Environmental Product Declaration (EPD)
According to ISO 14025 and EN 15804

Insulating glass unit

Registration number:	EPD-Kiwa-EE-171030-EN
Issue date:	29-05-2024
Valid until:	29-05-2029
Declaration owner:	Osby Glas
Publisher:	Kiwa-Ecobility Experts
Program operator:	Kiwa-Ecobility Experts
Status:	verified

1 General information

1.1 PRODUCT

Insulating glass unit

1.2 REGISTRATION NUMBER

EPD-Kiwa-EE-171030-EN

1.3 VALIDITY

Issue date: 29-05-2024

Valid until: 29-05-2029

1.4 PROGRAM OPERATOR

Kiwa-Ecobility Experts
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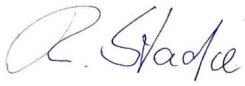
13355 Berlin
DE

Raoul Mancke

(Head of programme operations, Kiwa-Ecobility Experts)



Dr. Ronny Stadie

(Verification body, Kiwa-Ecobility Experts)

1.5 OWNER OF THE DECLARATION

Manufacturer: Osby Glas

Address: Virvelvägen 3, 28344 Osby

E-mail: fredrik@osbyglas.se

Website: https://www.osbyglas.se/

Production location: Osby Glas AB

Address production location: Virvelvägen 3, 283 44 Osby

1.6 VERIFICATION OF THE DECLARATION

The independent verification is in accordance with the ISO 14025:2011. The LCA is in compliance with ISO 14040:2006 and ISO 14044:2006. The EN 15804:2012+A2:2019 serves as the core PCR.

☐ Internal ☐ External

Lucas Pedro Berman, Senda

1.7 STATEMENTS

The owner of this EPD shall be liable for the underlying information and evidence. The programme operator Kiwa-Ecobility Experts shall not be liable with respect to manufacturer data, life cycle assessment data and evidence.

1.8 PRODUCT CATEGORY RULES

Kiwa-Ecobility Experts (Kiwa-EE) – General Product Category Rules (2022-02-14)

EN 17074:2019: Glass in building – Environmental product declaration – Product category rules for flat glass products (2019-11-04)

1.9 COMPARABILITY

In principle, a comparison or assessment of the environmental impacts of different products is only possible if they have been prepared in accordance with EN 15804+A2. For the evaluation of the comparability, the following aspects have to be considered in particular: PCR used, functional or declared unit, geographical reference, the definition of

1 General information

the system boundary, declared modules, data selection (primary or secondary data, background database, data quality), scenarios used for use and disposal phases, and the life cycle inventory (data collection, calculation methods, allocations, validity period). PCRs and general program instructions of different EPD program operators may differ. Comparability needs to be evaluated. For further guidance, see EN 15804+A2 (5.3 Comparability of EPD for construction products) and ISO 14025 (6.7.2 Requirements for comparability).

1.10 CALCULATION BASIS

LCA method R<THiNK: Ecobility Experts | EN15804+A2

LCA software*: Simapro 9.1

Characterization method: EN 15804 +A2 Method v1.0

LCA database profiles: EcoInvent version 3.6

Version database: v3.17 (2024-05-22)

** Simapro is used for calculating the characterized results of the Environmental profiles within R<THiNK.*

1.11 LCA BACKGROUND REPORT

This EPD is generated on the basis of the LCA background report 'Insulating glass unit' with the calculation identifier ReTHiNK-71030.

2 Product

2.1 PRODUCT DESCRIPTION

The insulating glass unit (IGU) is used for insulation and energy saving of buildings in colder climates. The unit consist of at least two panes of glass. The glass panes are separated by a spacer. For the insulating capabilities at least one of the glass panes are coated with a metallic layer and between the glass panes the gas argon is used as an insulating barrier.

The double-paned unit have glass panes with 4 mm thickness and a spacer of 16 mm of a total thickness of 24 mm. The weight of the unit is 20,8 kg. The double-paned unit have one coated glass pane. The triple-paned glass unit have glass panes with 4 mm thickness and two spacers of 16 mm of a total thickness of 44 mm. The weight of the unit is 31,7 kg. The triple-paned unit have two coated glass panes.

Component	Weight %	Material
Glass	95,49	Glass
Spacer	1,05	Composite
Butyl	0,10	Polyisobutylene
Sealant	2,60	Silicone/Polysulfide
Argon	0,16	Argon
Drying agent	0,60	Zeolite

2.2 APPLICATION (INTENDED USE OF THE PRODUCT)

According to EN 1279:2018 the main intended uses of insulating glass units are installations in windows, doors, curtain walling, bonded glazing for doors, windows and curtain walling, roofs and partitions.

The achieving of the requirements of this standard means that the insulating glass units meet the needs of the intended uses and ensures through the conformity assessment that the visual, energy acoustic and safety parameters do not change significantly over time.

The main customers of the manufacturer are other businesses.

2.3 REFERENCE SERVICE LIFE

RSL PRODUCT

The reference service life is 30 years according to the manufacturer and EN 17074.

USED RSL (YR) IN THIS LCA CALCULATION:

30

2.4 TECHNICAL DATA

For insulating glass the technical data varies depending on different factors. Some examples are the type of glass that is used, thickness and if the unit contains gas. This type of unit contains argon gas and float glass with and without coating. The following table shows the technical data for the IGU units. The standards the values are based on are EN 356, EN 410, EN 673, EN 1063, EN 12600, EN 13501-1, EN 13501-2 and 13541.

Characteristics	Unit	Performance double-paned	Performance triple-paned
Fire resistance		NPD	NPD
Reaction to fire		NPD	NPD
External fire performance		NPD	NPD
Bullet resistance		NPD	NPD
Explosion resistance		NPD	NPD
Fracture resistance		NPD	NPD
Impact resistance of pendulum body		NPD	NPD
Resistance to sudden temperature variations and temperature differentials	K	NPD	NPD
Resistance to wind, snow, load in m/ma	Mm	45	45
Acoustic attenuation to direct airborne noise	dbA	30	33
Emissivity	n	NPD	NPD

2 Product

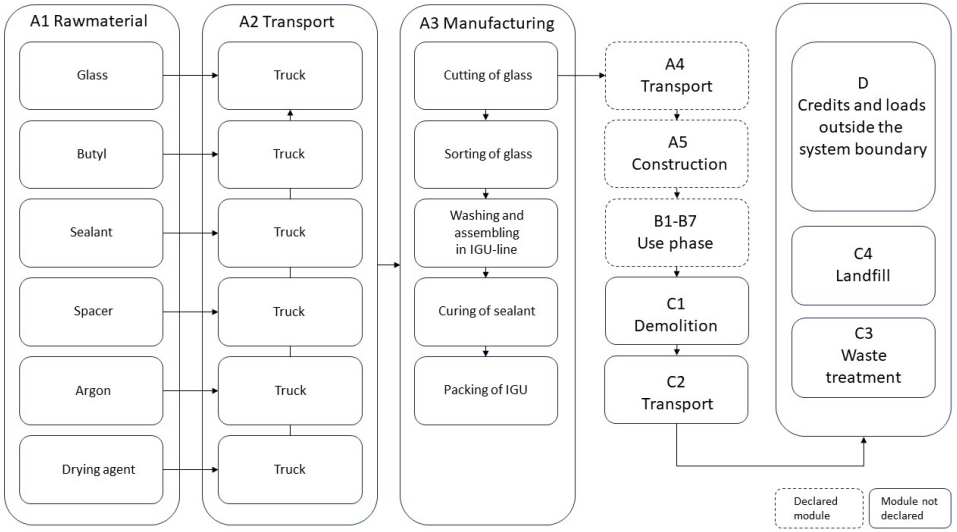
Characteristics	Unit	Performance double-paned	Performance triple-paned
Thermal properties (U-value)	W/ (m²·K)	1,1	0,6
Light transmittance v	(%)	82	74
Light reflection v:	(%)	12	15
Solar energy transmittance e	(%)	57	46
Solar energy reflection e	(%)	28	32
Solar factor g	(%)	64	52

2.5 SUBSTANCES OF VERY HIGH CONCERN

The product in this EPD does not contain substances from the "Candidate list of substances of very high concern (SVHC) for authorization" in concentration above 0.1%.

2.6 DESCRIPTION PRODUCTION PROCESS

All raw materials used in the production of the IGU units are transported by truck to the production facility. At the production facility the manufacturing starts with cutting the glass panes into appropriate sizes before being sorted. The sorted glass panes are then put into the assembly line there preparations such as washing and grinding are done. After the preparations the glass panes, spacers, butyl, argon gas are assembled into insulating units and afterwards sealed with sealant. Thereafter begins the curing of the sealant. Following the curing of the sealant begins the packaging of the unit for delivery.



3 Calculation rules

3.1 DECLARED UNIT

1 m² of insulating glass unit

The declared unit is 1 m² of insulating glass unit.

Reference unit: square meter (m2)

3.2 CONVERSION FACTORS

Description	Value	Unit
Reference unit	1	m2
Weight per reference unit	20.810	kg
Conversion factor to 1 kg	0.048054	m2

3.3 SCOPE OF DECLARATION AND SYSTEM BOUNDARIES

This is a Cradle to gate with modules C1-C4 and module D LCA. The life cycle stages included are as shown below:

(X = module included, ND = module not declared)

A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X

The modules of the EN15804 contain the following:

Module A1 = Raw material supply	Module B5 = Refurbishment
Module A2 = Transport	Module B6 = Operational energy use
Module A3 = Manufacturing	Module B7 = Operational water use
Module A4 = Transport	Module C1 = De-construction / Demolition
Module A5 = Construction - Installation process	Module C2 = Transport
Module B1 = Use	Module C3 = Waste Processing
Module B2 = Maintenance	Module C4 = Disposal
Module B3 = Repair	Module D = Benefits and loads beyond the product system boundaries
Module B4 = Replacement	

3.4 REPRESENTATIVENESS

This EPD is representative for Insulating glass unit, a product of Osby Glas. The results of this EPD are representative for European Union.

3.5 CUT-OFF CRITERIA

Product Stage (A1-A3)

All input flows (e.g. raw materials, transportation, energy use, packaging, etc.) and output flows (e.g. production waste) are considered in this LCA. The total neglected input flows do therefore not exceed the limit of 5% of energy use and mass.

3 Calculation rules

The manufacture of equipment used in production, buildings or any other capital goods, the transport of personnel to and within the plant, research and development activities and the long-term emissions were not taken into account in the LCA

End of life stage (C1-C4)

All input flows (e.g. energy use for demolition or disassembly, transport to waste processing, etc.) and output flows (e.g. end-of-life waste processing of the product, etc.) are considered in this LCA. The total neglected input flows do therefore not exceed the limit of 5% of energy use and mass.

Benefits and Loads beyond the system boundary (Module D)

All benefits and loads beyond the system boundary resulting from reusable products, recyclable materials and/or useful energy carriers leaving the product system are considered in this LCA.

3.6 ALLOCATION

There are no co-products produced during the manufacturing of this product. There are no allocations for the declared modules.

3.7 DATA COLLECTION & REFERENCE TIME PERIOD

All relevant data was collected for the calendar year 2023.

3.8 ESTIMATES AND ASSUMPTIONS

The following estimates and assumptions have been made for this EPD.

The energy and amount of water per declared unit refers to the average amount used for one m^2 of glass pane for 2023. This is due to most of the energy being used for the heating of the water for washing the glass panes.

The packaging material is averaged to one unit of insulating glass based on the used packaging material and sold IGU units for 2023.

The mass for butyl and sealant have been divided up according to the percentage bought from the different suppliers and the total amount for 2023.

A scaling method was used to calculate the LCA results for double-paned and triple-paned IGU units. The scaling is based on the number of coated glass panes for each unit. Due to the scaling there are results for both the fixed parts and the scalable parts of the units. The fixed part means that this number is the same for each product in the product group and the scalable part is the part that depends on the number of coated glass panes of the product. To calculate the environmental impact categories correctly for each unit, the following calculation should be done:

[number fixed part]+([number of coated glass panes]*[number scalable part])

Example for the double-paned unit with one coated glass pane the calculation is as follows (fixed part) + 1 x (scalable part).

The inputs of raw material except for uncoated glass had an linear dependence on the number of coated glass panes. The packaging material did not have an linear dependence due to the assumption that the same amount is used for both types of IGU units and was together with the uncoated pane put as fixed for the scaling. The inputs of energy and water also had an linear dependence on the number of glass panes.

3.9 DATA QUALITY

All data that is specific to the product and process was provided by the manufacturer for the operating year 2023 and is therefore up-to-date. The manufacturer and their production is located in Osby, Sweden.

Background data was taken from the Ecoinvent 3.6 database. The database is regularly checked and thus complies with the requirements of ISO 14040/44 (background data not older than 10 years). The background data meets the requirements of EN 15804.

The general rule was followed that specific data from specific production processes or average data derived from specific processes must be given priority when calculating an EPD or Life Cycle Assessment. Data for processes that the manufacturer cannot influence or choose, were backed up with generic data.

3.10 GUARANTEES OF ORIGIN

The energy for the production comes from two different sources. The largest part comes from a supplier with renewable energy mix in Sweden. An energy mix was created for this source based on the suppliers mix of energy production for 2023. The other part is the installed solar panels in the company. An energy profile was also created for solar panels.

3 Calculation rules

3.12 SCALING

Parameter	Value
Scaling type	Linear
Description dimension	double or triple glass
Dimension	0.000
Scalable dimension	1.000
Unit dimension	glass panes

4 Scenarios and additional technical information

4.1 DE-CONSTRUCTION, DEMOLITION (C1)

No inputs are needed for the product at the de-construction / demolition phase

4.2 TRANSPORT END-OF-LIFE (C2)

The following distances and transport conveyance are assumed for transportation during end of life for the different types of waste processing.

Waste Scenario	Transport conveyance	Not removed (stays in work) [km]	Landfill [km]	Incineration [km]	Recycling [km]	Re-use [km]
finishes (adhered to wood, plastic, metal) (NMD ID 2)	Lorry (Truck), unspecified (default) | market group for (GLO)	0	100	150	50	0
waste not applicable or evaporated (empty scenario) (NMD ID 26)	Lorry (Truck), unspecified (default) | market group for (GLO)	0	0	0	0	0
glass (i.a. flat glass) (NMD ID 28)	Lorry (Truck), unspecified (default) | market group for (GLO)	0	100	150	50	0
Metals, others (i.a. fasteners, fittings) (NMD ID 50)	Lorry (Truck), unspecified (default) | market group for (GLO)	0	100	150	50	0
plastics, other (i.a. profiles, sheets, pipes) (NMD ID 45)	Lorry (Truck), unspecified (default) | market group for (GLO)	0	100	150	50	0

The transport conveyance(s) used in the scenario(s) for transport during end of life has the following characteristics.

	Value and unit
Vehicle type used for transport	Lorry (Truck), unspecified (default) | market group for (GLO)
Fuel type and consumption of vehicle	not available
Capacity utilisation (including empty returns)	50 % (loaded up and return empty)
Bulk density of transported products	inapplicable
Volume capacity utilisation factor	1

4 Scenarios and additional technical information

4.3 END OF LIFE (C3, C4)

The scenario(s) assumed for end of life of the product are given in the following tables.
First the assumed percentages per type of waste processing are displayed, followed by the assumed amounts.

Waste Scenario	Region	Not removed (stays in work) [%]	Landfill [%]	Incineration [%]	Recycling [%]	Re-use [%]
finishes (adhered to wood, plastic, metal) (NMD ID 2)	NL	0	0	100	0	0
waste not applicable or evaporated (empty scenario) (NMD ID 26)	NL	0	0	0	0	0
glass (i.a. flat glass) (NMD ID 28)	NL	0	30	0	70	0
Metals, others (i.a. fasteners, fittings) (NMD ID 50)	NL	0	5	5	90	0
plastics, other (i.a. profiles, sheets, pipes) (NMD ID 45)	NL	0	0	90	10	0

Waste Scenario	Not removed (stays in work) [kg]	Landfill [kg]	Incineration [kg]	Recycling [kg]	Re-use [kg]
finishes (adhered to wood, plastic, metal) (NMD ID 2)	0.000	0.000	0.574	0.000	0.000
glass (i.a. flat glass) (NMD ID 28)	0.000	6.000	0.000	14.000	0.000
Metals, others (i.a. fasteners, fittings) (NMD ID 50)	0.000	0.006	0.006	0.105	0.000
plastics, other (i.a. profiles, sheets, pipes) (NMD ID 45)	0.000	0.000	0.081	0.009	0.000
Total	**0.000**	**6.006**	**0.661**	**14.114**	**0.000**

4.4 BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY (D)

The presented Benefits and loads beyond the system boundary in this EPD are based on the following calculated Net output flows in kilograms and Energy recovery displayed in MJ Lower Heating Value.

Waste Scenario	Net output flow [kg]	Energy recovery [MJ]
finishes (adhered to wood, plastic, metal) (NMD ID 2)	0.000	12.671
waste not applicable or evaporated (empty scenario) (NMD ID 26)	0.000	0.000
glass (i.a. flat glass) (NMD ID 28)	14.000	0.000
Metals, others (i.a. fasteners, fittings) (NMD ID 50)	0.090	0.000
plastics, other (i.a. profiles, sheets, pipes) (NMD ID 45)	0.009	2.507
Total	**14.099**	**15.178**

5 Results

For the impact assessment, the characterization factors of the LCIA method EN 15804 +A2 Method v1.0 are used. Long-term emissions (>100 years) are not considered in the impact assessment. The results of the impact assessment are only relative statements that do not make any statements about end-points of the impact categories, exceedance of threshold values, safety margins or risks. The following tables show the results of the indicators of the impact assessment, of the use of resources as well as of waste and other output flows.

5 Results

5.1 ENVIRONMENTAL IMPACT INDICATORS PER SQUARE METER (FIXED PART)

CORE ENVIRONMENTAL IMPACT INDICATORS EN15804+A2

Abbr.	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
AP	mol H+ eqv.	1.04E-1	6.45E-3	1.79E-2	1.29E-1	0.00E+0	5.09E-4	3.43E-4	1.25E-4	-1.37E-2
GWP-total	kg CO2 eqv.	9.83E+0	1.11E+0	1.84E+0	1.28E+1	0.00E+0	8.78E-2	1.48E-1	1.29E-2	-2.68E+0
GWP-b	kg CO2 eqv.	7.29E-2	5.13E-4	3.47E-1	4.21E-1	0.00E+0	4.05E-5	5.66E-2	4.14E-5	-2.29E-2
GWP-f	kg CO2 eqv.	9.75E+0	1.11E+0	1.49E+0	1.24E+1	0.00E+0	8.77E-2	9.15E-2	1.28E-2	-2.66E+0
GWP-luluc	kg CO2 eqv.	2.45E-3	4.08E-4	5.08E-3	7.93E-3	0.00E+0	3.21E-5	4.70E-5	2.52E-6	-2.42E-3
EP-m	kg N eqv.	1.64E-2	2.27E-3	2.83E-3	2.15E-2	0.00E+0	1.79E-4	1.25E-4	4.71E-5	-1.94E-3
EP-fw	kg P eqv.	1.81E-4	1.12E-5	2.45E-5	2.16E-4	0.00E+0	8.85E-7	1.86E-6	9.60E-8	-1.11E-4
EP-T	mol N eqv.	2.01E-1	2.51E-2	4.09E-2	2.67E-1	0.00E+0	1.98E-3	1.18E-3	5.19E-4	-3.17E-2
ODP	kg CFC 11 eqv.	1.12E-6	2.46E-7	2.47E-7	1.62E-6	0.00E+0	1.94E-8	8.96E-9	6.27E-9	-1.02E-7
POCP	kg NMVOC eqv.	4.86E-2	7.16E-3	8.45E-3	6.42E-2	0.00E+0	5.64E-4	3.42E-4	1.48E-4	-5.83E-3
ADP-f	MJ	1.09E+2	1.68E+1	2.77E+1	1.54E+2	0.00E+0	1.32E+0	8.32E-1	4.15E-1	-2.32E+1
ADP-mm	kg Sb-eqv.	2.80E-4	2.82E-5	1.53E-5	3.23E-4	0.00E+0	2.22E-6	2.77E-6	1.14E-7	-3.22E-4
WDP	m3 world eqv.	2.18E+0	6.00E-2	6.42E-1	2.89E+0	0.00E+0	4.73E-3	3.70E-2	1.26E-3	-9.51E-1

AP=Acidification (AP) | **GWP-total**=Global warming potential (GWP-total) | **GWP-b**=Global warming potential - Biogenic (GWP-b) | **GWP-f**=Global warming potential - Fossil (GWP-f) | **GWP-luluc**=Global warming potential - Land use and land use change (GWP-luluc) | **EP-m**=Eutrophication marine (EP-m) | **EP-fw**=Eutrophication, freshwater (EP-fw) | **EP-T**=Eutrophication, terrestrial (EP-T) | **ODP**=Ozone depletion (ODP) | **POCP**=Photochemical ozone formation - human health (POCP) | **ADP-f**=Resource use, fossils (ADP-f) | **ADP-mm**=Resource use, minerals and metals (ADP-mm) | **WDP**=Water use (WDP)

5 Results

ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS EN15804+A2

Abbr.	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
ETP-fw	CTUe	2.01E+2	1.50E+1	3.05E+1	2.47E+2	0.00E+0	1.18E+0	2.51E+1	2.28E-1	-9.57E+1
PM	disease incidence	1.03E-6	1.00E-7	1.78E-7	1.31E-6	0.00E+0	7.89E-9	5.40E-9	2.68E-9	-1.20E-7
HTP-c	CTUh	1.91E-9	4.85E-10	5.07E-10	2.90E-9	0.00E+0	3.83E-11	2.09E-10	4.80E-12	-8.47E-10
HTP-nc	CTUh	6.70E-8	1.64E-8	1.64E-8	9.98E-8	0.00E+0	1.29E-9	1.38E-9	1.25E-10	-2.96E-8
IR	kBq U235 eqv.	3.04E-1	7.03E-2	4.17E-1	7.92E-1	0.00E+0	5.54E-3	4.40E-3	1.80E-3	-8.33E-2
SQP	Pt	4.42E+1	1.45E+1	2.53E+1	8.41E+1	0.00E+0	1.15E+0	7.58E-1	9.13E-1	-1.73E+1

ETP-fw=Ecotoxicity, freshwater (ETP-fw) | **PM**=Particulate Matter (PM) | **HTP-c**=Human toxicity, cancer (HTP-c) | **HTP-nc**=Human toxicity, non-cancer (HTP-nc) | **IR**=Ionising radiation, human health (IR) | **SQP**=Land use (SQP)

CLASSIFICATION OF DISCLAIMERS TO THE DECLARATION OF CORE AND ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS

ILCD classification	Indicator	Disclaimer
ILCD type / level 1	Global warming potential (GWP)	None
	Depletion potential of the stratospheric ozone layer (ODP)	None
	Potential incidence of disease due to PM emissions (PM)	None
ILCD type / level 2	AAcidification potential, Accumulated Exceedance (AP)	None
	Eutrophication potential, Fraction of nutrients reaching freshwater end compartment (EP-freshwater)	None
	Eutrophication potential, Fraction of nutrients reaching marine end compartment (EP-marine)	None
	Eutrophication potential, Accumulated Exceedance (EP-terrestrial)	None
	Formation potential of tropospheric ozone (POCP)	None
	Potential Human exposure efficiency relative to U235 (IRP)	1
ILCD type / level 3	Abiotic depletion potential for non-fossil resources (ADP-minerals&metals)	2
	Abiotic depletion potential for fossil resources (ADP-fossil)	2
	Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	2
	Potential Comparative Toxic Unit for ecosystems (ETP-fw)	2

5 Results

ILCD classification	Indicator	Disclaimer
	Potential Comparative Toxic Unit for humans (HTP-c)	2
	Potential Comparative Toxic Unit for humans (HTP-nc)	2
	Potential Soil quality index (SQP)	2

Disclaimer 1 – This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

5.2 ENVIRONMENTAL IMPACT INDICATORS PER SQUARE METER (SCALABLE PART)

CORE ENVIRONMENTAL IMPACT INDICATORS EN15804+A2

Abbr.	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
AP	mol H+ eqv.	1.30E-1	7.13E-3	2.08E-2	1.58E-1	0.00E+0	5.91E-4	5.66E-4	1.26E-4	-1.48E-2
GWP-total	kg CO2 eqv.	1.35E+1	1.23E+0	2.23E+0	1.70E+1	0.00E+0	1.02E-1	1.74E+0	1.29E-2	-3.45E+0
GWP-b	kg CO2 eqv.	1.04E-1	5.68E-4	3.56E-1	4.60E-1	0.00E+0	4.71E-5	5.67E-2	4.38E-5	-2.18E-2
GWP-f	kg CO2 eqv.	1.34E+1	1.23E+0	1.87E+0	1.65E+1	0.00E+0	1.02E-1	1.68E+0	1.29E-2	-3.43E+0
GWP-luluc	kg CO2 eqv.	5.37E-3	4.51E-4	5.39E-3	1.12E-2	0.00E+0	3.74E-5	6.79E-5	2.53E-6	-2.34E-3
EP-m	kg N eqv.	2.02E-2	2.51E-3	3.24E-3	2.60E-2	0.00E+0	2.08E-4	2.07E-4	4.73E-5	-2.19E-3
EP-fw	kg P eqv.	3.51E-4	1.24E-5	4.28E-5	4.06E-4	0.00E+0	1.03E-6	2.69E-6	9.67E-8	-1.17E-4
EP-T	mol N eqv.	2.45E-1	2.77E-2	4.59E-2	3.19E-1	0.00E+0	2.30E-3	2.09E-3	5.21E-4	-3.46E-2
ODP	kg CFC 11 eqv.	1.51E-6	2.71E-7	2.79E-7	2.06E-6	0.00E+0	2.25E-8	1.70E-8	6.29E-9	-1.88E-7
POCP	kg NMVOC eqv.	6.14E-2	7.91E-3	9.74E-3	7.90E-2	0.00E+0	6.56E-4	5.74E-4	1.49E-4	-7.16E-3

AP=Acidification (AP) | **GWP-total**=Global warming potential (GWP-total) | **GWP-b**=Global warming potential - Biogenic (GWP-b) | **GWP-f**=Global warming potential - Fossil (GWP-f) | **GWP-luluc**=Global warming potential - Land use and land use change (GWP-luluc) | **EP-m**=Eutrophication marine (EP-m) | **EP-fw**=Eutrophication, freshwater (EP-fw) | **EP-T**=Eutrophication, terrestrial (EP-T) | **ODP**=Ozone depletion (ODP) | **POCP**=Photochemical ozone formation - human health (POCP) | **ADP-f**=Resource use, fossils (ADP-f) | **ADP-mm**=Resource use, minerals and metals (ADP-mm) | **WDP**=Water use (WDP)

5 Results

Abbr.	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
ADP-f	MJ	1.59E+2	1.85E+1	3.16E+1	2.09E+2	0.00E+0	1.54E+0	1.13E+0	4.16E-1	-3.51E+1
ADP-mm	kg Sb-eqv.	4.71E-4	3.12E-5	3.55E-5	5.38E-4	0.00E+0	2.58E-6	3.18E-6	1.14E-7	-3.22E-4
WDP	m3 world eqv.	3.80E+0	6.64E-2	8.21E-1	4.69E+0	0.00E+0	5.50E-3	4.26E-2	1.26E-3	-1.03E+0

AP=Acidification (AP) | **GWP-total**=Global warming potential (GWP-total) | **GWP-b**=Global warming potential - Biogenic (GWP-b) | **GWP-f**=Global warming potential - Fossil (GWP-f) | **GWP-luluc**=Global warming potential - Land use and land use change (GWP-luluc) | **EP-m**=Eutrophication marine (EP-m) | **EP-fw**=Eutrophication, freshwater (EP-fw) | **EP-T**=Eutrophication, terrestrial (EP-T) | **ODP**=Ozone depletion (ODP) | **POCP**=Photochemical ozone formation - human health (POCP) | **ADP-f**=Resource use, fossils (ADP-f) | **ADP-mm**=Resource use, minerals and metals (ADP-mm) | **WDP**=Water use (WDP)

ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS EN15804+A2

Abbr.	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
ETP-fw	CTUe	4.86E+2	1.65E+1	4.50E+1	5.48E+2	0.00E+0	1.37E+0	2.82E+1	2.35E-1	-1.01E+2
PM	disease incidence	1.28E-6	1.11E-7	2.01E-7	1.59E-6	0.00E+0	9.17E-9	7.25E-9	2.69E-9	-1.30E-7
HTP-c	CTUh	2.04E-8	5.36E-10	1.55E-9	2.25E-8	0.00E+0	4.45E-11	2.01E-9	4.86E-12	-9.07E-10
HTP-nc	CTUh	2.12E-7	1.81E-8	2.86E-8	2.59E-7	0.00E+0	1.50E-9	7.65E-9	1.30E-10	-5.04E-9
IR	kBq U235 eqv.	4.70E-1	7.77E-2	4.41E-1	9.89E-1	0.00E+0	6.44E-3	5.39E-3	1.81E-3	-8.48E-2
SQP	Pt	6.71E+1	1.61E+1	2.76E+1	1.11E+2	0.00E+0	1.33E+0	8.79E-1	9.17E-1	-1.77E+1

ETP-fw=Ecotoxicity, freshwater (ETP-fw) | **PM**=Particulate Matter (PM) | **HTP-c**=Human toxicity, cancer (HTP-c) | **HTP-nc**=Human toxicity, non-cancer (HTP-nc) | **IR**=Ionising radiation, human health (IR) | **SQP**=Land use (SQP)

CLASSIFICATION OF DISCLAIMERS TO THE DECLARATION OF CORE AND ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS

ILCD classification	Indicator	Disclaimer
ILCD type / level 1	Global warming potential (GWP)	None
	Depletion potential of the stratospheric ozone layer (ODP)	None
	Potential incidence of disease due to PM emissions (PM)	None
ILCD type / level 2	AAcidification potential, Accumulated Exceedance (AP)	None
		None

5 Results

ILCD classification	Indicator	Disclaimer
ILCD type / level 3	Eutrophication potential, Fraction of nutrients reaching freshwater end compartment (EP-freshwater)	
	Eutrophication potential, Fraction of nutrients reaching marine end compartment (EP-marine)	None
	Eutrophication potential, Accumulated Exceedance (EP-terrestrial)	None
	Formation potential of tropospheric ozone (POCP)	None
	Potential Human exposure efficiency relative to U235 (IRP)	1
	Abiotic depletion potential for non-fossil resources (ADP-minerals&metals)	2
	Abiotic depletion potential for fossil resources (ADP-fossil)	2
	Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	2
	Potential Comparative Toxic Unit for ecosystems (ETP-fw)	2
	Potential Comparative Toxic Unit for humans (HTP-c)	2
	Potential Comparative Toxic Unit for humans (HTP-nc)	2
	Potential Soil quality index (SQP)	2

Disclaimer 1 – This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

5 Results

5.3 ENVIRONMENTAL IMPACT INDICATORS PER SQUARE METER (FIXED PART)

PARAMETERS DESCRIBING RESOURCE USE

Abbr.	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
PERE	MJ	5.32E+0	2.10E-1	1.02E+1	1.58E+1	0.00E+0	1.66E-2	5.44E-2	6.38E-3	-2.81E+0
PERM	MJ	0.00E+0	0.00E+0	5.26E-2	5.26E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PERT	MJ	5.32E+0	2.10E-1	1.03E+1	1.58E+1	0.00E+0	1.66E-2	5.44E-2	6.38E-3	-2.81E+0
PENRE	MJ	1.18E+2	1.78E+1	2.90E+1	1.65E+2	0.00E+0	1.40E+0	8.81E-1	4.40E-1	-2.47E+1
PENRM	MJ	0.00E+0	0.00E+0	1.40E-1	1.40E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PENRT	MJ	1.18E+2	1.78E+1	2.92E+1	1.65E+2	0.00E+0	1.40E+0	8.81E-1	4.40E-1	-2.47E+1
SM	Kg	0.00E+0	0.00E+0	2.16E-4	2.16E-4	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
RSF	MJ	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
NRSF	MJ	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
FW	M3	5.84E-2	2.04E-3	2.33E-2	8.37E-2	0.00E+0	1.61E-4	1.06E-3	4.95E-4	-2.76E-2

PERE=renewable primary energy ex. raw materials | **PERM**=renewable primary energy used as raw materials | **PERT**=renewable primary energy total | **PENRE**=non-renewable primary energy ex. raw materials | **PENRM**=non-renewable primary energy used as raw materials | **PENRT**=non-renewable primary energy total | **SM**=use of secondary material | **RSF**=use of renewable secondary fuels | **NRSF**=use of non-renewable secondary fuels | **FW**=use of net fresh water

OTHER ENVIRONMENTAL INFORMATION DESCRIBING WASTE CATEGORIES

Abbr.	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
HWD	Kg	1.24E-4	4.25E-5	8.96E-5	2.56E-4	0.00E+0	3.35E-6	1.78E-6	4.62E-7	-1.88E-5
NHWD	Kg	6.42E-1	1.06E+0	7.58E-1	2.46E+0	0.00E+0	8.39E-2	2.30E-1	3.00E+0	-2.85E-1
RWD	Kg	4.00E-4	1.10E-4	2.30E-4	7.40E-4	0.00E+0	8.69E-6	5.24E-6	2.82E-6	-6.73E-5

HWD=hazardous waste disposed | **NHWD**=non hazardous waste disposed | **RWD**=radioactive waste disposed

5 Results

ENVIRONMENTAL INFORMATION DESCRIBING OUTPUT FLOWS

Abbr.	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
CRU	Kg	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MFR	Kg	0.00E+0	0.00E+0	1.04E+0	1.04E+0	0.00E+0	0.00E+0	7.00E+0	0.00E+0	0.00E+0
MER	Kg	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EET	MJ	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EEE	MJ	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0

CRU=Components for re-use | **MFR**=Materials for recycling | **MER**=Materials for energy recovery | **EET**=Exported Energy Thermic | **EEE**=Exported Energy Electric

5.4 ENVIRONMENTAL IMPACT INDICATORS PER SQUARE METER (SCALABLE PART)

PARAMETERS DESCRIBING RESOURCE USE

Abbr.	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
PERE	MJ	1.11E+1	2.32E-1	1.08E+1	2.21E+1	0.00E+0	1.93E-2	7.56E-2	6.46E-3	-2.81E+0
PERM	MJ	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PERT	MJ	1.11E+1	2.32E-1	1.08E+1	2.21E+1	0.00E+0	1.93E-2	7.56E-2	6.46E-3	-2.81E+0
PENRE	MJ	1.56E+2	1.97E+1	3.19E+1	2.08E+2	0.00E+0	1.63E+0	1.20E+0	4.42E-1	-3.76E+1
PENRM	MJ	1.55E+1	0.00E+0	1.28E+0	1.67E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-2.57E-1
PENRT	MJ	1.71E+2	1.97E+1	3.32E+1	2.24E+2	0.00E+0	1.63E+0	1.20E+0	4.42E-1	-3.78E+1
SM	Kg	1.52E-2	0.00E+0	3.04E-4	1.55E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
RSF	MJ	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
NRSF	MJ	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
FW	M3	1.05E-1	2.26E-3	2.89E-2	1.36E-1	0.00E+0	1.87E-4	1.49E-3	4.97E-4	-2.88E-2

PERE=renewable primary energy ex. raw materials | **PERM**=renewable primary energy used as raw materials | **PERT**=renewable primary energy total | **PENRE**=non-renewable primary energy ex. raw materials | **PENRM**=non-renewable primary energy used as raw materials | **PENRT**=non-renewable primary energy total | **SM**=use of secondary material | **RSF**=use of renewable secondary fuels | **NRSF**=use of non-renewable secondary fuels | **FW**=use of net fresh water

5 Results

OTHER ENVIRONMENTAL INFORMATION DESCRIBING WASTE CATEGORIES

Abbr.	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
HWD	Kg	1.88E-4	4.70E-5	9.48E-5	3.30E-4	0.00E+0	3.90E-6	4.01E-6	4.64E-7	-4.77E-5
NHWD	Kg	2.03E+0	1.18E+0	8.68E-1	4.07E+0	0.00E+0	9.75E-2	2.58E-1	3.00E+0	-3.02E-1
RWD	Kg	5.54E-4	1.22E-4	2.53E-4	9.28E-4	0.00E+0	1.01E-5	6.23E-6	2.83E-6	-7.19E-5

HWD=hazardous waste disposed | **NHWD**=non hazardous waste disposed | **RWD**=radioactive waste disposed

ENVIRONMENTAL INFORMATION DESCRIBING OUTPUT FLOWS

Abbr.	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
CRU	Kg	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MFR	Kg	0.00E+0	0.00E+0	1.09E+0	1.09E+0	0.00E+0	0.00E+0	7.11E+0	0.00E+0	0.00E+0
MER	Kg	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EET	MJ	0.00E+0	0.00E+0	3.95E-1	3.95E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.71E+0
EEE	MJ	0.00E+0	0.00E+0	2.29E-1	2.29E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.73E+0

CRU=Components for re-use | **MFR**=Materials for recycling | **MER**=Materials for energy recovery | **EET**=Exported Energy Thermic | **EEE**=Exported Energy Electric

5 Results

5.5 INFORMATION ON BIOGENIC CARBON CONTENT PER SQUARE METER

BIOGENIC CARBON CONTENT

The following Information describes the biogenic carbon content in (the main parts of) the product at the factory gate per square meter:

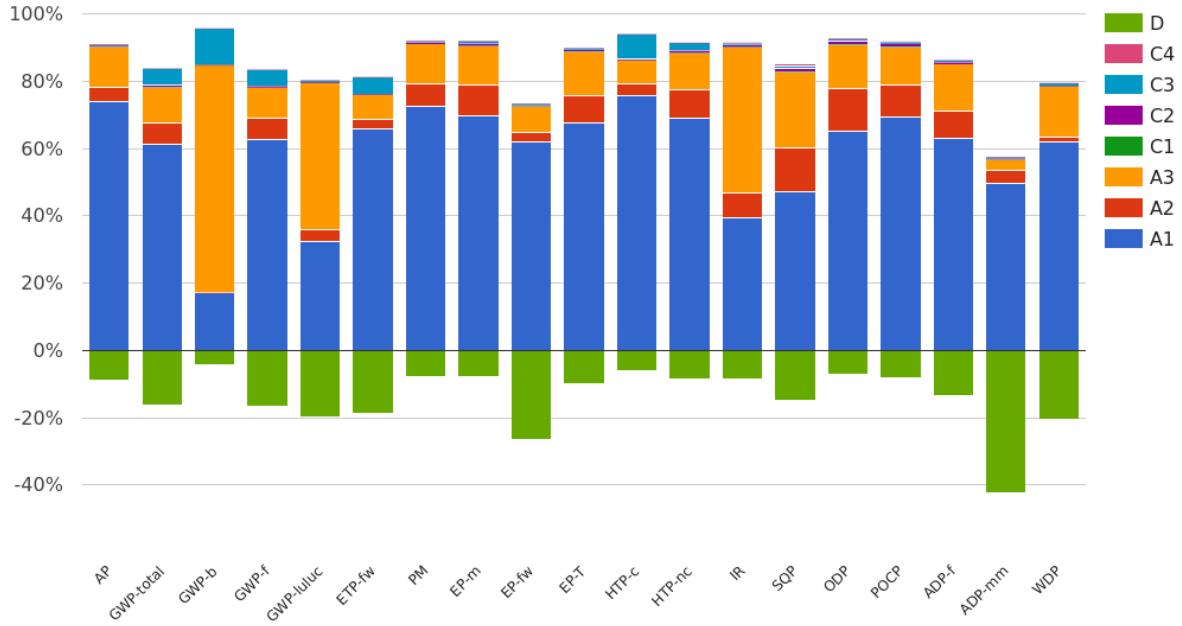
Biogenic carbon content	Amount	Unit
Biogenic carbon content in the product	0	kg C
Biogenic carbon content in accompanying packaging	0.001501	kg C

UPTAKE OF BIOGENIC CARBON DIOXIDE

The following amount carbon dioxide uptake is taken into account. Related uptake and release of carbon dioxide in downstream processes are not taken into account in this number although they do appear in the presented results.

Uptake Biogenic Carbon dioxide	Amount	Unit
Packaging	0.005503	kg CO2 (biogenic)

6 Interpretation of results



The figure shows the influence of the different life stages on the environmental core indicators for the IGU units. As shown in the figure the majority of the environmental impacts is attributed to the raw material processing phase (A1), followed by the production (A3) and the transports of raw materials (A2). The benefits and loads beyond the system boundary (D) have a considerable impact across all the environmental impact categories. These life stages also have the biggest impact on the GWP-total. The glass in the units is the largest contributor to the environmental impact categories. It is the raw material with the biggest mass in the unit. The glass contributes to a large part of the module benefits and loads (D) caused by the recycling of the waste glass. The phases deconstruction/ demolition (C1), transport (C2) and disposal (C3) have the least impact on the environmental impact categories. The phase waste processing (C3) has an larger impact than the rest of the end of life stage for example due to the recycling of the waste glass

6 Interpretation of results

that in turn affects the phase benefits and loads (D). The packaging materials (cardboard) contribute to a biogenic CO2 uptake.

7 References

ISO 14040
ISO 14040:2006-10, Environmental management - Life cycle assessment - Principles and framework; EN ISO 14040:2006

ISO 14044
ISO 14044:2006-10, Environmental management - Life cycle assessment - Requirements and guidelines; EN ISO 14040:2006

ISO 14025
ISO 14025:2011-10: Environmental labels and declarations — Type III environmental declarations — Principles and procedures

EN 15804+A2
EN 15804+A2: 2019: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

General PCR Ecobility Experts
Kiwa-Ecobility Experts (Kiwa-EE) – General Product Category Rules (2022-02-14)

PCR B
EN 17074:2019: Glass in building – Environmental product declaration – Product category rules for flat glass products (2019-11-04)

EN 1279:2018
EN 1279:2018: Glass in Building - Insulating glass units

EN 356
EN 356: Glass in building - Security glazing - Testing and classification of resistance against manual attack

EN 410:2011
EN 410:2011: Glass in building - Determination of luminous and solar characteristics of glazing

EN 673:2011
EN 673:2011: Glass in building - Determination of thermal transmittance (U value) - Calculation method

EN 1063
EN 1063: Glass in building - Security glazing - Testing and classification of resistance against bullet attack

EN 12600
EN 12600: Glass in building - Pendulum test - Impact test method and classification for flat glass

7 References

EN 13501-1:2019
EN 13501-1:2019: Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests

EN 13501-2:2023
EN 13501-2:2023: Fire classification of construction products and building elements - Part 2: Classification using data from fire resistance and/or smoke control tests, excluding ventilation services

EN 13541:2012
EN 13541:2012: Glass in building - Security glazing - Testing and classification of resistance against explosion pressure

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