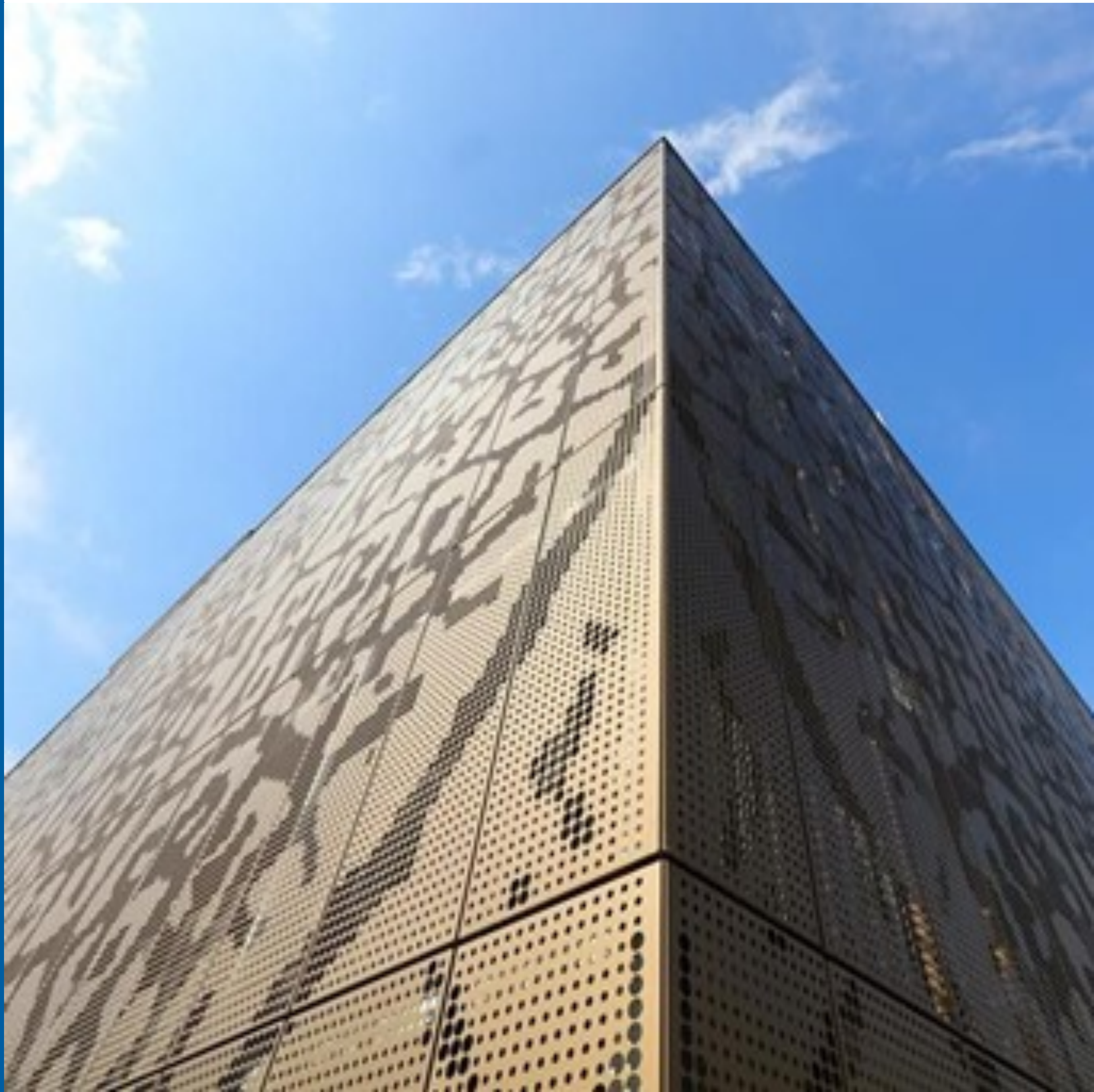
Environmental Product Declaration (EPD)
According to ISO 14025 and EN 15804

Perforated aluminum sheet with surface finish



Registration number:	EPD-Kiwa-EE-191580-EN
Issue date:	13-02-2025
Valid until:	13-02-2030
Declaration owner:	Dillinger Fabrik Gelochter Bleche GmbH
Publisher:	Kiwa-Ecobility Experts
Programme operator:	Kiwa-Ecobility Experts
Status:	verified

1 General information

1.1 PRODUCT

Perforated aluminum sheet with surface finish

1.2 REGISTRATION NUMBER

EPD-Kiwa-EE-191580-EN

1.3 VALIDITY

Issue date: 13-02-2025

Valid until: 13-02-2030

1.4 PROGRAMME OPERATOR

Kiwa-Ecobility Experts
Wattstraße 11-13
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: Dillinger Fabrik Gelochter Bleche GmbH

Address: Franz-Méguin-Strasse 20, 66763 Dillingen / Saar

E-mail: info@dfgb.de

Website: www.dfgb.de

Production location: Dillinger Fabrik Gelochter Bleche average location - all locations are listed in the product description

Address production location: Average of several locations,

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

Friedrich Halstenberg, GreenDelta GmbH

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), v 2.1

Secondary PCR-Document (Institut Bauen und Umwelt - IBU) - PCR for products of aluminium and aluminium alloys (2024-04-30), v6

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 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

1 General information

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 'Perforated aluminum sheet with surface finish' with the calculation identifier ReTHiNK-91580.

2 Product

2.1 PRODUCT DESCRIPTION

Material	Share in the product
Aluminium	100%

This average EPD refers to 1 kg of perforated aluminium sheet with a decorative finish, achieved either through anodizing or powder coating. The only difference between the products is the surface finish. The resulting variations in the LCA results are negligible. The results shown in this EPD are those of the perforated aluminum sheet with an anodized finish, as this is the one with the worse result. The product is produced at the three following sites:

-Bulgaria, Mezhdunarodno shose Nr. 31, 2210 Dragoman (~5%)
-Netherlands, Adriaan-Tripweg 13, 9641 Veendam (~25%)
-Germany, Franz-Méguin-Straße 20, 66763 Dillingen (~70%)

The product is intended for indoor and outdoor use and can be used for roofs, walls, ceilings, railings and facades. It is a perforated, flat or three-dimensional, cold-formed aluminium sheet which is then given a decorative finish.

The most important component of Dillinger Fabrik Gelochter Bleche GmbH's anodized/powder-coated perforated aluminium sheets is aluminium. This is supplied in the form of coils from various manufacturers.

After internal processing, in which the aluminium is punched, cut, straightened, nibbled and folded, it is sent to an external service provider for electrolytic oxidation or powder coating.

2.2 APPLICATION (INTENDED USE OF THE PRODUCT)

The perforated sheets from Dillinger Fabrik Gelochter Bleche are a quick to install building component used for roofs, walls, facades and railings. In the facade segment, they are designed as a mounted and ventilated facade cladding or as a sun protection element, consisting of profiled sheets or facade cassettes with an open or closed joint pattern and supplied with a system-related substructure. Various material surfaces, surface treatments and colours are available.

The use is subject to national regulations.

2.3 REFERENCE SERVICE LIFE

RSL PRODUCT

According to the Assessment System for Sustainable Building BBSR Table 2017, the reference service life of external wall cladding made of metal (aluminum) is over 50 years.

USED RSL (YR) IN THIS LCA CALCULATION:

50

2.4 TECHNICAL DATA

The raw material on which this EPD is based is aluminium. It is processed as coil in various thicknesses and widths. The aluminium is procured in accordance with the technical regulations DIN EN 573-3 and DIN EN 485-1.

The first step in the manufacturing process is to punch holes in the aluminum coil. This is done in accordance with DIN 24041.

For the subsequent processing steps, the technical requirements are agreed upon with the customer and the suppliers of the surface finishing.

Characteristic	Value
Thickness	1-5 mm
Density	2,6989 g/cm³
Thermal conductivity	160 W/(mK)
Melting point	660,3° C
Electrical conductivity	34 - 38 m/Ohm mm²
Coefficient of thermal expansion	23,1^-6k^-1
Modulus of elasticity	70.000 N/mm²
Shear modulus	25,5 GPa
Specific heat capacity	900 J/(kg*K)
Hardness	50-100 HB
Yield strength RP 0.2 min	20MPa
Tensile strength min.	65MPa
Elongation at break A5min	2-35%

2 Product

2.5 SUBSTANCES OF VERY HIGH CONCERN

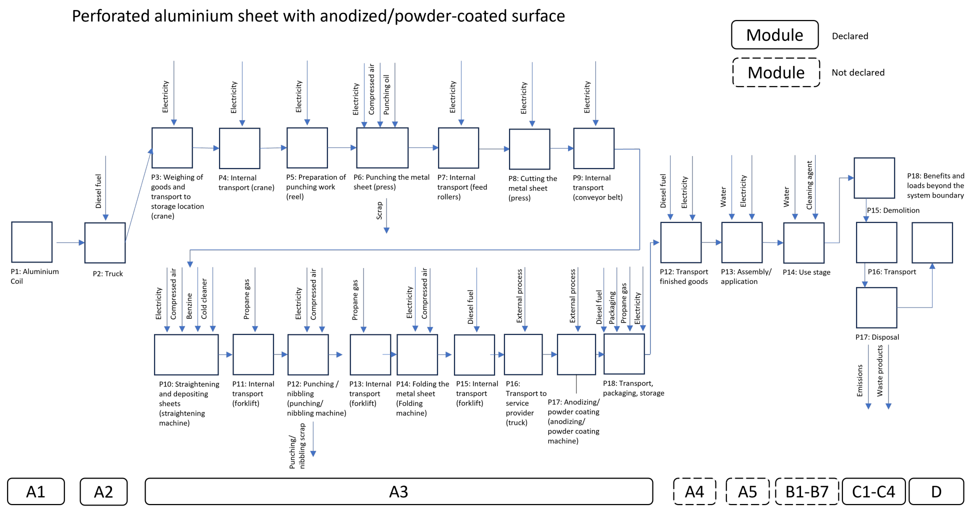
The product does not contain any substances from the "Candidate List of Substances of Very High Concern for Authorization" (SVHC).

2.6 DESCRIPTION PRODUCTION PROCESS

The production of perforated aluminium sheets with an anodised/powder coated surface is divided into internal and external processing steps.

The following figure shows the process flow diagram modelled for the LCA. For each life cycle phase, it shows which process steps are carried out in each phase and how the different phases are interrelated.

The raw material, in the form of aluminium coils, is transported by truck from the supplier to one of the three production sites. There it is unloaded, weighed and transported by crane either directly to storage or to a press system for further processing. Prior to pressing the coils are stretched onto a reel, unrolled, greased, perforated and cut to length. A conveyor belt transports the perforated sheet to a straightening machine where it is then straightened. From there it is transported to a punching/nibbling machine. This machine punches holes, cut-outs, contours and other widths and lengths according to the customers specifications. After, the product is transported to a folding machine, folded and then packed for shipping. The semi-finished perforated sheet is transported to an external service provider where the perforated sheet is anodized/powder coated. The perforated sheet is then repacked and returned to the production site for storage or onward shipment to the customer.



3 Calculation rules

3.1 DECLARED UNIT

kg

1 kg perforated aluminum sheet with a surface finish with a layer thickness of between 60 and 80 µm and an average grammage of 5 kg/m².

Reference unit: kilogram (kg)

3.2 CONVERSION FACTORS

Description	Value	Unit
Reference unit	1	kg
Conversion factor to 1 kg	1.000000	kg

3.3 SCOPE OF DECLARATION AND SYSTEM BOUNDARIES

This is a Cradle to gate with modules C1-C4 and module D EPD. 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 document refers to perforated aluminium sheets with surface treatment of the company Dillinger Fabrik Gelochter Bleche GmbH, produced in the plants Dillingen - Germany, Veendam - Netherlands and Dragoman - Bulgaria. This is an average EPD: an average perforated aluminum sheet with surface treatment, referring to the declared unit of 1 kg. The data collection for the LCA was carried out on a site-specific basis with current annual data from 2023, from which the average data was calculated. The production shares of the three sites in the company's total production were used. This allowed weighted averages to be calculated for inputs with different values. Germany is responsible for 75%, the Netherlands for 20% and Bulgaria for 5% of the total production. The weighted average was therefore calculated using these data for the transport of raw materials and packaging, as well as the use of electricity.

3 Calculation rules

The LCA is therefore representative for perforated aluminum sheet with surface finishing from Dillinger Fabrik Gelochter Bleche GmbH. The declaration holder is responsible for the underlying data and its verification.

3.5 CUT-OFF CRITERIA

Product stage (modules A1-A3)
All relevant input flows (e.g. raw materials, transportation, energy consumption, packaging, etc.) and output flows (e.g. production waste) are considered in this LCA. The neglected input flows do not exceed the limit of 5% of energy consumption and mass. Specifically, the manufacturing process of the plants, buildings and other capital goods used in the production of perforated aluminum sheets has not been included in this calculation. It also excludes transportation of personnel to and from the plant, research and development activities, and long-term emissions. Disposal of packaging waste was also excluded.

End-of-life stage (modules C1-C4)
All relevant input flows (e.g. energy consumption for deconstruction or demolition, transport for waste treatment, etc.) and output flows (e.g. waste treatment at the end of the product's life, etc.) are considered in this LCA. The total neglected input flows do not exceed the limit of 5% of energy consumption and mass. For the demolition scenario, only the activity of the excavator for the actual demolition was considered, but not the movement of the excavator around the demolition site.

Benefits and loads beyond the system boundary (module D)
All relevant benefits and loads beyond the system boundary resulting from reusable products, recyclable materials and/or energy sources leaving the product system are considered in this LCA.

3.6 ALLOCATION

Allocations have been avoided as much as possible. No by-products or co-products are produced in the manufacture of the product under evaluation. The energy requirements of production have been allocated to the individual products based on energy consumption measurements. Specific information on allocations within the background data can be found in the documentation of the Ecoinvent datasets.

As this EPD is an average EPD taking into account data from 3 production sites, allocations have been made based on physical properties. In general, the processes, materials and machinery used are the same at all 3 sites. The differences lie in:

- the suppliers, and therefore the transport distances
- the electricity mix used.

In order to allocate consumption correctly, weighted averages were calculated for both categories based on the quantities produced at each site.

3.7 DATA COLLECTION & REFERENCE PERIOD

The primary data was collected and provided internally by Dillinger Fabrik Gelochter Bleche GmbH. All data was collected in the year 2023.

Transport distances are based on the distances between the production site and the suppliers used in 2023.

Electricity consumption was measured over the year and calculated down to the declared unit based on the quantity produced.

3.8 ESTIMATES AND ASSUMPTIONS

The EPD contains data from three different sites, all of which should be covered in one EPD by averaging the data from all sites. To increase accuracy, a weighted average of resource consumption has been calculated based on the raw material consumption at each site, where possible for the raw material under consideration. This was used specifically for energy consumption as the three sites have different electricity mixes.

All specific transport distances of the raw materials were recorded and taken into account. As this EPD covers three different sites, the transport distances were averaged so that the transport distance reported is representative of all sites.

A scenario was developed for the deconstruction of the product (module C1), reflecting an average deconstruction process. The weight of the raw material was related to the hourly deconstruction potential of the construction machine. The value of the environmental impact was taken from an NMD dataset stored in R<THiNK. The assumptions on the deconstruction potential of the construction machine were taken from a study listed in the references.

The distances from the place of use to the respective waste treatment are taken from the LCA calculation software R<THiNK, which uses the distances from the Dutch National Environmental Database (NMD).

3.9 DATA QUALITY

The quality level of geographical representativeness can be considered “good”.
The quality level of technical representativeness can be considered “good”.
The time representativeness can also be regarded as “good” and the overall data quality for this EPD can therefore be described as “good”.

3 Calculation rules

All relevant process-specific data was collected during the operational data collection. The energy consumption for the German production site could be related to the processes. The other production sites use the same machinery and processes, so the German electricity consumption was taken as the standard. This consumption was then divided between the three sites according to the mass of products processed at each site in order to account for the different electricity mixes.

Wherever possible, primary data from customers has been used, which is of very high quality as it comes directly from the source. In addition, secondary data from the Ecoinvent database (2019, version 3.6) was used when primary data could not be provided. The database is regularly checked and therefore meets the requirements of DIN EN ISO 14040/44 (background data not older than 10 years). The background data meet the requirements of EN 15804+A2. The quantities of raw and ancillary materials used, as well as energy consumption, have been recorded and averaged over the entire year of operation.

The general rule that specific data from specific production processes or average data derived from specific processes must take precedence in the calculation of an EPD or LCA was followed. Data for processes over which the manufacturer has no control have been assigned to generic data/scenarios. When selecting these, care was taken to always select the data set/scenario that most realistically represents the processes.

3.10 POWER MIX

The electricity mix was selected based on data provided by Dillinger Fabrik Gelochter Bleche. The reference year is 2023 and the electricity mix follows the market-based approach.

4 Scenarios and additional technical information

4.1 DE-CONSTRUCTION, DEMOLITION (C1)

The following information describes the scenario for demolition at end of life.

Description	Amount	Unit
Hydraulic excavator (average) [NMD generic]	0.000	hr

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]
aluminium, cast alloy for buildings (i.a. profiles, sheets, pipes) (NMD ID 4)	Lorry (Truck), unspecified (default) | market group for (GLO)	0	100	150	50	0
finishes (adhered to wood, plastic, metal) (NMD ID 2)	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

4.3 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.

4 Scenarios and additional technical information

Waste Scenario	Region	Not removed (stays in work) [%]	Landfill [%]	Incineration [%]	Recycling [%]	Re-use [%]
aluminium, cast alloy for buildings (i.a. profiles, sheets, pipes) (NMD ID 4)	NL	0	3	3	94	0
finishes (adhered to wood, plastic, metal) (NMD ID 2)	NL	0	0	100	0	0

Waste Scenario	Not removed (stays in work) [kg]	Landfill [kg]	Incineration [kg]	Recycling [kg]	Re-use [kg]
aluminium, cast alloy for buildings (i.a. profiles, sheets, pipes) (NMD ID 4)	0.000	0.030	0.030	0.940	0.000
finishes (adhered to wood, plastic, metal) (NMD ID 2)	0.000	0.000	0.200	0.000	0.000
Total	**0.000**	**0.030**	**0.230**	**0.940**	**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]
aluminium, cast alloy for buildings (i.a. profiles, sheets, pipes) (NMD ID 4)	0.940	0.000
Total	**0.940**	**0.000**

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.

5.1 ENVIRONMENTAL IMPACT INDICATORS PER KILOGRAM

CORE ENVIRONMENTAL IMPACT INDICATORS EN15804+A2

Abbr.	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
AP	mol H+ eqv.	1.21E-1	6.81E-4	1.17E-2	1.33E-1	4.16E-5	6.61E-5	1.25E-3	8.01E-6	-1.09E-1
GWP-total	kg CO2 eqv.	1.86E+1	1.18E-1	2.15E+0	2.08E+1	3.98E-3	1.14E-2	7.57E-1	1.22E-3	-1.66E+1
GWP-b	kg CO2 eqv.	-6.83E-2	5.42E-5	-1.90E-1	-2.59E-1	1.11E-6	5.26E-6	-1.84E-4	1.49E-5	7.81E-2
GWP-f	kg CO2 eqv.	1.86E+1	1.17E-1	2.34E+0	2.10E+1	3.98E-3	1.14E-2	7.57E-1	1.20E-3	-1.66E+1
GWP-luluc	kg CO2 eqv.	6.97E-2	4.30E-5	3.13E-3	7.29E-2	3.14E-7	4.18E-6	1.41E-4	1.11E-6	-6.47E-2
EP-m	kg N eqv.	1.81E-2	2.40E-4	1.90E-3	2.03E-2	1.84E-5	2.33E-5	2.22E-4	1.87E-6	-1.63E-2
EP-fw	kg P eq	6.16E-4	1.18E-6	1.49E-4	7.66E-4	1.45E-8	1.15E-7	8.01E-6	4.14E-8	-5.44E-4
EP-T	mol N eqv.	2.02E-1	2.65E-3	2.24E-2	2.27E-1	2.02E-4	2.57E-4	2.58E-3	2.09E-5	-1.81E-1
ODP	kg CFC 11 eqv.	7.15E-7	2.59E-8	1.85E-7	9.26E-7	8.60E-10	2.52E-9	1.97E-8	1.35E-10	-6.03E-7
POCP	kg NMVOC eqv.	5.93E-2	7.55E-4	6.49E-3	6.65E-2	5.55E-5	7.34E-5	7.18E-4	6.21E-6	-5.32E-2
ADP-f	MJ	1.75E+2	1.77E+0	3.40E+1	2.11E+2	5.48E-2	1.72E-1	2.12E+0	1.69E-2	-1.56E+2
ADP-mm	kg Sb-eqv.	4.43E-5	2.97E-6	1.48E-3	1.53E-3	6.11E-9	2.89E-7	4.92E-6	9.18E-9	3.77E-3
WDP	m3 world eqv.	2.43E+0	6.34E-3	2.24E+0	4.67E+0	7.34E-5	6.15E-4	1.67E-2	4.32E-4	-1.36E+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)

5 Results

ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS EN15804+A2

Abbr.	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
ETP-fw	CTUe	4.74E+2	1.58E+0	1.22E+2	5.98E+2	3.30E-2	1.53E-1	7.06E+0	1.86E+1	-3.96E+2
PM	disease incidence	1.43E-6	1.06E-8	8.35E-8	1.52E-6	1.10E-9	1.03E-9	1.52E-8	1.09E-10	-1.31E-6
HTP-c	CTUh	2.61E-8	5.12E-11	1.93E-9	2.81E-8	1.15E-12	4.97E-12	7.73E-10	1.04E-12	-2.33E-8
HTP-nc	CTUh	4.57E-7	1.73E-9	4.45E-8	5.03E-7	2.84E-11	1.68E-10	8.83E-9	2.95E-11	-3.91E-7
IR	kBq U235 eqv.	2.61E-1	7.42E-3	1.48E-1	4.17E-1	2.35E-4	7.21E-4	8.96E-3	5.73E-5	-2.11E-1
SQP	Pt	3.16E+1	1.54E+0	4.56E+1	7.88E+1	6.99E-3	1.49E-1	2.05E+0	2.10E-2	-2.38E+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	Acidification 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 INDICATORS DESCRIBING RESOURCE USE AND ENVIRONMENTAL INFORMATION BASED ON LIFE CYCLE INVENTORY (LCI)

PARAMETERS DESCRIBING RESOURCE USE

Abbr.	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
PERE	MJ	2.26E+1	2.22E-2	9.03E+0	3.17E+1	2.96E-4	2.15E-3	2.30E-1	9.96E-4	-2.03E+1
PERM	MJ	0.00E+0	0.00E+0	1.83E+0	1.83E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PERT	MJ	2.26E+1	2.22E-2	1.09E+1	3.35E+1	2.96E-4	2.15E-3	2.30E-1	9.96E-4	-2.03E+1
PENRE	MJ	1.86E+2	1.88E+0	3.57E+1	2.24E+2	5.82E-2	1.83E-1	2.26E+0	1.80E-2	-1.65E+2
PENRM	MJ	0.00E+0	0.00E+0	5.77E-1	5.77E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PENRT	MJ	1.86E+2	1.88E+0	3.62E+1	2.25E+2	5.82E-2	1.83E-1	2.26E+0	1.80E-2	-1.65E+2
SM	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
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	1.25E-1	2.16E-4	9.47E-2	2.20E-1	2.82E-6	2.10E-5	1.12E-3	1.27E-5	-9.35E-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	6.53E-5	4.49E-6	5.37E-3	5.44E-3	1.49E-7	4.36E-7	6.21E-3	1.64E-8	7.60E-3
NHWD	Kg	3.53E+0	1.12E-1	4.59E-1	4.10E+0	6.49E-5	1.09E-2	8.31E-2	3.05E-2	-3.16E+0
RWD	Kg	2.92E-4	1.16E-5	1.36E-4	4.40E-4	3.81E-7	1.13E-6	9.93E-6	6.69E-8	-2.44E-4

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	3.62E-1	3.62E-1	0.00E+0	0.00E+0	9.40E-1	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	-3.23E-3	-3.23E-3	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EEE	MJ	0.00E+0	0.00E+0	-1.87E-3	-1.87E-3	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 Results

5.3 INFORMATION ON BIOGENIC CARBON CONTENT PER KILOGRAM

BIOGENIC CARBON CONTENT

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

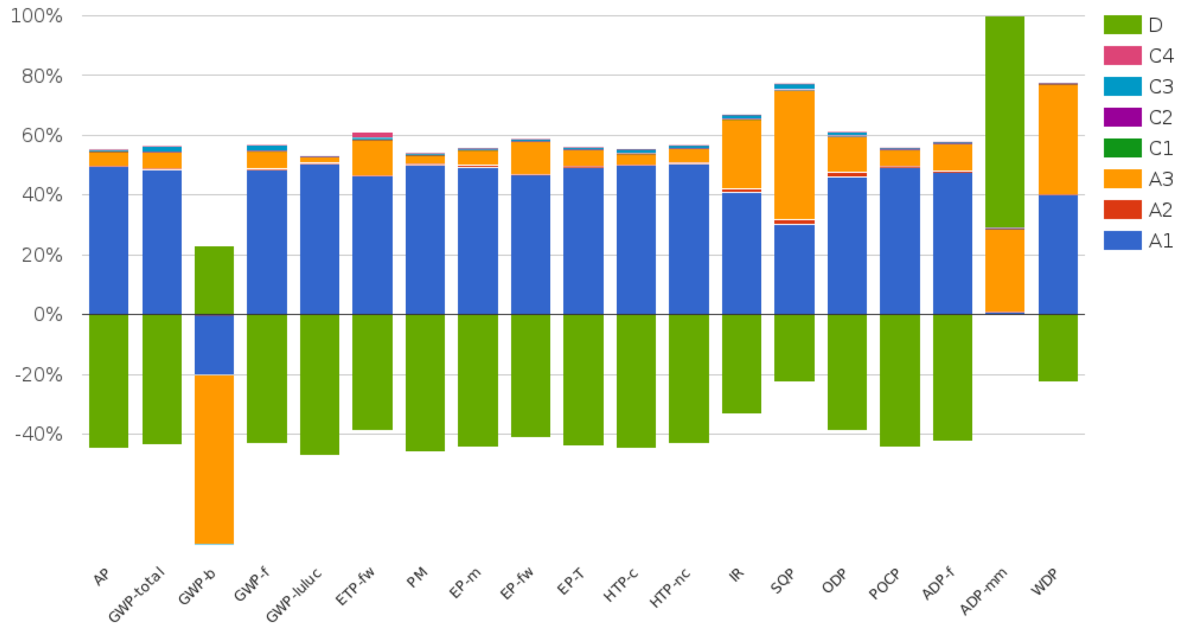
Biogenic carbon content	Amount	Unit
Biogenic carbon content in the product	0	kg C
Biogenic carbon content in accompanying packaging	0.05945	kg C

UPTAKE OF BIOGENIC CARBON DIOXIDE

The following amount of 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. One kilogram of biogenic Carbon content is equivalent to 44/12 kg of biogenic carbon dioxide uptake.

Uptake Biogenic Carbon dioxide	Amount	Unit
Packaging	0.218	kg CO2 (biogenic)

6 Interpretation of results



In general, the results show the strong influence of Module D. This is due to the high recycled content of the environmental profile used for aluminium.

Modules A1 and D have the largest impact on the Global Warming Potential - total (GWP-total) with an influence of around 75%. A3 contributes to the Global Warming Potential - biogenic (GWP-b) with a negative value of around 85%. This is due to the wooden pallet in the packaging.

The influence of the modules in the other environmental impact categories is otherwise quite homogeneous. There are still significant differences for Ionising radiation (IR), where the influence of A3 increases by about 20 percentage points, and for Land use (SQP), where the variance increases to about 65 percentage points. For Depletion of abiotic resources - minerals and metals (ADP-mm), there is almost no influence of A1, but an even

6 Interpretation of results

stronger influence of D at around 65%. C1 can be found with a maximum of ~15%, especially for Eutrophication potential - marine (EP-m), Eutrophication potential - terrestrial (EP-t), Ozone depletion (ODP) and Photochemical ozone formation (POCP).

Packaging accounts for the majority of CO2 emissions within the GWP-biogenic impact category. As module A5, which includes packaging waste treatment, is not reported, there appears to be an imbalance in biogenic CO2 emissions. The alleged imbalance can be explained by the fact that module A5 is not included in the EPD.

7 References

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

ISO 14044
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General PCR Ecobility Experts
Kiwa-Ecobility Experts (Kiwa-EE) – General Product Category Rules (2022-02-14), v 2.1

Secondary PCR-Document
Institut Bauen und Umwelt - IBU - PCR for products of aluminium and aluminium alloys (2024-04-30), v6

Reference Service Life BBSR
Federal Institute for Research on Building, Urban Affairs and Spatial Development - Service Life of Building Components - Assessment System for Sustainable Building (BNB) (24.02.2017)

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LCA Rapportage categorie 3 data Nationale Milieudatabase Hoofdstuk 43 Staalconstructies, Seite 15 (2021-09-27), v3

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