

Environmental Product Declaration



THE INTERNATIONAL EPD® SYSTEM



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

Geocells

from

GeoGlobe Europe EOOD



Programme:	The International EPD® System, www.environdec.com
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EPD of multiple products, based on the average results of the product group.

An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com



General information

Programme information

Programme:	The International EPD® System
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
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Accountabilities for PCR, LCA and independent, third-party verification
Product Category Rules (PCR)
CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product Category Rules (PCR): PCR 2019:14 Construction products, version 1.3.3
UN CPC Code: 36950
PCR review was conducted by: The Technical Committee of the International EPD® System. See www.environdec.com for a list of members. Review chair: Claudia A. Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat www.environdec.com/contact .
Life Cycle Assessment (LCA)
LCA accountability: denkstatt Bulgaria, 4-6 Lyubata str., Sofia, Bulgaria, office@denkstatt.bg
Third-party verification
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via:
<input checked="" type="checkbox"/> EPD verification by individual verifier
Third-party verifier: Dr-Ing. Nikolay Minkov, GREENZERO AX GmbH <name, organisation, and signature of the third-party verifier>
Approved by: The International EPD® System
Procedure for follow-up of data during EPD validity involves third party verifier:
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No

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

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same 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 equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

Company information

Owner of the EPD:

GeoGlobe Europe EOOD

Contact:

Mariyan Tsankov, e-mail: m.tsankov@geoglobeeurope.com

Description of the organisation:

GeoGlobe Europe EOOD is specialized in the production of polyethylene (PE) geosynthetic geocells. GeoGlobe Europe EOOD was founded in 2016 with the vision to meet the growing demand of Geosynthetic Geocells worldwide. Since 2016 GeoGlobe Europe has established a commercial network in over 30 countries on 4 continents.

Over the years GeoGlobe Europe has expanded its portfolio with new range of geocells, striving to meet the growing expectations of the customers.

Product-related or management system-related certifications:

- ISO 9001:2015 Quality management system – certificate № 44 100 19 32 0184
- ISO 14001:2015 Environmental management system – certificate № 44 104 19 32 0184
- ISO 45001:2018 Occupational health and safety management systems – certificate № 44 126 19 32 0184
- CE Certificate of conformity of the factory production control – certificate № 1871-CPR-0246

Name and location of production site:

GeoGlobe Europe EOOD – 11 Kuklensko shose Blvd, Plovdiv, Bulgaria

Product information

Product name: **Geosynthetic Geocells**

Product description:

Geosynthetic geocells are three-dimensional lightweight and flexible material made of ultrasonically bonded polyethylene strips, to form a shape of honeycomb. This design enables the geocells to confine material and prevent its movement sideways. This function finds its way into slope and channels stabilization, retaining walls, landfills and reservoirs stabilization, load support for infrastructure etc. The geocells improve the load-bearing capacity of the soil by limiting its lateral motion under pressure of loads. They also limit the erosion processes by preventing materials from sliding down on slopes of various inclines.

The geocells allow for the use of various infill materials – soil, sand, humus, gravel, graded crushed stones, RAP, concrete, wooden chips, recycled tires, etc. - thus reducing the need to haul expensive building materials.

There are four principal types of geosynthetic geocells: GGEUE, GGEUS, GGEUB and GGEUG. They differ mainly in the ratio of the used primary and secondary polyethylene. Depending on the specific project requirements geocells can vary in the thickness of the strips, width of the strips, and in the distance between the welds.

	Geocell GGEUE and GGEUS	Geocell GGEUB	Geocell GGEUG
Weld strength (kN/m), EN ISO 13426-I	Shear Weld Strength: 22.5 Peel Weld Strength: 12.7 Split Weld Strength: 24.2	Shear Weld Strength: 18.4 Peel Weld Strength: 10.3 Split Weld Strength: 19.7	Shear Weld Strength: 15.0 Peel Weld Strength: 8.4 Split Weld Strength: 16
Tensile strength (kN/m), EN ISO 10319	Non-perforated strip: 24 Perforated strip: 20.0 Strips connected by screws: 20.0	Non-perforated strip: 19.5 Perforated strip: 16.3 Strips connected by screws: 16.3	Non-perforated strip: 15.9 Perforated strip: 13.3 Strips connected by screws: 13.3
Strip thickness (mm), ASTM D 5199	Prior to texture: 1.2 After texture: 1.4	Prior to texture: 1.1 After texture: 1.3	Prior to texture: 1.1 After texture: 1.3
Material Composition, ASTM D 1505	Blends of polyethylene with average density of 0.9425-0.965 g/cm ³		
Surface Treatment	Cell walls textured with multitude of rhomboidal indentations with depth 0.2-0.5 mm		
Perforation	Non-perforated or perforated with Ø20 mm or Ø10 mm, according to their application		
Cell dimensions	Height: 50-200 mm Nominal Cell Size: from 24.4x20.5 to 63x52.9 cm Cell Area: 250.1 to 1664 cm ²		
Regular section dimensions	Covered Area of Regular Section: 20 to 52.66 m ²		

Disclaimer: All values are subject to tolerance of +/- 10%.

UN CPC code:

The product UN CPC code is 36330 according to Central Product Classification, Version 2.1.

Geographical scope:

Global for raw materials production and supply, Bulgaria for Geosynthetic Geocells manufacturing, Global for product use and end-of-life.

LCA information

Declared unit:

The declared unit for this study is 1 kilogram of average geosynthetic geocells.

Time representativeness:

The study covers data for the year 2022.

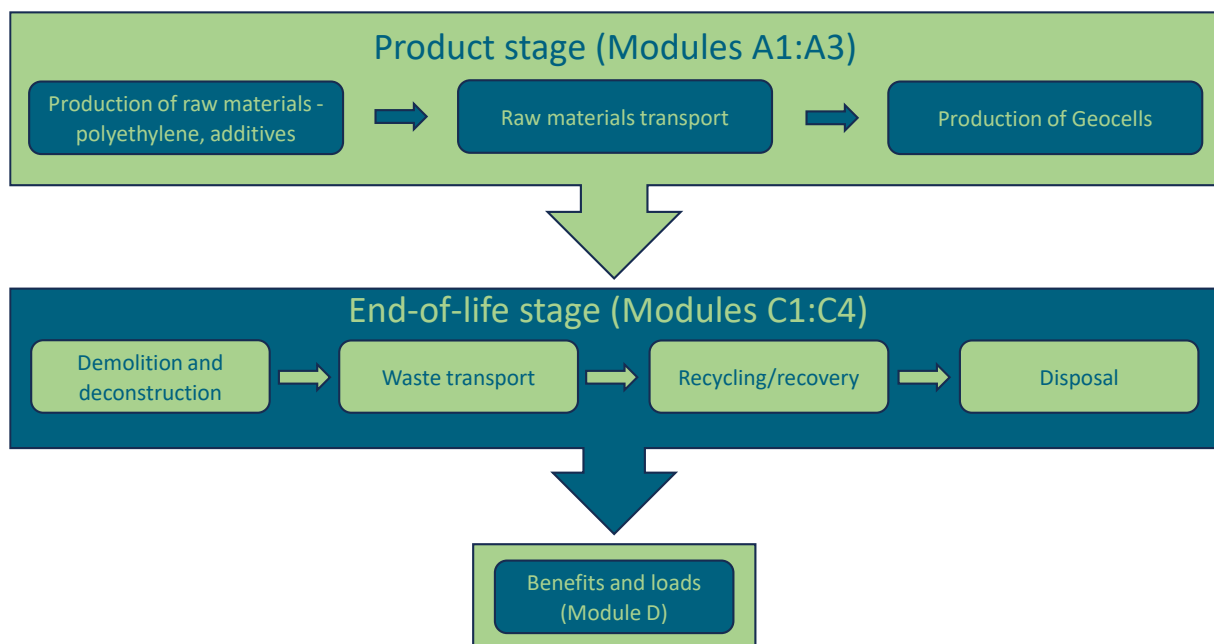
Database(s) and LCA software used:

SimaPro software, version 9.5.0 with Ecoinvent 3.9.1 database, EF 3.1 reference package

Description of system boundaries:

a) Cradle to gate with modules C1–C4 and module D (A1–A3 + C + D)

System diagram:



Description of the included modules:

Module A1 - RAW MATERIAL SUPPLY

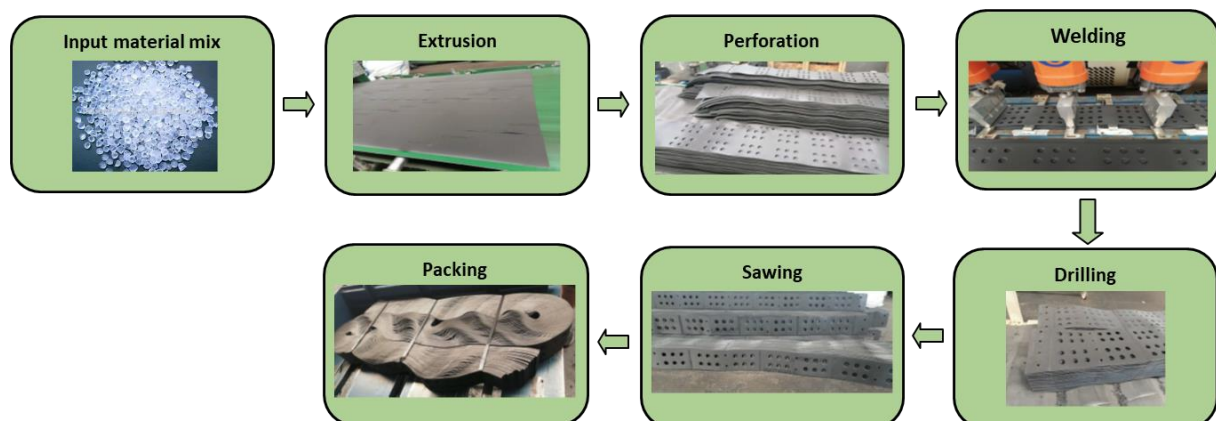
Raw material extraction and pre-treatments are included in this stage. The main input material is secondary polyethylene. Primary polyethylene, as well as is used in the production of the geocells, and its input vary depending on the geocell type. Minor additives like colouring substances are as well considered in the assessment.

Module A2 - RAW MATERIAL TRANSPORT

Raw material transport from supplier to manufacturer is included in the raw material supply stage. The distances and vehicle types were provided by the manufacturer. Raw material is supplied through trucks.

Module A3 – MANUFACTURING

The manufacturing process is represented principally by extrusion of polyethylene strips, consequent perforation and welding then finalizing by cutting and packing, as per the manufacturing diagram below:



Only electricity is used for the manufacturing of the geosynthetic geocells. The electricity consumption modelling is based on the residual mix for Bulgaria, provided in the AIB 2022 report as a data source. The environmental impact of the used electricity mix is 0.553 kgCO₂e/kWh. The details of the mix are as follows:

Renewable, unspecified	Biomass	Solar	Geothermal	Wind	Hydro	Nuclear	Fossil, unspecified	Hard coal	Lignite	Oil	Gas
0.01%	4.26%	3.44%	0.00%	2.98%	3.29%	36.65%	0.00%	44.30%	0.00%	0.85%	4.21%

All production waste is either sold for recycling or returned back in the production system, therefore an internal closed loop exists. Part of the post-industrial secondary raw material from geocells production is returned back to production and does not bear any impacts allocated to it (both when used for geocell production and when sold to external clients).

Module C1 - DECONSTRUCTION / DEMOLITION

For the studied product the deconstruction/demolition stage includes excavating of the product at its end-of-life. For this study it is assumed the impact a diesel hydraulic digging machinery is having for excavating 1 kg of declared unit.

Module C2 - WASTE TRANSPORT

Waste transport includes the transport of materials after they reach their end-of-life. For this study it is assumed an average distance of 50 km by truck from demolition site to a landfill.

Module C3 - WASTE PROCESSING

It is assumed that no processing and recovery of the product takes place after it reaches its end-of-life stage.

Module C4 – DISPOSAL

As per the data provided landfilling was selected as end-of-life disposal method.

Module D – BENEFITS AND LOADS

Module D represents the benefits of the recycling of the geocells. As no processing and recovery of the product takes place after it reaches its end-of-life stage, benefits and loads are assumed to be 0.

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

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules declared	X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	GLO	GLO	BG										GLO	GLO	GLO	GLO	GLO
Specific data used	>90%																
Variation – products	Geocells GGEUE: 12% Geocells GGEUB: -2% Geocells GGEUG: -13% Geocells GGEUS: 3%																
Variation – sites	0%																

Content information

Product components	Weight, kg	Post-consumer material, weight-%	Biogenic material, weight-% and kg C/kg
Polyethylene	9.6E-01	38.92%	0
Colour masterbatch additive	3.1E-02	0.00%	0
UV stabilizer additive	7.8E-03	0.00%	0
TOTAL	1.0E+00	0.00%	0
Packaging materials	Weight, kg	Weight-% (versus the product)	Weight biogenic carbon, kg C/kg
Plastic	1.7E-03	0.2%	0.0E+00
Wood (pallets)	0.0E+00	2.9%	1.4.E-02
TOTAL	1.7E-03	3.1%	1.4.E-02

No substances included in the Candidate List of Substances of Very High Concern for authorization under the REACH regulations are present in this product either above the threshold for registration with the European Chemicals Agency or above 0.1% (wt/wt).

Results of the environmental performance indicators

Mandatory impact category indicators according to EN 15804

Results per functional or declared unit ¹							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
GWP-fossil	kg CO ₂ eq.	1.71E+00	6.15E-04	9.24E-03	0.00E+00	2.86E-03	0.00E+00
GWP-biogenic ²	kg CO ₂ eq.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GWP-LULUC	kg CO ₂ eq.	7.99E-04	8.58E-08	4.56E-06	0.00E+00	3.40E-07	0.00E+00
GWP-total	kg CO ₂ eq.	1.71E+00	6.15E-04	9.24E-03	0.00E+00	2.86E-03	0.00E+00
ODP	kg CFC 11 eq.	1.68E-08	1.05E-11	2.01E-10	0.00E+00	4.31E-11	0.00E+00
AP	mol H ⁺ eq.	7.74E-03	5.55E-06	2.02E-05	0.00E+00	2.58E-05	0.00E+00
EP-freshwater	kg P eq.	4.27E-04	2.84E-08	6.57E-07	0.00E+00	1.45E-07	0.00E+00
EP-marine	kg N eq.	1.62E-03	2.55E-06	5.09E-06	0.00E+00	1.16E-05	0.00E+00
EP-terrestrial	mol N eq.	1.49E-02	2.78E-05	5.18E-05	0.00E+00	1.26E-04	0.00E+00
POCP	kg NMVOC eq.	6.06E-03	8.27E-06	3.13E-05	0.00E+00	3.79E-05	0.00E+00
ADP-minerals & metals ³	kg Sb eq.	6.81E-06	2.79E-10	3.02E-08	0.00E+00	1.03E-09	0.00E+00
ADP-fossil ³	MJ	4.66E+01	8.02E-03	1.31E-01	0.00E+00	3.66E-02	0.00E+00
WDP ³	m ³	1.06E+00	1.99E-05	5.41E-04	0.00E+00	8.16E-05	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						

¹Disclaimer: The use of the results for modules A1-A3 should not be used without considering the results of module C.

²Disclaimer: The GWP-biogenic indicator has negative value in modules A1-A3 due to the carbon content of the packaging materials. As module A5 is not declared, the emissions from end-of-life packaging are balanced out in modules A1-A3 thus resulting in a value of 0.

³Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.

Additional mandatory and voluntary impact category indicators

Results per functional or declared unit							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
GWP-GHG	kg CO ₂ eq.	1.60E+00	6.14E-04	9.19E-03	0.00E+00	2.84E-03	0.00E+00
PM	Disease incidence	7.19E-08	1.54E-10	6.88E-10	0.00E+00	7.07E-10	0.00E+00
IRP	kBq U235 eq.	3.31E-01	5.46E-06	1.78E-04	0.00E+00	1.86E-05	0.00E+00
ETP-fw	CTUe	5.09E+00	7.28E-03	1.27E-01	0.00E+00	3.39E-02	0.00E+00
HTP-c	CTUh	7.36E-10	2.99E-13	4.21E-12	0.00E+00	9.02E-13	0.00E+00
HTP-nc	CTUh	1.45E-08	1.55E-12	9.31E-11	0.00E+00	7.20E-12	0.00E+00
SQP	dimensionless (Pt)	9.63E+00	5.77E-04	7.93E-02	0.00E+00	4.37E-02	0.00E+00
Acronyms	PM - Particulate matter emissions; IRP - Ionizing radiation, human health; ETP-fw - Eco-toxicity – freshwater; HTP-c - Human toxicity, cancer effect; HTP-nc - Human toxicity, non-cancer effects; SQP - Land use related impacts/Soil quality						

Disclaimer: The GWP-GHG 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. IRP 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.

Resource use indicators

Results per functional or declared unit							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
PERE	MJ	7.19E-08	1.54E-10	6.88E-10	0.00E+00	7.07E-10	0.00E+00
PERM	MJ	3.31E-01	5.46E-06	1.78E-04	0.00E+00	1.86E-05	0.00E+00
PERT	MJ	5.09E+00	7.28E-03	1.27E-01	0.00E+00	3.39E-02	0.00E+00
PENRE	MJ	7.36E-10	2.99E-13	4.21E-12	0.00E+00	9.02E-13	0.00E+00
PENRM	MJ	1.45E-08	1.55E-12	9.31E-11	0.00E+00	7.20E-12	0.00E+00
PENRT	MJ	9.63E+00	5.77E-04	7.93E-02	0.00E+00	4.37E-02	0.00E+00
SM	kg	7.19E-08	1.54E-10	6.88E-10	0.00E+00	7.07E-10	0.00E+00
RSF	MJ	3.31E-01	5.46E-06	1.78E-04	0.00E+00	1.86E-05	0.00E+00
NRSF	MJ	5.09E+00	7.28E-03	1.27E-01	0.00E+00	3.39E-02	0.00E+00
FW	m ³	7.36E-10	2.99E-13	4.21E-12	0.00E+00	9.02E-13	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 re-sources; 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 functional or declared unit							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Hazardous waste disposed	kg	4.08E-05	5.34E-08	8.35E-07	0.00E+00	2.38E-07	0.00E+00
Non-hazardous waste disposed	kg	2.42E-01	1.72E-05	6.52E-03	0.00E+00	9.99E-01	0.00E+00
Radioactive waste disposed	kg	8.08E-05	1.30E-09	4.31E-08	0.00E+00	4.32E-09	0.00E+00

Output flow indicators

Results per functional or 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	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	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

Disclaimer: 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.

References

General Programme Instructions of the International EPD® System. Version 4.0.

EN 15804:2012+A2:2019 - Sustainability of construction works - Environmental Product Declarations – Core rules for the product category of construction products

ISO 14025 - DIN EN ISO 14025:2009-11: Environmental labels and declarations - Type III environmental declarations — Principles and procedures

ISO 14040/44 - DIN EN ISO 14040:2006-10, Environmental management - Life cycle assessment - Principles and framework (ISO14040:2006) and Requirements and guidelines (ISO 14044:2006)

ISO 14020:2022 - Environmental statements and programmes for products - Principles and general requirements

PCR 2019:14 Construction products (EN 15804:A2) (1.3.3) prepared by IVL Swedish Environmental Research Institute, EPD International Secretariat




The International EPD® System/ The International EPD® System is a programme for type III environmental declarations, maintaining a system to verify and register EPD® s as well as keeping a library of EPD® s and PCRs in accordance with ISO 14025. www.environdec.com

Ecoinvent database - Ecoinvent Centre, www.ecoinvent.org

SimaPro - SimaPro LCA Software, PRé Consultants, the Netherlands, www.pre-sustainability.com



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