ENVIRONMENTAL PRODUCT DECLARATION

as per /ISO 14025/ and /EN 15804/

Owner of the Declaration	SaarGummi Construction Deutschland GmbH
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
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Butyl waterproofing membrane NovoProof® FAI

SaarGummi Construction Deutschland GmbH

Institut Bauen und Umwelt e.V.

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ECO PLATFORM EPD EN 15804 VERIFIED

1. General Information

SaarGummi Construction Deutschland GmbH

Programme holder
IBU - Institut Bauen und Umwelt e.V.
Panoramastr. 1
10178 Berlin
Germany

Declaration number
EPD-DUR-20170092-IBD1-EN

This Declaration is based on the Product Category Rules:
Plastic and elastomer roofing and sealing sheet systems, 07.2014
(PCR tested and approved by the SVR)

Issue date
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Valid to
10.09.2022

Prof. Dr.-Ing. Horst J. Bossenmayer
(President of Institut Bauen und Umwelt e.V.)

Dr. Burkhart Lehmann
(Managing Director IBU)

EPDM waterproofing membrane NovoProof® FAI

Owner of the Declaration
SaarGummi Construction Deutschland GmbH
Eisenbahnstraße 24
66687 Wadern-Büschfeld
Germany

Declared product / Declared unit
The declared unit is one (1) square metre (m²) average FAI waterproofing membrane for interior applications. Membrane thicknesses of 0.75, 1.0, 1.3 and 1.5 mm are taken into consideration for forming averages. The waterproofing membrane comprises:
- the actual waterproofing membrane
- adhesive for fastening
- packaging materials

The average was established from the weights relating to volumes of the variants produced.

Scope:
This EPD refers to the entire life cycle of an average FAI SaarGummi Construction Deutschland waterproofing membrane. The various technical characteristics are depicted in section 2.3.

The products are manufactured at the SaarGummi Construction Deutschland production facility in Wadern-Büschfeld, Germany.
This document is translated from the German Environmental Product Declaration into English. It is based on the German original version EPD-DUR-20170092-IBD1-DE. The verifier has no influence on the quality of the translation.

The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

Verification

The CEN Norm /EN 15804/ serves as the core PCR
Independent verification of the declaration according to /ISO 14025/
☐ internally ☒ externally

Juliane Franze
(Independent verifier appointed by SVR)

2. Product

2.1 Product description / Product definition

NovoProof® waterproofing systems comprise fully cross-linked elastomer sheets based on butyl (IIR).

The NovoProof® family comprises numerous variants. The following variants are considered here:

NovoProof® FAI
Homogeneous butyl waterproofing sheet

Averaging is based on the corresponding production volumes for the 2014 calendar year.

Directive (EU) No. 305/2011 (CPR) applies for placing the product on the market in the EU/EFTA. The product requires a Declaration of Performance taking consideration of
- DIN EN 13859-2:2014 Flexible sheets for waterproofing – Definitions and characteristics of underlays – Part 2: Underlays for walls;
- and CE marking.

Use is governed by the respective national regulations.

2.2 Application

NovoProof® FAI is used for establishing permanently resilient, airtight and vapour-tight waterproofing of window connections and facade joints. The sheet is adhered to the internal wall and/or window.

2.3 Technical Data

- The product's performance values correspond with the Declaration of Performance in terms of its essential properties in accordance with DIN EN 13859-2:2014 Flexible sheets for waterproofing - Definitions and characteristics of underlays - Part 2: Underlays for walls.

NovoProof® FAI
Constructional data

Name	Value	Unit
Peel resistance of the seam joint	n.a.	N/50mm
Seam strength to EN 12317-2 (roofing membranes)	n.a.	-
Artificial ageing to EN 1297 (roof membranes)	passed	-
Dimensional stability to EN 1107-2 (roof membranes)	≤ 0.5	%
Folding at low temperatures to EN 1109	-30	°C
Exposure to bitumen to EN 1548 (roofing membranes)	n.a.	-
Resistance to root penetration (for green roofs) to EN 13948 and FLL (roofing membranes)	n.a.	-
Ozone resistance (for EPDM/IIR) to EN 1844 (roof membranes)	n.a.	-
Tensile strain performance to EN 12311-2 (roof membranes)	≥ 400	%
Resistance to impact to EN 12691	n.a.	mm
Shear resistance of the seam joint to EN 12317-2 (roof membranes)	n.a.	N/50mm
Tear propagation resistance to EN 12310-2 (roof membranes)	≥ 80	N
Waterproof to EN 1928 A (roof membranes)	W1	-
Tensile strength to EN 12311-1	≥ 170	N/50mm
Air permeability of building components and building elements to EN 12114	≤ 0.1	m³/(m²xhx 50Pa)

N.a. values can be queried from the Manufacturer.

2.4 Delivery status

NovoProof® waterproofing membranes are wound on cardboard rolls and wrapped in black protective foil for delivery ex works. A separating foil is also in place for non-backed products. Density corresponds with 1250 kg/m³.
Butyl waterproofing membranes are available in the following strengths:
0.75, 1.0, 1.3, 1.5 mm.

2.5 Base materials / Ancillary materials

NovoProof® FAI is based on an EPDM / butyl rubber mixture. It contains the following percentages of various materials (excl. packaging):

Material	FAI
Polymer	25-30%
Carbon black	30-40%
Oil	19-25%
Filler	10-15%
Processing and crosslinking auxiliaries	5-8%

2.6 Manufacture

The production of rubber compound as a material for manufacturing butyl waterproofing membranes is based on a formula which specifies the quality and quantity of raw materials used.
The manufacturing process in Wadern-Büschfeld is a classic batch process. The requisite raw materials are portioned in accordance with the formula calculator into automatic weighing machines and conveyed to an internal mixer using suitable conveying equipment. The mixing process results in a homogenous rubber compound.
During production, quality characteristics such as strength, elasticity, hardness, density and rheometer curve are tested on all finished compounds.
The rubber compound is then processed on a roller-head plant.
The continuous production process commences with extrusion, whereby the material achieves the desired thickness (0.6 - 2.5 mm) and width (max. 1400 mm) using a wide extrusion die and calender. The uncured sheet is run through embossing rolls where the letters "IIR" are embossed on the butyl waterproofing membranes.
Another stage of the process involves curing the sheets in a continuous hot air channel (cross-linking). Curing is followed by the sheets achieving room temperature over a cooling conveyor zone and winding onto rolls. If necessary, the sheets can be pre-assembled.
Development and manufacturing are in line with the requirements of the quality management system according to /DIN EN ISO 9001:2008/.
The quality of the finished products is regularly assured in the form of factory production control and external quality Monitoring.

2.7 Environment and health during manufacturing

In addition to general occupational safety measures for commercial operations, preventive measures are also offered and implemented.
The company is certified to the Environment Management system in accordance with /DIN EN ISO 14001/.

2.8 Product processing/Installation

NovoProof® sheets enable permanently airtight, waterproof and vapour-tight window connections and facade joints displaying the requisite permanent resilience in accordance with /DIN 4108/ and RAL quality guidelines.
All installation systems must be carried out in accordance with the corresponding standards and guidelines as well as the installation specifications and manufacturers' instructions.

2.9 Packaging

The butyl waterproofing membranes are wound on cardboard/plastic rolls and wrapped in black protective foil. A separating foil is also wound on unlaminated NovoProof® FAI waterproofing membranes.

The packed rolls are delivered ex works in boxes or on wooden pallets.
The packaging materials are recyclable and re-usable

2.10 Condition of use
Professionally processed butyl waterproofing membranes are practically maintenance-free. Over the period of use, NovoProof® FAI remain resilient and functional.

2.11 Environment and health during use
During the period of use, butyl waterproofing membranes do not have
any negative influence on the environment or user health.

2.12 Reference service life
The roofing membrane variants service life is indicated in the BBSR tables “Useful life of components for life cycle assessments in accordance with the Sustainable Building assessment system (BNB)”: 40 years.

2.13 Extraordinary effects

Fire
Fire performance in accordance with /EN ISO 11925-2/ and /DIN EN 13501-1/ leads to classification of the roofing membranes in class E.

Fire protection

Name	Value
Building material class	E
Burning droplets	-
Smoke gas development	-

Water
When used as designated, the declared butyl waterproofing membranes are insoluble in water and resistant to exposure to water. Water tightness has been tested in accordance with /DIN EN 1928/.

Mechanical destruction
No environmental hazards are anticipated on mechanical destruction of NovoProof® butyl waterproofing Membranes.

2.14 Re-use phase
NovoProof® butyl waterproofing membranes are de-constructed once the use phase has expired. Thermal utilisation is possible. Energy contained in the declared products can be recovered by incineration in waste incineration plants. Material utilisation is also possible. Adhesive and fleece residue is inevitable for butyl waterproofing membranes. After thorough cleaning, material recycling can take the form of crushing and separation.

2.15 Disposal
The waste key codes in accordance with the European Waste Catalogue and the List of Wastes Directive /AVV/ are listed below for the individual product components.

Packaging
Packaging waste incurred during installation in the building is disposed of in line with the following waste codes:

- /EWC 15 01 01/ Paper and cardboard packaging
- /EWC 15 01 02/ Plastic packaging
- /EWC 15 01 03/ Wooden packaging

End of Life
Waterproofing membrane residue can be disposed of as mixed construction site waste and rubble under waste code /AVV 17 09 04/. As a general rule, material recycling should take preference over energetic utilisation (incineration).

2.16 Further information
Our contact data is available on the back of this Declaration. Further information on NovoProof® butyl is available for downloading (www.novoproof.de).

3. LCA: Calculation rules

3.1 Declared Unit
The declared unit is 1 m² adhered NovoProof® waterproofing membrane FAI, including packaging and fastening materials (adhesive).

Declared unit

Name	Value	Unit
Declared unit	1	m^2
Basis weight (roll)	1.15	kg/m²
Basis weight (overlapping)	1.20	kg/m²
Securing materials	0.10	kg/m²
Conversion factor to 1 kg	0.77	-
Packaging	0.05	kg/m²
Total	1.35	kg/m²
Sealing type	Sealing with rubber-based adhesive	-

3.2 System boundary
Type of EPD: Cradle to gate – with options

Modules A1-A3
The manufacturing stage involves production of the requisite raw materials including all of the upstream chains as well as the requisite procurement transport. Production of the declared unit also considered the requisite electrical and thermal energy as well as auxiliaries and consumables, including their upstream chains. Waste and waste water incurred are considered until full disposal thereof.

Module A4
This module considers the ecological impact of transporting the declared unit from the plant gate to the construction site.

Module A5
The environmental impacts incurred during the disposal of product packaging materials were taken into consideration here. Efforts associated with installation are also considered.

Modules C2-3
These modules include the environmental impacts of waste treatment at the end of life and the associated

transports. In scenario 1, the efforts associated with processing are modelled while scenario 2 involves the efforts associated with incineration of the waterproofing membranes.

Module D
The value streams arising from waste treatment (from A5 and C3) which can in turn serve as energetic (incineration with energy recovery, scenario 2) or material input (recycling, scenario 1) for a downstream product system are indicated as credits here.

3.3 Estimates and assumptions

- A5: 1% cuttings are assumed during installation of the waterproofing membrane at the construction site. 5% overlapping is also assumed during installation of the roofing membranes.

A theoretical recycling route was modelled for recycling the waterproofing membranes:

- C3-1: On account of the non-reusable materials in the waterproofing membranes, 70% is recovered as EPDM by means of recycling after deducting losses in the regranulation process and collection of the waterproofing membranes on the construction site.

- D1: The recyclate is subject to a further depreciation accounting for 20% in line with the prices of fresh goods and recyclate on the commodity exchange (€1/kg for fresh goods, €0.8/kg for recyclate).

3.4 Cut-off criteria
The manufacture of machinery, plants and other infrastructure required for production as well as secondary and tertiary packaging was not taken into consideration in the LCAs. All other material and energy flows were analysed. Accordingly, the model displays a very high degree of integrity; no specific cut-off criteria were applied.

3.5 Background data
The latest version 6 of the /GaBi 6/ software system for comprehensive analysis (“GaBi”) was applied. All background data sets were taken from various GaBi data bases and the /ecoinvent/ data base (version 2.2). For Modules A1-A3, German (production processes in Germany) data sets were used where possible; distribution transports (A4) and disposal processes (A5, C Modules) availed of the corresponding European data sets.

3.6 Data quality
The overall data quality is regarded as good. The background data from the GaBi data bases used for the analysis largely concerns the reference year 2013; data used from the ecoinvent data base originates from the period 1995 to 2005. Accordingly, some data is older than 10 years but still applies as the most suitable data available for modelling the product system under review. These individual data sets account for less than 1% and together account for less than 5% (in terms of mass). The cut-off criteria would, therefore, apply. However, as they are incorporated, they represent a conservative analysis. Furthermore, these low percentages mean that there is no risk of obsolete data having a significant influence on the overall result. The data on the products under review was recorded using analyses of internal production and environmental data, and LCA-relevant data within the supplier chain. The data recorded has been examined for plausibility and consistency with the result that good representativity can be assumed.

3.7 Period under review
The material input and output flows were recorded on the basis of the corresponding production volumes. The energetic input and output flows were taken into consideration using the corresponding overall quantities from 2011. According to the manufacturer, there have been no changes since then with the result that these energy requirements can also be assumed for 2014.

3.8 Allocation
The energy required by production was allocated to individual products on the basis of consumption measurements.
The credits from Modules A5 and C3-1 are indicated in Module D-1 while credits from Modules A5 and C3-2 can be seen in Module D-2.

3.9 Comparability
Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to /EN 15804/ and the building context, respectively the product-specific characteristics of performance, are taken into account.
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4. LCA: Scenarios and additional technical information

This section outlines the scenarios considered in accordance with life cycles A1-3 in this Life Cycle Assessment.

Transport to the building site (A4)

Name	Value	Unit
Litres of fuel	0.003	l/100km
Transport distance	470	km
Capacity utilisation (including empty runs)	85	%
Gross density of products transported	1250	kg/m³
Volume capacity factor	100	%

Installation into the building (A5)

Name	Value	Unit
Ancillary material (for securing the waterproofing membrane)	0.1	kg
Water consumption	0	m^3
Other resources	0	kg
Electricity consumption	0	kWh
Other energy carriers	0	MJ
Output materials following waste treatment on the building site	0	kg
Dust in the air	n.a.	kg
VOC in the air	n.a.	kg

Transport distance to waste treatment plant	75	kg
Capacity utilisation (including empty runs)	85	%
Material loss during installation	1	%
Overlapping	5.3	%

End of life (C2-C3)

Two different scenarios were calculated for modelling the *EoL* which, although both represent a 100% route, also permit proportional calculation (e.g. Scenario 1 = 30% / Scenario 2 = 70%). This is of interest in order to calculate the individual possibilities offered by the disposal routes currently available on the market, i.e. in line with a real situation. Even if product disposal is currently largely by means of thermal utilisation, recycling options are meanwhile available which permit a 100% recycling route.

Data sets were used which represent a European average.

Name	Value	Unit
Collected as mixed construction waste	1.25	kg
Reuse	0	kg
Landfilling	0	kg
For energy recovery C3-2	1.25	kg
For recycling C3-1	1.25	kg
Transport distance C2	250	km
Truck capacity utilisation (incl. empty runs)	85	%

5. LCA: Results

The following tables depict the results of the indicators concerning the estimated impact, use of resources as well as waste and other output flows in relation to 1 m² roofing membrane installed.
C3-1 and D1 represent the impacts of the recycling scenario, C3-2 and D2 describe thermal utilisation of the roofing membranes at the end of the use Phase.

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	MND	MND	MNR	MNR	MNR	MND	MND	MND	X	X	MND	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 m² average waterproofing membrane (FAI) incl. packaging and securing materials

Parameter	Unit	A1-A3	A4	A5	C2	C3/1	C3/2	D/1	D/2
GWP	[kg CO_2-Eq.]	3.71E+0	2.68E-2	6.95E-1	1.62E-2	8.62E-3	2.59E+0	-2.22E+0	-1.50E+0
ODP	[kg CFC11-Eq.]	2.49E-7	1.23E-13	1.10E-8	7.45E-14	6.12E-12	5.56E-10	-2.59E-11	-6.72E-13
AP	[kg SO_2-Eq.]	8.37E-3	1.17E-4	9.53E-4	1.01E-4	2.40E-5	1.98E-4	-2.79E-3	-1.02E-3
EP	[kg $(PO_4)^{3-}$-Eq.]	9.42E-4	2.86E-5	1.05E-4	2.54E-5	2.15E-6	4.34E-5	-3.35E-4	-1.52E-4
POCP	[kg ethene-Eq.]	9.11E-4	-3.99E-5	1.70E-4	-4.25E-5	1.65E-6	2.26E-5	-4.85E-4	-1.91E-4
ADPE	[kg Sb-Eq.]	1.25E-5	1.78E-9	5.80E-7	1.08E-9	2.81E-9	-1.84E-8	-1.61E-6	-6.99E-8
ADPF	[MJ]	8.52E+1	3.69E-1	1.37E+1	2.23E-1	9.34E-2	6.43E-1	-6.02E+1	-2.44E+1

Caption	GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources

RESULTS OF THE LCA - RESOURCE USE: 1 m² average waterproofing membrane (FAI) incl. packaging and securing materials

Parameter	Unit	A1-A3	A4	A5	C2	C3/1	C3/2	D/1	D/2
PERE	[MJ]	7.18E+0	2.10E-2	5.23E-1	1.27E-2	4.21E-2	6.29E-2	-1.86E+0	-5.72E-2
PERM	[MJ]	8.45E-2	0.00E+0	-9.70E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PERT	[MJ]	7.26E+0	2.10E-2	4.26E-1	1.27E-2	4.21E-2	6.29E-2	-1.86E+0	-5.72E-2
PENRE	[MJ]	4.99E+1	3.70E-1	1.59E+1	2.24E-1	2.72E+1	7.21E-1	-3.43E+1	-2.44E+1
PENRM	[MJ]	4.01E+1	0.00E+0	-1.77E+0	0.00E+0	-2.70E+1	-2.70E+1	-2.70E+1	0.00E+0
PENRT	[MJ]	9.00E+1	3.70E-1	1.41E+1	2.24E-1	1.50E-1	7.21E-1	-6.13E+1	-2.44E+1
SM	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.99E-1	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
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
FW	[m^3]	4.73E-1	5.25E-5	2.06E-2	3.18E-5	6.49E-5	6.54E-3	-7.19E-3	-8.00E-4

Caption	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

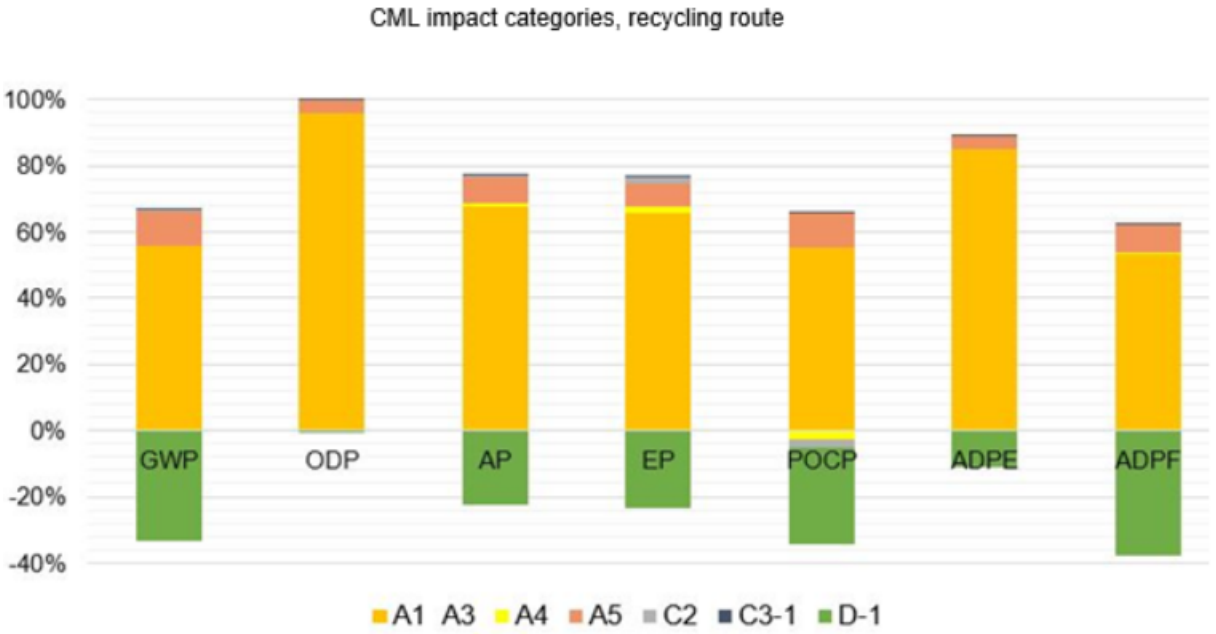
RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: 1 m² average waterproofing membrane (FAI) incl. packaging and securing materials

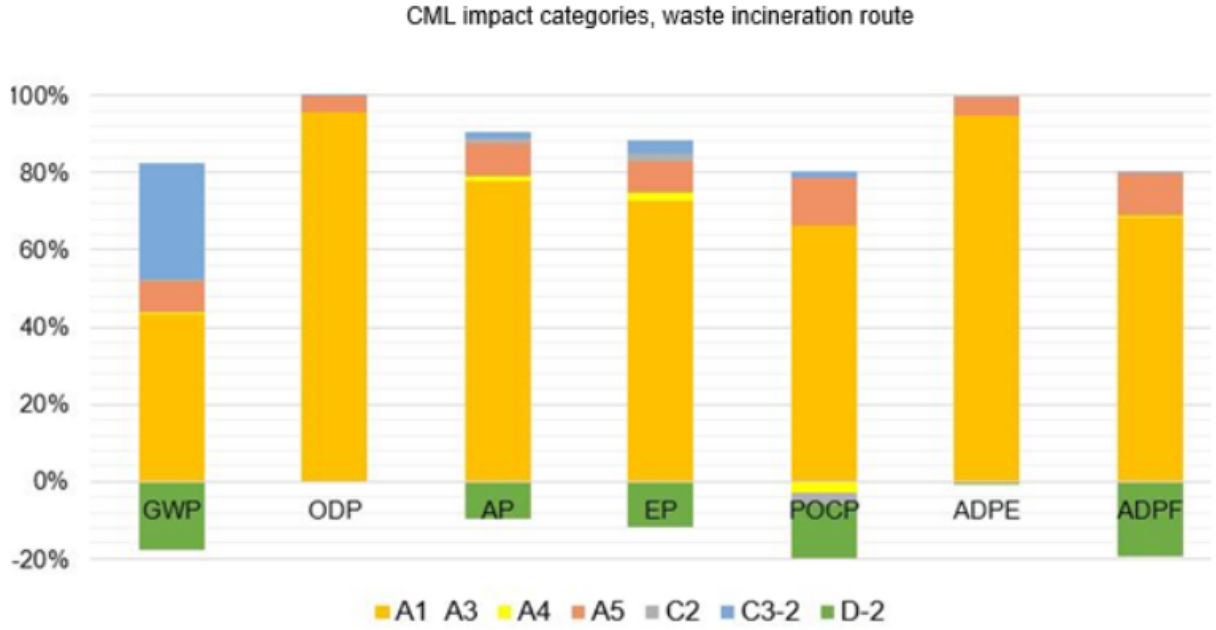
Parameter	Unit	A1-A3	A4	A5	C2	C3/1	C3/2	D/1	D/2
HWD	[kg]	1.87E-7	2.80E-8	7.67E-9	1.70E-8	9.54E-11	5.09E-9	-2.97E-7	-4.36E-9
NHWD	[kg]	2.62E-2	3.11E-5	3.93E-3	1.88E-5	9.07E-5	5.65E-6	-2.47E-2	-2.63E-3
RWD	[kg]	1.69E-3	5.29E-7	1.60E-4	3.21E-7	2.27E-5	9.62E-8	-4.43E-4	-1.31E-5
CRU	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MFR	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.19E+0	0.00E+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
EEE	[MJ]	0.00E+0	0.00E+0	2.94E-1	0.00E+0	0.00E+0	4.59E+0	0.00E+0	0.00E+0
EET	[MJ]	0.00E+0	0.00E+0	6.76E-1	0.00E+0	0.00E+0	1.11E+1	0.00E+0	0.00E+0

Caption	HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EEE = Exported thermal energy

6. LCA: Interpretation

Dominance analysis





Module A1-A3 has a dominant influence on all environmental impacts.

GWP
The manufacturing phase (**Module A1-A3**) contributes around 55% (waste incineration route, more than 80% for recycling) to the overall **Global Warming Potential (GWP)**. The manufactured EPDM compound, carbon black and electricity generation account for the greatest share of overall emissions in the module, i.e. 30%, 26% and 21%, respectively, whereby the role played by packaging is negligible.
Transport to the customer (**A4**) as well as disposal transports (**C2**) are of minor environmental relevance in this analysis. Installation of the product at the construction site (**A5**) makes a minor, yet noticeable, contribution of approx. 10% on account of the rubber-based adhesive and plastic securing plates.
Likewise, recycling the product at the *EoL* implies hardly any environmental impacts (**C3-1**) while the emissions associated with the incineration plants (**C3-2**) make a significantly high contribution to the overall results (approx. 37%). This is caused by incineration of the carbon which is bound beforehand.
Module D has a very minor influence on ODP and ADPE in both the recycling and waste incineration scenarios. In the other environmental categories, the values for potentials and loads avoided outside the system boundary account for between 10 and 25% in the waste incineration route and for 25 to more than 50% in the recycling route.

7. Requisite evidence

No evidence is required.

8. References

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Product Category Rules for Building Products, Part A: Institut Bauen und Umwelt e.V., Königswinter (pub.): Product Category Rules for Construction Products from the range of Environmental Product Declarations of Institut Bauen und Umwelt (IBU), Part A: Calculation rules for the Life Cycle Assessment and requirements on the Background Report, 2016-03

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