2300 Harmon Road Auburn Hills, MI 48306
DECLARATION NUMBER	4791213166.102.1
DECLARED PRODUCT & FUNCTIONAL UNIT OF DECLARED UNIT	Guardian Glass Unprocessed (Flat) Glass, Brazil Products Functional Unit = 1 metric tonne of Unprocessed (Flat) Glass
REFERENCE PCR AND VERSION NUMBER	National Glass Association (NGA) PCR for Flat Glass: UN CPC 3711 v2
DESCRIPTION OF PRODUCT(S) APPLICATION/USE	Brazilian Flat Unprocessed Glass Products
PRODUCT RSL DESCRIPTION	30 Years
MARKETS OF APPLICABILITY	South America, covering facilities in Brazil
DATE OF ISSUE	March 1, 2024
PERIOD OF VALIDITY	5 years
EPD TYPE	Product Specific
DATASET VARIABILITY	N/A
EPD SCOPE	Cradle-to-Gate
YEAR(S) OF REPORTED PRIMARY DATA	Calendar Year 2021
LCA SOFTWARE & VERSION NUMBER	LCA for Experts (formerly GaBi) 10.6
LCI DATABASE(S) & VERSION NUMBER	Sphera Managed LCA Content (formerly GaBi) databases & USLCI v2.0
LCIA METHODOLOGY & VERSION NUMBER	TRACI 2.1; CML 4.1
The sub-category PCR review was conducted by:	NSF International - PCR Review Panel - ncss@nsf.org
This declaration was independently verified in accordance with ISO 14025: 2006. The UL Environment: Product Category Rules for Building-Related Products and Services in North America, Part A: Life Cycle Assessment Calculation Rules and Report Requirements, v.3.2, December 2018, based on ISO 21930 serves as the core PCR. [ ] INTERNAL [X] EXTERNAL	Cooper McCollum Cooper McCollum, UL Solutions
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	Thomas P. Gloria, Industrial Ecology Consultants

Comparison of the environmental performance using EPD information shall consider all relevant information modules over the full life cycle of the products within the building. This PCR allows EPD comparability only when the same functional requirements between products are ensured and the requirements of ISO 21930 §5.5 are met. It should be noted that different LCA software and background LCI datasets may lead to differences in results for upstream or downstream of the life cycle stages declared.

Summary of Declaration and Global Warming Potential Results

This Environmental Product Declaration covers Brazilian uncoated flat glass products. The following product families and manufacturing facilities are included within this declaration.

Product Families/Categories Covered:

Commercial:

- Guardian Clear Glass
- Guardian UltraClear™ Low Iron Glass
- Guardian Green Glass
- Guardian Gray Glass
- Guardian Bronze Glass
- Guardian Clear Glass

Manufacturing Facilities Covered:

- Porto Real, Brazil
- Tatui, Brazil

Global Warming Potential (Embodied Carbon) Impact Assessment Results:

The following table details the Global Warming Potential (GWP) results as found in Table 4 but scaled to each thickness available. The calculation by given thickness is from scaling factors found in Table 8 which are based on the weight per square meter of glass at each thickness and the total amount of area that would comprise a metric tonne of glass. Both TRACI (North American) and CML (global life cycle) global warming potential impact assessment values are provided.

Table 1 - Global Warming Potential per Thickness of Uncoated Flat Glass

Thickness	Cradle to Gate (A1- A3) GWP (kg CO_2 eq/m^2)	
	TRACI (North American)	CML (Global)
2 mm	4.58	4.63
3 mm	6.89	6.95
4 mm	9.16	9.25
5 mm	11.5	11.6
6 mm	13.7	13.9
8 mm	18.3	18.5
10 mm	22.9	23.1
12 mm	27.5	27.8

General Information

Description of Company / Organization

Guardian Glass is one of the largest flat glass producers and innovators in the world. We've been working with glass since 1932 and manufacturing float glass since 1970, and yet the limitless potential of this amazing material still fascinates and inspires us every day. We are committed to advancing glass technology and exploring every application possible. Not only to enhance our consumers' well-being with light and space, but to help conserve energy, regulate temperatures, protect privacy, preserve history and help us See What's Possible™.

Through pioneering research, the dedication of our people and a firm belief in close collaboration with our partners and customers, we find new ways to build, design and inspire with glass. We continue to build our expertise on each and every project, whether that's an iconic, energy-efficient building or a new glass coating that will solve the challenges of today and beyond.

Every day, we work to create more value, using fewer resources than the day before. We constantly challenge ourselves to identify opportunities to build upon the benefits of glass. We expertly combine glass types to maximize energy savings and bring light and an unrivalled aesthetic to people's lives. We're committed to the efficient use of natural resources while operating in a way that protects the safety, health and well-being of our employees, customers, the environment and society.

For more information visit our website at www.guardianglass.com

Product Description

This EPD is valid for the following flat unprocessed Guardian Glass products:

- Guardian Clear Glass
- Guardian UltraClear™ Low Iron Glass
- Guardian Green Glass
- Guardian Gray Glass
- Guardian Bronze Glass
- Guardian Clear Glass

Manufacturer-Specific EPD

This product-specific EPD was developed based on the Guardian Glass Americas Cradle-to-Gate Life Cycle Assessment. The EPD accounts for raw material extraction and processing, transport, and product manufacturing. Manufacturing data were gathered directly from company personnel. When updated company-specific data were not available the ratio of production units, within the calendar year 2021, was used as a proxy. For any product group EPDs, an impact assessment was completed for each product and the highest impacts were reported as conservative representations of the product group. Product grouping was considered appropriate if the individual product impacts differed by no more than ±10% in any impact category.

Application

Flat glass products are used in a wide variety of applications, including commercial, residential, interior, transportation, solar and specialty applications. Guardian Glass typically supplies float glass and coated glass products to either its fabricator customers or its own fabrication facilities who further process that glass into the final product by cutting, heat-treating, laminating, insulating, or otherwise fabricating the glass into the desired size and makeup for use in the intended application. The glass makeup is typically specified by architects, glazing contractors, window manufacturers, and other design professionals.

Material Composition

Float glass is typically manufactured from virgin, non-renewable raw materials such as silica sand, soda ash, dolomite, limestone, and cullet (internal cullet is comprised of the afore-mentioned raw materials). It can also contain recycled cullet. The crystalline raw materials chemically and structurally transform into amorphous glass through a fusion (melting) process, thereby producing a product which is >99.9% glass oxide. Guardian tinted and patterned glass are similar in composition to clear float glass but may include slight variations of trace elements to achieve required optical properties.

Technical Data

Technical data on Guardian Glass products is available on at www.guardianglass.com.

Placing on the Market / Application Rules

The standard that can be applied for Guardian Flat Glass Products:
- ASTM C 1036: Standard Specification for Flat Glass
- ABNT NBR NM 294:2004 Float Glass

Properties of Declared Product as Shipped

Product Sizes: While products are primarily cut to customers' specified dimensions, common dimensions of flat glass include:

- 2000mm x 3210mm
- 2200mm x 3210mm
- 2400mm x 3210mm
- 2540mm x 3210mm
- 2600mm x 3210mm
- 2600mm x 3600mm
- 2540mm x 3600mm
- 2400mm x 3600mm
- 2200mm x 3600mm
- 2000mm x 3600mm

While thickness of glass also varies based on customer needs, some standard thicknesses for flat glass include:

- 2 mm
- 3 mm
- 4 mm
- 5 mm
- 6 mm
- 8 mm
- 10 mm
- 12 mm

Please contact local sales representative for available sizes in your area.

Declaration Type: Business-to-Business

Geographic Scope: This declaration is valid for products produced in Brazil from Guardian Glass.

Additional Notes: Further processing of the flat glass, such as coating, tempering, laminating, etc., are beyond the scope of the PCR and as such, not included in this analysis. Please see a separate EPD from Guardian Glass for processed glass products. Additionally, this analysis represents the performance of a production-weighted average of Guardian Glass products, based on 2021 production volumes.

Methodological Framework

Declared Unit

The declaration refers to the functional unit of 1 metric tonne of unprocessed flat glass as specified in the PCR.

Table 2 – Declared Unit Description

Name	Value	Unit
Declared Unit	1.0	metric tonne
Area Covered by Declared Unit	100	m^2
Thickness	4.0	mm
Reference Service Life	30	years

System Boundary

This study is a cradle-to-gate environmental product declaration. The following life cycle phases were considered:

Table 3 - Description of the System Boundary

Product			Construction Installation		Use							End-of-Life*				Benefits of loads beyond the system boundary		
Raw Material Extraction and Processing	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
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D	D	D
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

Description of the System Boundary Stages Corresponding to the PCR
(X = Included; MND = Module Not Declared)
*This includes provision of all materials, products and energy, packaging processing and its transport, as well as waste processing up to the end-of waste state or disposal of final residues.

Allocation

Where manufacturing inputs, such as electricity use, were not sub-metered, allocation was determined on a per metric tonne basis for primary data. For secondary data, cut-off methodology was used.

Cut-off Criteria

Processes whose total contribution to the final result, with respect to their mass and in relation to all considered impact categories, is less than 1% can be neglected. The sum of the neglected processes may not exceed 5% by mass of the considered impact categories. For that a documented assumption is admissible.

For Hazardous Substances the following requirements apply:

- The Life Cycle Inventory (LCI) of hazardous substances will be included, if the inventory is available.
- If the LCI for a hazardous substance is not available, the substance will appear as an input in the LCI of the product, if its mass represents more than 0.1% of the product composition.
- If the LCI of a hazardous substance is approximated by modeling another substance, documentation will be provided.

This EPD is in compliance with the cut-off criteria. No processes were neglected or excluded. Capital items for the production processes (machine, buildings, etc.) were not taken into consideration.

Data Sources

Primary data were collected for every process in the product system under the control of Guardian Glass. Secondary data from the LCA for Experts LCA for Experts Sphera database & USLCI v2.0 databases were utilized. These data were evaluated and have temporal, geographic, and technical coverage appropriate to the scope of the Glass product category.

Data Quality

The data sources used are complete and representative of North America in terms of the geographic and technological coverage and are a recent vintage (i.e., less than ten years old). The data used for primary data are based on direct information sources of the manufacturer. Secondary data sets were used for raw materials extraction and processing, end of life, transportation, and energy production flows. Wherever secondary data is used, the study adopts critically reviewed data for consistency, precision, and reproducibility to limit uncertainty.

Comparability and Benchmarking

A comparison or an evaluation of EPD data is only possible if all data sets to be compared were created according to ISO 21930and the building context, respectively the product-specific characteristics of performance, are taken into account. Environmental declarations from different programs may not be comparable. Full conformance with the National Glass Association (NGA) PCR for Flat Glass: UN CPC 3711 allows EPD comparability only when all stages of the product's life cycle have been considered. However, variations and deviations are possible.

Estimates and Assumptions

Due to limitations in data availability, assumptions were made in allocating important manufacturing inputs and outputs including process materials, natural gas, and facility emissions. The allocation approaches taken may therefore overestimate the environmental burden for uncoated glass production.

Additionally, the “average” glass pane used in modeling is a calculated average and does not represent a specific product manufactured by Guardian Glass.

Units

The LCA results within this EPD are reported in the International System (SI) units.

Additional Environmental Information

Background data

For life cycle modeling of the considered products, the LCA for Experts for Life Cycle Engineering, developed by Sphera, is used. The LCA for Experts-database contains consistent and documented datasets which are

documented in the online LCA for Experts- documentation. To ensure comparability of results in the LCA, the basic data of the LCA for Experts database were used for energy, transportation and auxiliary materials.

Manufacturing

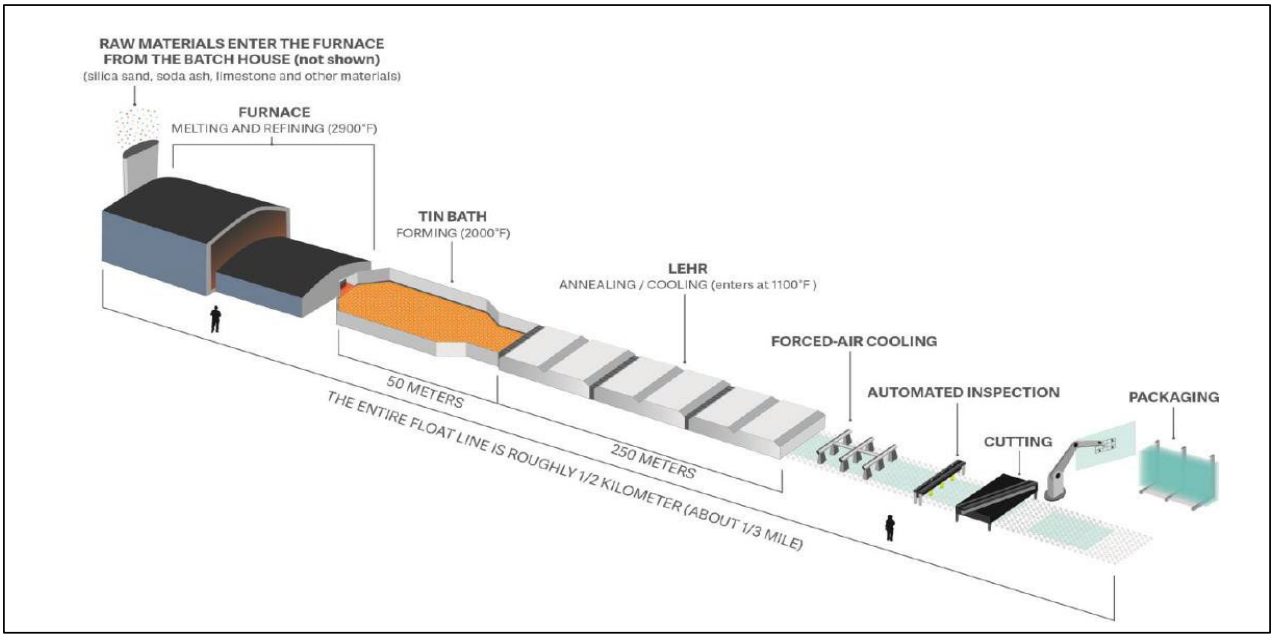

Figure 1 - Flat Glass Production

Flat glass production involves heating the raw materials to a liquid state and then floating the subsequent ribbon of glass atop a bath of molten tin. Once the ribbon has sufficiently cooled, it is transferred onto rollers and annealed to limit residual stresses, its edges are trimmed and the ribbon is cut to the desired sizes. The finished flat glass products are stored for additional processing (e.g., heat- treating or coating) or directly packaged and shipped to customers for further processing.

Product Installation

Guardian Glass products should be processed and installed according to best industry standards and according to all applicable building codes in the given jurisdiction.

Distribution, Product Use, and End of Life

Upon leaving Guardian Glass facilities, flat glass can be further processed through a nationwide network of independent fabricators or Guardian's own fabrication facilities.

Racks used for distribution of glass are reused many times both in the manufacturing plant and shipped to the customer and returned to Guardian Glass plants.

Glass should be installed according to industry standards and according to all applicable building codes in the given jurisdiction. Installed glass should be washed frequently to remove surface dirt and to protect the glass from staining. Glass staining occurs when the sodium within the glass reacts with moisture in the air. Sodium, when combined with small amounts of water, can create sodium hydroxide which is corrosive to glass.

Once installed, Guardian Glass products do not consume energy or require maintenance beyond general cleaning to fulfill their estimated service life. At the end of life, flat glass is typically landfilled or reclaimed and recycled.

Unprocessed (Flat) Glass Results per Declared Unit

Results shown below were calculated using TRACI 2.1 and CML 2001-April 2013 impact assessment methodology. TRACI 2.1 is a life cycle impact assessment methodology typically used for North American projects. CML 2001 is a methodology used globally for life cycle impact assessments.

Table 4 - Life Cycle Impact Assessment Results per Metric Tonne of Flat Glass

TRACI 2.1 Impact Assessment						
			Materials		Production	
Parameter		Unit	A1	A2	A3	Total
GWP	Global warming potential	kg CO_2-Eq.	1.14E+02	3.09E+01	7.71E+02	**9.16E+02**
ODP	Depletion potential of the stratospheric ozone layer	kg CFC-11 Eq.	7.02E-08	1.17E-09	1.23E-08	**8.37E-08**
AP Air	Acidification potential for air emissions	kg SO_2-Eq.	2.29E-01	1.85E-01	4.60E+00	**5.01E+00**
EP	Eutrophication potential	kg N-Eq.	1.28E-02	1.03E-02	1.12E-01	**1.35E-01**
SP	Smog formation potential	kg O_3-Eq.	3.42E+00	5.11E+00	1.35E+01	**2.20E+01**
FFD	Fossil fuel depletion	MJ-surplus	1.08E+02	5.46E+01	1.23E+03	**1.39E+03**
MRD	Mineral Resource Depletion potential	kg Fe-Eq.	1.63E+00	1.13E-03	-1.16E-01	**1.52E+00**
CML						
			Materials		Production	
Parameter		Unit	A1	A2	A3	Total
GWP	Global warming potential	kg CO_2-Eq.	1.15E+02	3.10E+01	7.79E+02	**9.25E+02**
ODP	Depletion potential of the stratospheric ozone layer	kg CFC-11 Eq.	5.58E-08	1.17E-09	1.02E-08	**6.72E-08**
AP Air	Acidification potential for air emissions	kg SO_2-Eq.	2.19E-01	1.52E-01	5.29E+00	**5.66E+00**
EP	Eutrophication potential	kg N-Eq.	2.34E-02	2.71E-02	1.15E-01	**1.66E-01**
SP	Smog formation potential	kg O_3-Eq.	1.60E-02	1.78E-02	2.96E-01	**3.30E-01**
FFD	Fossil fuel depletion	MJ-surplus	4.56E-03	1.28E-08	1.46E-05	**4.57E-03**
MRD	Mineral Resource Depletion potential	kg Fe-Eq.	1.35E+03	3.94E+02	1.01E+04	**1.18E+04**

Results below contain the resource use throughout the life cycle of the product.

Table 5 - Resource Use per Metric Tonne of Flat Glass

			Materials		Production	
Parameter		Unit	A1	A2	A3	Total
Renewable Primary Energy Resources						
RPR_E	Renewable primary energy as energy carrier	MJ	1.97E+02	0.00E+00	3.68E+02	**5.65E+02**
	Solar	MJ	*5.09E+01*	*0.00E+00*	*1.90E+02*	***2.41E+02***
	Wind	MJ	*4.40E+01*	*0.00E+00*	*1.15E+02*	***1.59E+02***
	Hydro	MJ	*2.13E+01*	*0.00E+00*	*4.68E+02*	***4.89E+02***
	Biomass	MJ	*1.63E-04*	*0.00E+00*	*1.58E-02*	***1.60E-02***
	Geothermal	MJ	*2.83E+00*	*0.00E+00*	*1.11E-01*	***2.94E+00***
RPR_M	Renewable primary energy resources as material utilization	MJ	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Nonrenewable Primary Energy Resources						
$NRPR_E$	Nonrenewable primary energy as energy carrier	MJ	1.91E+03	8.31E+02	1.24E+04	**1.51E+04**
	Fossil	*MJ*	*1.35E+03*	*3.93E+02*	*1.01E+04*	***1.18E+04***
	Nuclear	*MJ*	*1.34E+02*	*3.59E+00*	*7.33E+01*	***2.11E+02***
$NRPR_M$	Nonrenewable primary energy as material utilization	MJ	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Secondary Resources						
SM	Use of secondary material	kg	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
RSF	Use of renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
NRSF	Use of nonrenewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
RE	Energy recovered from disposed waste	MJ	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**

Results below contain the emissions to air and water throughout the cradle-to-gate life cycle of the product.

Table 6 - Emissions to Water and Air per Metric Tonne of Flat Glass

Parameter	Unit	Materials		Production	Total
Emissions to Air		**A1**	**A2**	**A3**	**Total**
Sulfur oxides (SOx)	kg	7.63E-06	0.00E+00	1.35E-04	**1.43E-04**
Nitrogen oxides (NO_x)	kg	1.35E-01	2.02E-01	5.14E-01	**8.51E-01**
Carbon Dioxide (CO_2)	kg	1.08E+02	2.97E+01	7.08E+02	**8.46E+02**
Carbon monoxide (CO)	kg	8.75E-02	1.56E-01	2.26E-01	**4.70E-01**
Volatile organic compounds (VOCs)	kg	4.27E-04	9.72E-03	1.39E-01	**1.49E-01**
Iron (Fe)	kg	3.50E-05	0.00E+00	1.15E-06	**3.62E-05**
Particulate Matter (PM)	kg	1.36E-01	6.27E-03	4.73E-02	**1.89E-01**
Water emissions and use		**A1**	**A2**	**A3**	**Total**
Phosphates	kg	1.55E-04	0.00E+00	9.89E-04	**1.14E-03**
Nitrates	kg	5.36E-03	4.52E-12	7.24E-02	**7.78E-02**
Dioxin	kg	4.48E-21	0.00E+00	9.12E-18	**9.12E-18**
Heavy Metals	kg	1.41E-02	5.78E-03	8.97E-02	**1.10E-01**
Arsenic	kg	-1.06E-11	0.00E+00	4.20E-06	**4.20E-06**
Lead	kg	1.08E-05	1.83E-05	2.58E-04	**2.87E-04**
Mercury	kg	2.76E-07	3.03E-08	2.31E-07	**5.37E-07**
Cadmium	kg	5.02E-06	1.29E-06	1.36E-04	**1.42E-04**
Chromium	kg	1.99E-05	7.81E-05	4.29E-04	**5.27E-04**
Water Consumption	m3	5.77E-01	0.00E+00	3.09E+00	**3.67E+00**

Results below contain the output flows and wastes throughout the life cycle of the product.

Table 7 - Waste and Outflows per Metric Tonne of Flat Glass

Parameter	Unit	Materials		Production	Total
		A1	**A2**	**A3**	**Total**
Incineration with energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Incineration without energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Landfill (non-hazardous solid waste)	kg	8.65E-01	0.00E+00	9.26E+00	**1.01E+01**
Hazardous waste	kg	4.82E-08	0.00E+00	6.79E-06	**6.84E-06**
Recycling (landfill avoidance)	kg	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
High-level radioactive waste	kg	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Intermediate- and low-level radioactive waste	kg	5.17E-02	0.00E+00	1.83E-02	**7.00E-02**
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Recovered energy exported from system	MJ	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**

Unprocessed (Flat) Glass LCA Interpretation

The production of flat glass (A3) dominates the impacts across all impact categories, except ozone depletion. This is due to the electricity and natural gas used to make the products. Raw materials drives the impacts in the ozone depletion category.

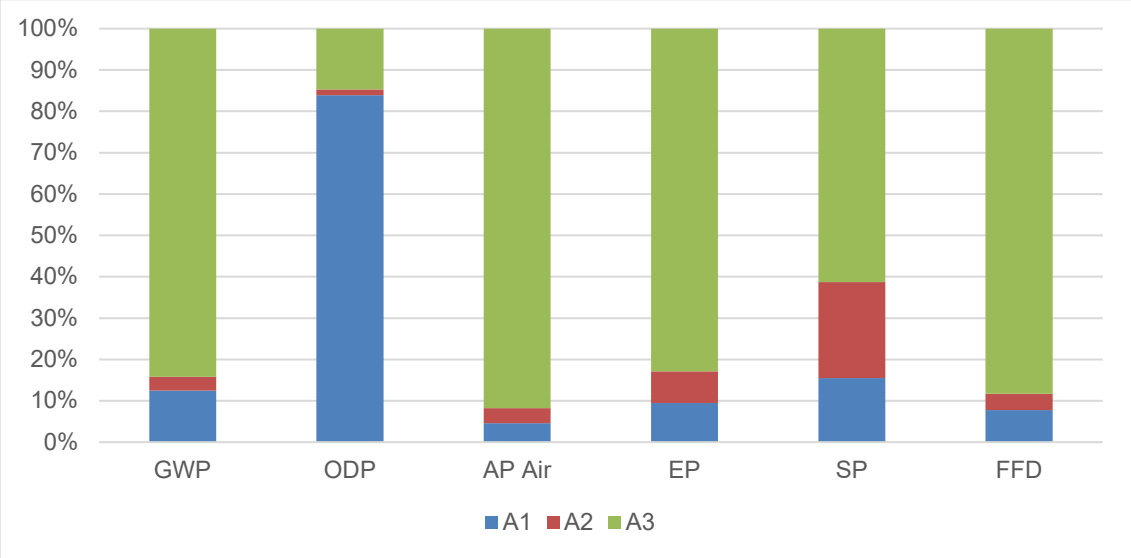

Figure 2 - Relative Contributions of Cradle to Gate Life Cycle Stages for Uncoated Flat Glass

Glass can come in a variety of different sizes, but its impacts can be scaled to different glass thicknesses. For this EPD, results are reported per metric tonne of glass produced. To convert to area (a square meter) at a given thickness, please see the scaling factor below for different sizes. Divide the results in Tables 4 – 7 above by the scaling factor below.

Equation 1. Scaling Results to an Area at an Assumed Thickness

$$Impact\ Assessment\ Result\ per\ m^2 = Impact\ Quantity\ (in\ Tables\ 4-7) \div Scaling\ Factor\ at\ Desired\ Thickness$$

Table 8 - Scaling Factors Used to Divide the Metric Tonne Results to Equate to Various Thicknesses

Thickness	Scaling Factor
2 mm	200
3 mm	133
4 mm	100
5 mm	80.0
6 mm	66.7
8 mm	50.0
10 mm	40.0
12 mm	33.3

Additional Environmental Information

Environmental and Health During Manufacturing

At Guardian Glass, our vision is to help people improve their lives by providing the products and services they value more highly than their alternatives. We do this responsibly, while consuming fewer resources; seeking mutually beneficial

outcomes with customers, employees, suppliers, communities, and other key constituencies.

Our stewardship framework flows directly from this vision, describing our commitment and priorities around Environmental, Social and Governance (ESG) topics. Stewardship broadly encompasses the responsible management of our actions and the resources entrusted to our care in a manner that respects the rights of others.

Guardian has invested in socially responsible policies and practices to help our businesses embed stewardship into the company culture and business decisions. Through responsible practices in the areas of environmental management and health and safety, Guardian's goal is to reduce potential environmental impacts to the communities in which it operates and create an exceptional workplace for its employees.

The safety and well-being of our employees and communities is our first priority. We build capability through our employees and resilience in our systems to prevent serious outcomes when the unexpected happens. We promote a principle-based, bottom-up approach to safety, involving front-line employees and supervisors in the identification of hazards and implementation of solutions all around the world. Each person is expected to raise concerns and share ideas about opportunities for improvement. Each manufacturing site has completed a risk evaluation that identified priorities with a focus on critical hazards. Action plans are developed, and knowledge networks are leveraged across the organization to better manage risk in those areas.

We pride ourselves on being solution providers, especially in the context of environmental stewardship, which involves considering each stage of the life cycle – from the sourcing of raw materials for each product, through to its production, application and end-of-life. Our approach to environmental stewardship is twofold – we strive to discover new and innovative technologies that improve both the environmental performance and effectiveness of our manufacturing processes and of our products.

We're committed to improving the energy efficiency of our manufacturing processes and reducing our use of resources. One way to achieve these is to maximize the amount of glass cullet (broken or old glass) used. Wider use of cullet in the glass manufacturing process helps to reduce consumption of virgin raw materials, save energy and reduce emissions. In line with our environmental stewardship priorities, Guardian Glass has started various initiatives aiming to use more cullet in glass manufacturing instead of virgin raw materials. The ratio of cullet in batch and glass can vary from site to site and over time, depending on cullet availability.

Extraordinary Effects

This product does not meet the criteria for classification in any hazard class according to according to OSHA 29 CFR 1910.1200. Please refer to our other product declarations and certifications - e.g., voluntary safety data sheet (SDS) or health product declaration (HPD) - for additional composition information on our products. There are no known negative effects from the use of this product during fire, water, or mechanical destruction.

Delayed Emissions

Global warming potential is calculated using the TRACI 2.1 and CML 4.1 impact assessment methodologies. Delayed emissions are not considered.

Environmental Activities and Certifications

In an effort to provide greater support to the architects and designers who strive to meet increasingly stringent regulations, codes and standards and achieve ratings within various "green" building rating systems such as LEED and BREEAM, Guardian Glass provides product and regionally specific documents and certifications to communicate transparent information about the life-cycle environmental impact of many of our products.

More information on Guardian Glass's product certifications and declarations is available at www.guardianglass.com

Contact Information

Study Commissioner and Further Information

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