

Environmental Product Declaration

In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 for:

Incineration bottom ash aggregate (IBAA)

from

Sysav



Programme:

The International EPD System, www.environdec.com

Programme operator:

EPD International AB

Type of EPD:

EPD of a single product from a manufacturer

EPD registration number:

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An EPD may be updated or republished if conditions change. To find the latest version of the EPD and to confirm its validity, see www.environdec.com



GENERAL INFORMATION

Programme Information	
Programme:	The International EPD® System
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Product Category Rules (PCR)

CEN standard EN 15804 serves as the Core Product Category Rules (PCR)

Product Category Rules (PCR): Construction products 2019:14, version 2.0.1. UN CPC: N/A.

PCR review was conducted by: The Technical Committee of the International EPD System. See www.environdec.com for a list of members. Review chair: Rob Rouwette and Noa Meron (co-chair). The review panel may be contacted via the Secretariat www.environdec.com/contact.

Life Cycle Assessment (LCA)

LCA accountability: Karin Lindqvist, Sweco AB (karin.lindqvist@sweco.se)

Third-party Verification

Independent third-party verification of the declaration and data, according to ISO 14025:2006, via:

Individual EPD verification without a pre-verified LCA/EPD tool

Third-party verifier: *David Althoff Palm, Dalemarken AB*

Approved by: International EPD System

Procedure for follow-up of data during EPD validity involves third party verifier:

Yes No

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but published in different EPD programmes, may not be comparable. For two EPDs to be comparable, they shall be based on the same PCR (including the same first-digit version number) or be based on fully aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have identical scope in terms of included life-cycle stages (unless the excluded life-cycle stage is demonstrated to be insignificant); apply identical impact assessment methods (including the same version of characterisation factors); and be valid at the time of comparison.

For further information about comparability, see EN 15804 and ISO 14025.

INFORMATION ABOUT EPD OWNER

Owner of the EPD: Sysav Industri AB

Address: Box 503 44, 202 13 Malmö

Contact: Raul Grönholm, raul.gronholm@sysav.se

Description of the organisation: Sysav works to create a sustainable region, for this and coming generations together with our customers, partners, and the residents in our 14 owner municipalities. Sysav receives, treats, and recycles waste from households and industries. Waste is collected, among other ways, at recycling centers, other reception facilities, and through household waste collection. Sysav strives for a society with circular flows and sustainable production and consumption, where unnecessary waste is not generated.

Sysav has a sorting facility to recover the metals that remain in the bottom ash produced during energy recovery. By sorting the material into several fractions and using magnets and eddy current separators, valuable metals can be extracted and forwarded for recycling. At the same time, the material remaining after metal extraction becomes incineration bottom ash aggregate (IBAA) - a stable construction material that can be used in various building and construction projects, thus replacing the need for new, virgin aggregates.

Product-related or management system-related certifications: The manufacturing site operates under certified management systems, including ISO 9001 (quality management), ISO 14001 (environmental management) and ISO 45001 (occupational health and safety).

PRODUCT INFORMATION

Product name: Incineration bottom ash aggregate (IBAA)

Product identification: Sysav's IBAA is produced from incineration bottom ash deriving from industry and household waste in the Malmö region in Sweden. The IBAA has a grain of size 0/40 mm. This EPD does not cover recycled IBAA as this does not have carbonation similar to new IBAA.



UN CPC code: N/A

Product description: The incineration bottom ash aggregate (IBAA) is produced from the incineration bottom ash (IBA) that arise from the incineration for energy recovery of waste at Sysav's waste-to-energy plant. The waste comes from both industries and households in the Malmö region. The product has a grain size of 0/40 mm and can be used as construction material as sub-base for roads, streets, storage areas and parking lots, or as levelling layer for landfill capping.

Description of production: During waste incineration, residues such as incineration bottom ash, which consists of ash, metals, glass, and sand, are created. Incineration bottom ash aggregates are produced through the following processing steps:

- Particles larger than 50 mm are screened out
- Metals are sorted out
- Plastics and paper are sorted out
- Mixing of sorted fractions into one mineral material
- The IBAA is stored until it is chemically stabilized
- Quality control of the IBAA's health and environmental impact properties

Name and location of production site: Spillepeng Återvinningsanläggning, Nordreflindvägen, 211 24 Malmö, Sweden

See Sysav's website for more information on the product:
<https://www.sysav.se/foretag/produkter-tjanster/slaggrus/>

CONTENT DECLARATION

Product content	Mass, kg	Post-consumer recycled material, mass-% of product	Biogenic material, weight-% and kg C/DU
Recovered aggregate	1000	100%	0% and 0
TOTAL	1000	100%	0% and 0
Packaging materials	Mass, kg	Post-consumer recycled material, mass-% of product	Biogenic material, weight-% and kg C/DU

The product is sold as bulk material. Therefore, no packaging is required.

The product does not include any substances on the SVHC list.

There is possible leachate from the IBAA during the use phase. Previous studies have presented leachate from copper, zinc, chlorides and sulphates as potential issues. Sampling has, however, shown that these amounts are below the reference values for less sensitive land (mkm in Swedish) and have therefore not been included in the study. It is important that the IBAA is used carefully and only in approved areas where risk analyses have been conducted.

LCA INFORMATION

Declared unit: 1 ton of IBAA

Time representativeness: Primary data has been collected through relevant documentation from Sysav representing the production year 2024. The carbonation was measured in 2016 but is representative for 2026.

Geographical scope: Sweden

Database and LCA software used: Modelling of environmental impact has been carried out with the LCA tool SimaPro, version 10.2. Generic datasets and background data have been based on LCI data from Ecoinvent 3.11.

Impact assessment method: Categories, units and parameters used to describe environmental impacts were selected according to PCR 2019:14. Characterization factors used to assess material and energy flows were applied according to EN 15804:2012+A2:2019/AC:2021 based on EF 3.1.

Description of system boundaries: Cradle to gate with modules C1–C4 and module D (A1–A3 + C + D). Modules A4-A5 and B1-B7 are assessed to have limited impact and are not considered in the study.

Manufacturing stage (A1-A3)

No impacts from raw material supply (A1) are included since the raw material incineration bottom ash (IBA) is received burden-free, as it is a waste of a prior system.

Module A2 includes the transport of the IBAA to stockpiling and includes the impact from both production and combustion of fuel during the transport.

Module A3 includes transport and machine work for the stockpiling and quality control processes. It also includes leachate discharge from the stockpile and energy use for the connected treatment process, as well as CO₂-uptake deriving from a carbonation process.

End-of-life (C1-C4)

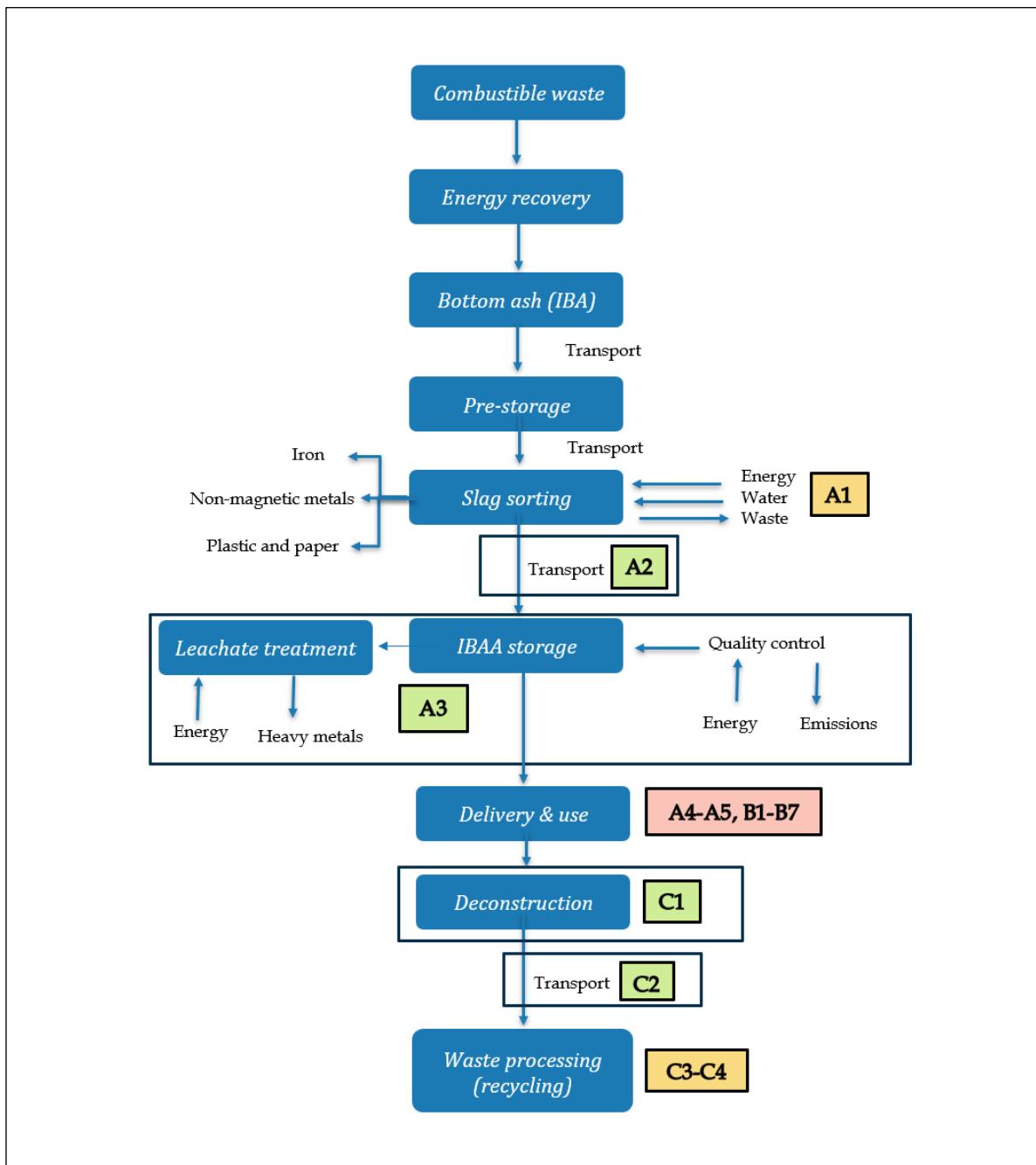
Module C1 includes deconstruction of the road where the product has been used. This work is done by an excavator. When the IBAA is removed from a road that is being demolished, it reverts to its status as waste and must, by law, be delivered to an approved waste recipient. It is not allowed to be mixed with other road construction materials and transported away. 1000 kg per ton IBAA is therefore collected separately.

Module C2 includes emissions from the transport of the product to waste treatment (both indirect emissions from the production of fuels and direct emissions from the combustion of fuels). The assumed transport mode is a EURO 6 truck of size class 16-32 metric tons, and the assumed distance is 60 km. The bulk density of the product is 1700 kg/m³.

After use, the product is recycled back into the production of new IBAA and there is therefore no impact connected to modules C3 and C4.

Since the input material of the IBAA is 100% recycled and the product is 100% recycled after use, a circular system is achieved, and no environmental benefits or loads are reported in module D.

Process flow diagram: A system diagram displaying the life cycle of the IBAA and the included modules is presented below. Modules marked with red are not included in the scope, while modules marked orange are included but does not entail any environmental impacts for the IBAA. In the case of A1 this is a result of the system boundary definition, as the waste incineration and sorting are assigned to the previous system. Green modules include environmental impacts, and the processes included in these have been framed in black squares to visualize it clearer.



Allocation procedure: The leachate emissions and energy use at the leachate treatment facility have been allocated based on the proportion that the IBAA stockpiling area constitutes of the total landfill area where the storage takes place. These amounts were then mass allocated based on total production volume in 2024 to represent the amounts per ton IBAA.

The waste allocation procedure of section 4.5.2 of PCR 2019:14 have been applied according to the polluter-pays principle. In accordance with the stipulations of the PCR, all impacts from the incineration bottom ash (IBA) processing must be allocated to the previous system that generated the waste, until it is of value again and becomes the recovered product incineration bottom ash aggregate (IBAA).

To assess the environmental impacts, Ecoinvent datasets for cut-off allocation have been used which are also of the polluter-pays principle.

Cut-off criteria: The cut-off criteria established by the PCR is 1% of all material and energy flows to a single unit process and 5% of total inflows (mass and energy) per module. No cut-offs exceeding this limit have been made. In accordance with PCR 2019:14, this study does not include infrastructure and capital goods.

Electricity in A3: The climate impact, using the GWP-GHG indicator, of electricity purchased in A3 is 0,053 kg CO₂-eq./kWh.

Data quality: Primary data has been collected through relevant documentation from Sysav's own production for the year 2024. Collected data reflects the current production and was gathered from September to November 2025. The data for carbonation was collected 2016 but is confirmed still valid. The uncertainties of that data regarding the possible variation in uptake are considered acceptable.

The data quality has been assessed according to EN15804 and is evaluated to be good. A data quality assessment of used datasets that influence the mandatory impact indicators are presented in the table below.

Process	Data classification	Geographical representativeness	Technical representativeness	Temporal representativeness
Transport, freight, lorry 28 metric ton, fatty acid methyl ester 100% {CH}	Representative secondary	Good	Good	Good
Electricity, high voltage {SE} heat and power co-generation, wood chips, 6667 kW, state-of-the-art 2014	Primary	Good	Good	Fair
Carbonation	Primary	Very good	Very good	Fair
Excavation, hydraulic digger {RER}	Representative secondary	Good	Good	Poor
Transport, freight, lorry, 16-32 metric ton, diesel, EURO 6 {RER}	Representative secondary	Good	Good	Very good

See table below for declaration of data sources, reference years, data categories and share of primary data for A1-A3.

Module	Process	Source type	Source	Reference year	Data category	GWP-GHG (kg CO ₂ -eq.)	Total share of primary data
A3	Carbonation	Collected data	EPD owner (master's thesis)	Collected 2016, valid 2026	Primary	-31,6	100%
A2, A3	Other processes	Database	Ecoinvent 3.11	2010-2019	Primary, Secondary	0,3	0%
A1-A3						-31,3	>90%

Modules declared, geographical scope, share of primary data (in GWP-GHG results) and data variation (in GWP-GHG results):

	Product stage			Distribution/installation stage	Use stage							End-of-life stage				Beyond product life cycle	
	Raw material supply	Transport	Manufacturing		Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules declared	X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	SE	SE	SE	ND	ND	ND	ND	ND	ND	ND	ND	ND	SE	SE	SE	SE	SE
Share of primary data	>90%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

The share of primary data is calculated based on GWP-GHG results. It is a simplified indicator for data quality that supports the use of more primary data, to increase the representativeness of and comparability between EPDs. Note that the indicator does not capture all relevant aspects of data quality and is not comparable across product categories.

ENVIRONMENTAL PERFORMANCE

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

The results of the end-of-life stage (modules C1-C4) should be considered when using the results of the product stage (modules A1-A3).

Mandatory impact category indicators according to EN 15804

Results per declared unit

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
GWP-total	kg CO ₂ eq.	-3,13E+01	2,94E-01	8,99E+00	0,00E+00	0,00E+00	0,00E+00
GWP-fossil	kg CO ₂ eq.	-3,13E+01	2,94E-01	8,99E+00	0,00E+00	0,00E+00	0,00E+00
GWP-biogenic	kg CO ₂ eq.	1,09E-02	7,00E-05	2,02E-03	0,00E+00	0,00E+00	0,00E+00
GWP-luluc	kg CO ₂ eq.	1,36E-04	5,79E-06	1,42E-04	0,00E+00	0,00E+00	0,00E+00
ODP	kg CFC 11 eq.	1,73E-08	6,59E-09	2,04E-07	0,00E+00	0,00E+00	0,00E+00
AP	mol H ⁺ eq.	9,34E-03	2,72E-03	1,12E-02	0,00E+00	0,00E+00	0,00E+00
EP-freshwater	kg P eq.	6,08E-05	2,04E-06	4,63E-05	0,00E+00	0,00E+00	0,00E+00
EP-marine	kg N eq.	8,31E-03	1,28E-03	2,52E-03	0,00E+00	0,00E+00	0,00E+00
EP-terrestrial	mol N eq.	4,51E-02	1,41E-02	2,74E-02	0,00E+00	0,00E+00	0,00E+00
POCP	kg NMVOC eq.	5,11E-03	4,22E-03	2,19E-02	0,00E+00	0,00E+00	0,00E+00
ADP-minerals & metals*	kg Sb eq.	6,50E-08	9,75E-09	2,35E-07	0,00E+00	0,00E+00	0,00E+00
ADP-fossil*	MJ	3,27E-01	3,13E-02	7,94E-01	0,00E+00	0,00E+00	0,00E+00
WDP*	m ³	4,63E-02	1,44E-03	3,91E-02	0,00E+00	0,00E+00	0,00E+00
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals & metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption						

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

Additional mandatory and voluntary impact category indicators

Results per declared unit

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
GWP-GHG ¹	kg CO ₂ eq.	-3,13E+01	2,94E-01	8,99E+00	0,00E+00	0,00E+00	0,00E+00
PM	disease inc.	7,09E-08	7,82E-08	5,39E-07	0,00E+00	0,00E+00	0,00E+00
IRP ²	kBq U-235 eq	1,48E-02	1,13E-03	3,01E-02	0,00E+00	0,00E+00	0,00E+00
ETP-fw ³	CTUe	5,19E+01	9,28E-02	4,31E+00	0,00E+00	0,00E+00	0,00E+00
HTP-c ³	CTUh	9,32E-10	1,58E-11	5,56E-10	0,00E+00	0,00E+00	0,00E+00
HTP-nc ³	CTUh	3,32E-08	2,95E-10	6,00E-08	0,00E+00	0,00E+00	0,00E+00
SQP ³	Pt	2,57E+01	6,47E-03	1,52E-01	0,00E+00	0,00E+00	0,00E+00
Acronyms	PM = Particulate Matter emissions; IRP = Ionizing radiation – human health; ETP-fw = Eco toxicity – freshwater; HTP-c = Human toxicity – cancer effects; HTP-nc = Human toxicity – non cancer effects; SQP = Soil Quality						

¹ This indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such, the indicator is identical to GWP-total except that the CF for biogenic CO₂ is set to zero.

² 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.

³ The results of this environmental indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

Resource use indicators

Results per declared unit							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
PERE	MJ	8,48E+00	1,09E-02	2,98E-01	0,00E+00	0,00E+00	0,00E+00
PERM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	MJ	8,48E+00	1,09E-02	2,98E-01	0,00E+00	0,00E+00	0,00E+00
PENRE	MJ	3,34E-01	3,23E-02	8,20E-01	0,00E+00	0,00E+00	0,00E+00
PENRM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	MJ	3,34E-01	3,23E-02	8,20E-01	0,00E+00	0,00E+00	0,00E+00
SM	kg	1,00E+03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	m ³	2,72E-02	6,70E-05	1,95E-03	0,00E+00	0,00E+00	0,00E+00
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water						

Waste indicators

Results per declared unit							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Hazardous waste disposed	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Non-hazardous waste disposed	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Radioactive waste disposed	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

Output flow indicators

Results per declared unit							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Components for re-use	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Material for recycling	kg	0,00E+00	0,00E+00	0,00E+00	1,00E+03	0,00E+00	0,00E+00
Materials for energy recovery	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy, electricity	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy, thermal	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

ABBREVIATIONS

Abbreviation	Definition
General Abbreviations	
EN	European Norm (Standard)
EPD	Environmental Product Declaration
EF	Environmental Footprint
GPI	General Programme Instructions
ISO	International Organization for Standardization
LCA	Life Cycle Assessment
PCR	Product Category Rules
c-PCR	Complementary Product Category Rules
CEN	European Committee for Standardization
CPC	Central product classification
Environmental Impact Indicators (EN 15804)	
GHG	Greenhouse gas
GWP	Global Warming Potential (kg CO ₂ eq.)
GWP-fossil	Global Warming Potential from fossil sources (kg CO ₂ eq.)
GWP-biogenic	Global Warming Potential from biogenic sources (kg CO ₂ eq.)
GWP-luluc	Global Warming Potential from land use and land use change (kg CO ₂ eq.)
GWP-total	Total Global Warming Potential (kg CO ₂ eq.)
GWP-GHG	Global Warming Potential for greenhouse gases (kg CO ₂ eq.)
ODP	Ozone Depletion Potential (kg CFC-11 eq.)
AP	Acidification Potential (mol H ⁺ eq.)
EP	Eutrophication Potential
EP-freshwater	Freshwater eutrophication potential (kg P eq.)
EP-marine	Marine eutrophication potential (kg N eq.)
EP-terrestrial	Terrestrial eutrophication potential (mol N eq.)
POCP	Photochemical Ozone Creation Potential (kg NMVOC eq.)
ADP	Abiotic Depletion Potential
ADP-minerals & metals	Abiotic depletion potential for non-fossil resources (kg Sb eq.)
ADP-fossil	Abiotic depletion potential for fossil resources (MJ)
WDP	Water Deprivation Potential (m ³)

Resource Use Indicators	
PERE	Use of renewable primary energy excluding renewable primary energy resources used as raw materials (MJ)
PERM	Use of renewable primary energy resources used as raw materials (MJ)
PERT	Total use of renewable primary energy resources (MJ)
PENRE	Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials (MJ)
PENRM	Use of non-renewable primary energy resources used as raw materials (MJ)
PENRT	Total use of non-renewable primary energy resources (MJ)
SM	Use of secondary material (kg)
RSF	Use of renewable secondary fuels (MJ)
NRSF	Use of non-renewable secondary fuels (MJ)
FW	Use of net fresh water (m ³)
Waste Indicators	
HW	Hazardous Waste (disposed) (kg)
NHW	Non-Hazardous Waste (disposed) (kg)
RW	Radioactive Waste (disposed) (kg)
Output Flow Indicators	
CFR	Components for Reuse (kg)
MR	Material for Recycling (kg)
MER	Materials for Energy Recovery (kg)
EEE	Exported Energy, Electricity (MJ)
EET	Exported Energy, Thermal (MJ)
Lifecycle Stages / Modules	
A1	Raw material supply
A2	Transport
A3	Manufacturing
A4	Transport to site
A5	Construction/Installation
B1	Use
B2	Maintenance
B3	Repair
B4	Replacement
B5	Refurbishment
B6	Operational energy use
B7	Operational water use
C1	Deconstruction/Demolition
C2	Transport to waste processing
C3	Waste processing
C4	Disposal
D	Reuse-Recovery-Recycling potential
Other Relevant Terms	
SVHC	Substances of Very High Concern
MJ	Megajoule
kg	Kilogram
m ³	Cubic Meter
NMVOC	Non-Methane Volatile Organic Compounds
Sb eq.	Antimony Equivalents
P eq.	Phosphorus Equivalents
N eq.	Nitrogen Equivalents
CFC-11 eq.	Chlorofluorocarbon-11 Equivalents
CO ₂ eq.	Carbon Dioxide Equivalents
kg C	Kilograms of Carbon
kg CO ₂ eq.	Kilograms of Carbon Dioxide Equivalent
ND	Not Declared

REFERENCES

General Programme Instructions of the International EPD® System. Version 5.0.1

PCR 2019:14. Construction Products. Version 2.0.1

LCA report Sysav IBAA. Sweco. Asker, Johansson & Lindqvist. 2026-01-29

VERSION HISTORY

Original Version of the EPD, 2026-01-29

