ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A2*

Owner of the Declaration	**Sika Services AG**
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-SIK-20220221-IBA1-EN
Issue date	25.11.2022
Valid to	24.11.2027

Sikaplan VGWT

Sika Services AG

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1. General Information

Sika Services AG	Sikaplan VGWT
Programme holder IBU – Institut Bauen und Umwelt e.V. Hegelplatz 1 10117 Berlin Germany	**Owner of the declaration** Sika Services AG Tüffenwies 16 8048 Zürich Switzerland
Declaration number EPD-SIK-20220221-IBA1-EN	**Declared product / declared unit** 1 m² Sikaplan VGWT polymeric waterproofing membrane
This declaration is based on the product category rules: Plastic and elastomer roofing and sealing sheet systems, 07.2022 (PCR checked and approved by the SVR)	**Scope:** This document applies to Sikaplan VGWT polymeric waterproofing membrane manufactured by Sika Manufacturing AG in Duedingen, Switzerland. The life cycle assessment data are based on production data from 2021 collected by Sika Services AG.
Issue date 25.11.2022	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. The EPD was created according to the specifications of *EN 15804+A2*. In the following, the standard will be simplified as *EN 15804*.
Valid to 24.11.2027	**Verification** The standard *EN 15804* serves as the core PCR Independent verification of the declaration and data according to *ISO 14025:2011* ☐ internally ☒ externally
 Dipl. Ing. Hans Peters (chairman of Institut Bauen und Umwelt e.V.)	 Mrs Kim Allbury (Independent verifier)
 Dr. Alexander Röder (Managing Director Institut Bauen und Umwelt e.V.))	

2. Product

2.1 Product description/Product definition

Sikaplan VGWT is a multi-layer synthetic roof waterproofing sheet based on polyvinyl chloride (PVC) with embedded polyester scrim reinforcing (DE/E1 PVC-P-NB-V-PG).
Sikaplan VGWT waterproofing sheets are available in these thicknesses: 1.2 mm, 1.5 mm and 1.8 mm.

All values given in the LCIA results section apply to Sikaplan VGWT-12; a formula for individually calculating values for other thicknesses is given in Chapter 5.

Placement of the product on the market in the European Union/European Free Trade Association (EU/EFTA) (except for Switzerland) is subject to Regulation (EU) *No. 305/2011* (CPR). The product requires a Declaration of Performance in accordance with the harmonised standard EN *13956:2012* “Flexible sheets for waterproofing” and the CE marking. Application is subject to the regulations of each specific country; in Germany the application standard *DIN SPEC 20000-201*.

2.2 Application

Sikaplan VGWT waterproofing sheets are used mainly for waterproofing flat roofs. The sheets can be loosely laid and mechanically fastened to roofs with any slope.

2.3 Technical Data

In the following table, only technical data relevant to Sikaplan VGWT waterproofing sheets are given.

Technical data

Name	Value	Unit
Watertightness as per EN 1928	Passed	
Tensile strain performance as per EN 12311-2	≥ 15	%
Peel resistance of the seam joint as per EN 12316-2	Passed	-
Shear resistance of the seam joint as per EN 12317-2	≥ 600	N/50mm
Artificial ageing as per EN 1297	Passed (> 5000 h)	-
Dimensional stability as per EN 1107-2	≤ |0.5|	%
Folding in the cold as per EN 495-5	≤ -30	°C

Performance data of the product in accordance with the declaration of performance with respect to its essential characteristics according to *EN 13956:2012*, Flexible sheets for waterproofing.

2.4 Delivery status

The products are delivered palletised: 20 m x 2 m or 20 m x 1.54 m, each 21 rolls per pallet.

2.5 Base materials/Ancillary materials

The base materials and ancillary materials of Sikaplan VGWT polymeric waterproofing membrane are:

- Polyvinyl chloride / PVC: 50 - 70%
- Plasticiser (Phthalate): 34 - 40%
- Stabiliser (UV/Heat): 0 - 2%
- Fire retardant (inorganic): 2 - 4%
- Carrier (Polyester scrim): 1 - 3%
- Pigments: 0 - 8%

This product contains substances listed in the Candidate List of Substances of Very High Concern for Authorisation (SVHC) (date: 04.07.2022) exceeding 0.1 percentage by mass: no

2.6 Manufacture

Sikaplan VGWT polymeric waterproofing sheets are manufactured in the following steps:

- Dosing of the various raw materials and plastification of the mixture in an extruder
- Rolling the melt into sheets by calendar processing
- Cooling and reeling the sheets
- Heat fusing of two sheets (top and bottom layers), embedding a polyester mesh, on a lamination machine
- Trimming the sheets and winding them onto cardboard spools made of recycled paper
- Wrapping the rolls in PE stretch film, palletising

Production waste such as scrap is recycled by feeding it directly back into the manufacturing process.
Sika maintains a quality management system certified in accordance with *ISO 9001*.

2.7 Environment and health during manufacturing

In the production of Sikaplan VGWT polymeric waterproofing membrane, the regulatory standards for exhaust gasses, waste water and solid waste as well as for noise emissions are fully met and the various limits are not exceeded. The health of production personnel is not put at risk during production.
Waste gasses from the production process are collected and filtered in exhaust gas scrubbers.
Water used is used exclusively for cooling and does not come into contact with the polymeric waterproofing membrane. There are no hazardous goods according to the *REACH* listing.

In addition to national requirements, there are Sika strategic goals for waste, energy and water reduction, as well as for zero personal accidents at work. There are regular meetings with the neighbourhood for feedback regarding, e.g. noise. Employees receive regular training for process standards, and for safety and hazards.
Sika maintains an environmental management system certified in accordance with *ISO 14001*.

2.8 Product processing/Installation

Sikaplan VGWT polymeric waterproofing sheets are loose laid with mechanical fastening for unballasted roofs with any slope. Seams between sheets are hot-air welded; linear fastening is recommended.

In principle, the current product data sheet should be consulted. Please request further information from your local Sika organisation.

2.9 Packaging

The rolls of polymeric waterproofing sheets are wrapped in PE stretch foil and shipped on pallets. The cardboard spools are made of recycled paper. The packaging materials can be sorted and collected for recycling.

2.10 Condition of use

Professionally installed and properly used, the condition of Sikaplan VGWT polymeric waterproofing membrane remains unchanged throughout its service life. This was confirmed in 2005 by the internal study *Radar.* Additionally, it was confirmed in the study by the *British Board of Agrément (BBA*).

2.11 Environment and health during use

During their service life, Sikaplan VGWT synthetic waterproofing sheets have no negative influence on the environment and health of users.

2.12 Reference service life

The reference service life of Sikaplan VGWT synthetic waterproofing sheets is at least 35 years.

The *British Board of Agrément (BBA*) certified Sikaplan VGWT to “under normal service conditions (…) provide a durable roof waterproofing with a service life in excess of 35 years”

This conclusion reflects the high resistance to weathering and aging of the product when properly used.

2.13 Extraordinary effects

Fire

Sikaplan VGWT polymeric waterproofing membrane is classified in Construction Material Class E, as defined by *EN 13501-1.*

Fire protection

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

Water

No environmental impact due to water exposure of the installed Sikaplan VGWT polymeric waterproofing membrane is known.

Mechanical destruction
Sikaplan VGWT polymeric waterproofing membrane possesses good mechanical strength and is highly robust. No environmental impact is known to result from unexpected mechanical damage.

2.14 Re-use phase
At the end of the service life or when roofing sheets must be replaced, Sikaplan VGWT waterproofing sheets can be selectively removed and recycled. This allows for a closed-loop material cycle.

Sika Services AG is affiliated with Roofcollect, the recycling system for polymeric roofing and waterproofing membranes. This enables increasingly more material recovery from sorted polymeric waterproofing membranes.

2.15 Disposal
Sikaplan VGWT polymeric waterproofing sheets can be recycled at the end of the use stage.
The sheets are completely recycled by Roofcollect in numerous recycling systems and new products are manufactured from the recovered material.
Sikaplan VGWT polymeric waterproofing membrane can be classified under Waste Code 170904 as defined by the *European Waste Catalogue*.

2.16 Further information
More information about the company and its products is available on the internet at **www.sika.com**.
Detailed information on the polymeric waterproofing membranes is available at your local Sika organisation's website.

3. LCA: Calculation rules

3.1 Declared Unit
This declaration applies to 1 m^2 of Sikaplan VGWT polymeric waterproofing membrane, thickness 1.2 mm. A formula is given for an independent calculation of the values for other thicknesses.

Declared unit

Name	Value	Unit
Declared unit	1	m^2
Grammage	1.5	kg/m^2
Type of sealing	Hot-air weld	-
Layer thickness	0.0012	m

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

The system boundaries of the EPD follow the modular construction system described by *EN 15804+A2*. The LCA takes into account the following modules:

- A1-A3: Manufacturing of pre-products, packaging, ancillary materials, transport to the factory, production including energy supply and waste handling
- A4: Transport to the building site
- A5: Installation into the building (welding energy, disposal of packaging
- C1: Deconstruction and demolition
- C2/1: Transport to the recycling facility
- C2/2: Transport to the incineration facility
- C3/1: Waste processing for recycling
- C3/2: Waste incineration
- C4: Disposal
- D: Potential for reuse, recovery and/or recycling as net flows and benefits

3.3 Estimates and assumptions
Various stabilisers were approximated with a general chemical dataset or proxies were built. The percentage by mass is < 3 %.
The membrane is assumed to be removed by hand at the end of life, so no inputs/outputs are considered.

3.4 Cut-off criteria
All data were taken into account (recipe constituents, thermal energy used, electricity used). Transport expenses were considered for all inputs and outputs. The manufacturing of the production machines and systems and associated infrastructure was not taken into account in the LCA. Additionally, inputs (solvents, lubricant oils) needed for maintenance of the production line, lighting, hygiene related water use, transportation of employees were considered negligible and excluded from the analysis.

3.5 Background data
The primary data provided by Sika derive from the plant at Duedingen, Switzerland. The underlying data were collected in the databases of *GaBi software* (version CUP2022.1) and *ecoinvent Version 3.8*. The Swiss Electrical Energy Mix was applied.

3.6 Data quality
To simulate the product stage, data recorded by Sika from the production year 2021 were used. All other relevant background datasets were taken from generic data not older than 10 years, using as many as datasets possible for raw materials and processes with technological and geographical representativeness.

3.7 Period under review
The period under review is the year 2021.

3.8 Allocation
Production waste that was reclaimed and reused internally has been modelled as closed-loop recycling in Modules A1-A3.
Regarding the recycling of the polymeric waterproofingsheets, the amount of recyclable membrane was treated as a corresponding PVC benefit. Benefits for the disposal of packaging (incineration), scrap and roofing membrane are credited in Module D; this also applies to the reuse of wooden pallets.

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.

4. LCA: Scenarios and additional technical information

Characteristic product properties
Information on biogenic carbon

Information on describing the biogenic Carbon Content at factory gate

Name	Value	Unit
Biogenic Carbon Content in product	-	kg C
Biogenic Carbon Content in accompanying packaging	0.066	kg C

The following technical information serves as a basis for the declared modules or can be used for the development of specific scenarios in the context of a building assessment.

Transport to the building site (A4)

Name	Value	Unit
Litres of fuel (truck)	0.004	l/100km
Transport distance (truck)	1600	km
Gross density of products transported	1250	kg/m^3
Transport distance (boat)	160	km
Litres of fuel (boat)	0.0008	l/100km

Installation into the building (A5)

Name	Value	Unit
Electricity consumption	0.016	kWh
Material loss (membrane)	2	%
Overlaps (membrane)	8	%

Reference service life

Name	Value	Unit
Reference service life	35	a

The *British Board of Agrément (BBA)* certified Sikaplan VGWT to provide a durable roof waterproofing with a service life in excess of 35 years.

End of life (C1-C4)

Name	Value	Unit
Recycling Scenario 1	100	%
Transport to recycling (boat)	160	km
Transport to recycling (truck)	1240	
Recycling Scenario 2	100	%
Transport to incineration (truck)	500	

Reuse, recovery and/or recycling potentials (D), relevant scenario information

The benefits from the incineration of waste produced during installation are credited in Module D as avoided generation of electricity and thermal energy, since in modern incineration plants the energy of combustion is used to produce power and thermal energy. The membrane material recycled at the end-of-life is credited as avoided production of PVC, while the partial reuse of pallets from packaging is also included in Module D as avoided production of new pallets.

5. LCA: Results

The results displayed below apply to Sikaplan VGWT-12. To calculate results for other thicknesses, please use this formula:

$I_x = ((x+0.58)/1.78) * I_{1.2}$

[I_x = the unknown parameter value for Sikaplan VGWT products with a thickness of "x" mm (e.g. 1.5 mm)]

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; ND = MODULE OR INDICATOR NOT DECLARED; MNR = MODULE NOT RELEVANT)

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	ND	ND	MNR	MNR	MNR	ND	ND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 m2 membrane

Core Indicator	Unit	A1-A3	A4	A5	C1	C2/1	C2/2	C3/1	C3/2	C4	D/1	D/2
GWP-total	[kg CO_2-Eq.]	4.17E+0	5.49E-2	6.90E-1	0.00E+0	1.95E-2	6.40E-3	2.34E-1	4.23E+0	0.00E+0	-2.85E+0	-1.20E+0
GWP-fossil	[kg CO_2-Eq.]	4.35E+0	5.48E-2	5.38E-1	0.00E+0	2.56E-2	8.86E-3	2.30E-1	4.23E+0	0.00E+0	-2.82E+0	-1.19E+0
GWP-biogenic	[kg CO_2-Eq.]	-2.51E-1	5.04E-5	1.45E-1	0.00E+0	-6.95E-3	-2.80E-3	3.69E-3	3.33E-3	0.00E+0	-2.29E-2	-9.52E-3
GWP-luluc	[kg CO_2-Eq.]	6.33E-2	7.24E-5	6.35E-3	0.00E+0	8.46E-4	3.41E-4	2.65E-5	3.26E-4	0.00E+0	-1.71E-3	-2.30E-4
ODP	[kg CFC11-Eq.]	4.56E-9	4.79E-15	4.57E-10	0.00E+0	9.30E-15	3.67E-15	1.65E-12	4.04E-12	0.00E+0	-2.00E-10	-1.40E-11
AP	[mol H^+-Eq.]	4.59E-2	1.37E-3	4.80E-3	0.00E+0	2.27E-4	3.62E-5	1.83E-4	1.09E-3	0.00E+0	-3.96E-3	-1.23E-3
EP-freshwater	[kg P-Eq.]	3.14E-5	4.78E-8	3.19E-6	0.00E+0	4.54E-7	1.83E-7	3.39E-7	1.03E-6	0.00E+0	-6.36E-6	-2.86E-6
EP-marine	[kg N-Eq.]	2.06E-3	3.50E-4	2.63E-4	0.00E+0	5.24E-5	7.10E-6	6.68E-5	3.63E-4	0.00E+0	-1.26E-3	-4.39E-4
EP-terrestrial	[mol N-Eq.]	2.13E-2	3.84E-3	2.78E-3	0.00E+0	6.16E-4	9.46E-5	7.24E-4	4.51E-3	0.00E+0	-1.39E-2	-4.66E-3
POCP	[kg NMVOC-Eq.]	1.35E-2	9.82E-4	1.50E-3	0.00E+0	1.68E-4	2.82E-5	1.62E-4	1.04E-3	0.00E+0	-6.99E-3	-1.13E-3
ADPE	[kg Sb-Eq.]	9.82E+1	6.85E-1	1.02E+1	0.00E+0	2.07E+0	8.18E-1	9.99E-1	7.48E+0	0.00E+0	-6.86E+1	-1.69E+1
ADPF	[MJ]	6.25E-2	3.29E-9	6.25E-3	0.00E+0	1.28E-8	5.12E-9	3.47E-8	9.89E-8	0.00E+0	-5.55E-7	-3.24E-7
WDP	[m^3 world-Eq deprived]	3.59E-1	1.40E-4	6.32E-2	0.00E+0	1.37E-3	5.49E-4	1.45E-2	3.25E-1	0.00E+0	-1.09E-1	-1.62E-2

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; WDP = Water (user) deprivation potential

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 m2 membrane

Indicator	Unit	A1-A3	A4	A5	C1	C2/1	C2/2	C3/1	C3/2	C4	D/1	D/2
PERE	[MJ]	1.22E+1	1.69E-2	1.78E-1	0.00E+0	1.15E-1	4.65E-2	7.68E-1	1.99E+0	0.00E+0	-8.94E+0	-6.53E+0
PERM	[MJ]	1.75E+0	0.00E+0	-3.34E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PERT	[MJ]	1.39E+1	1.69E-2	1.45E-1	0.00E+0	1.15E-1	4.65E-2	7.68E-1	1.99E+0	0.00E+0	-8.94E+0	-6.53E+0
PENRE	[MJ]	5.86E+1	6.86E-1	7.69E+0	0.00E+0	2.08E+0	8.20E-1	4.26E+1	4.91E+1	0.00E+0	-6.86E+1	-1.70E+1
PENRM	[MJ]	4.05E+1	0.00E+0	7.69E-1	0.00E+0	0.00E+0	0.00E+0	-4.16E+1	-4.16E+1	0.00E+0	0.00E+0	0.00E+0
PENRT	[MJ]	9.91E+1	6.86E-1	8.46E+0	0.00E+0	2.08E+0	8.20E-1	1.00E+0	7.49E+0	0.00E+0	-6.86E+1	-1.70E+1
SM	[kg]	5.45E-2	0.00E+0	5.45E-3	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-1.54E+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	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	0.00E+0	0.00E+0
FW	[m^3]	2.55E-2	1.59E-5	3.24E-3	0.00E+0	1.31E-4	5.26E-5	6.07E-4	8.47E-3	0.00E+0	-1.18E-2	-2.67E-3

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 – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 m2 membrane

Indicator	Unit	A1-A3	A4	A5	C1	C2/1	C2/2	C3/1	C3/2	C4	D/1	D/2
HWD	[kg]	7.75E-7	2.94E-12	7.76E-8	0.00E+0	9.91E-12	3.93E-12	1.04E-10	5.81E-10	0.00E+0	-1.43E-6	-2.83E-9
NHWD	[kg]	2.15E-1	8.11E-5	7.19E-2	0.00E+0	2.95E-4	1.17E-4	1.49E-2	2.58E+0	0.00E+0	-3.30E-2	-1.06E-2
RWD	[kg]	2.14E-3	7.47E-7	2.41E-4	0.00E+0	2.55E-6	1.01E-6	8.60E-5	2.36E-4	0.00E+0	-1.32E-3	-7.21E-4
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	0.00E+0	0.00E+0
MFR	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.54E+0	0.00E+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	0.00E+0	0.00E+0	0.00E+0
EEE	[MJ]	0.00E+0	0.00E+0	3.49E-1	0.00E+0	0.00E+0	0.00E+0	1.14E-1	4.23E+0	0.00E+0	0.00E+0	0.00E+0
EET	[MJ]	0.00E+0	0.00E+0	6.29E-1	0.00E+0	0.00E+0	0.00E+0	2.13E-1	7.72E+0	0.00E+0	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; EET = Exported thermal energy

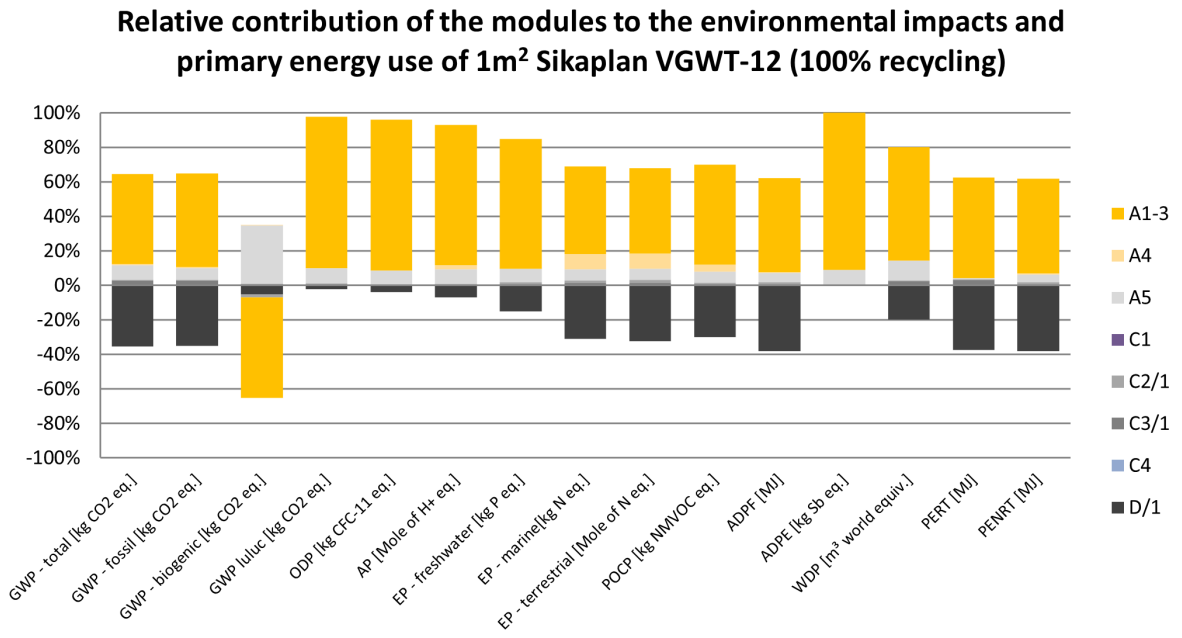
RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1 m2 membrane

Indicator	Unit	A1-A3	A4	A5	C1	C2/1	C2/2	C3/1	C3/2	C4	D/1	D/2
PM	[Disease Incidence]	4.72E+1	5.01E-1	4.97E+0	0.00E+0	1.44E+0	5.68E-1	3.99E-1	6.29E+0	0.00E+0	-3.47E+1	-3.25E+0
IRP	[kBq U235-Eq.]	1.95E-9	9.55E-12	2.03E-10	0.00E+0	2.89E-11	1.14E-11	1.60E-11	2.50E-10	0.00E+0	-9.64E-10	-1.87E-10
ETP-fw	[CTUe]	3.52E-7	4.57E-10	3.58E-8	0.00E+0	1.47E-9	5.83E-10	7.40E-10	2.67E-8	0.00E+0	-3.68E-8	-8.29E-9
HTP-c	[CTUh]	2.65E+1	8.18E-2	2.76E+0	0.00E+0	6.98E-1	2.81E-1	5.26E-1	1.72E+0	0.00E+0	-6.57E+0	-4.43E+0
HTP-nc	[CTUh]	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	0.00E+0	0.00E+0
SQP	[-]	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	0.00E+0	0.00E+0

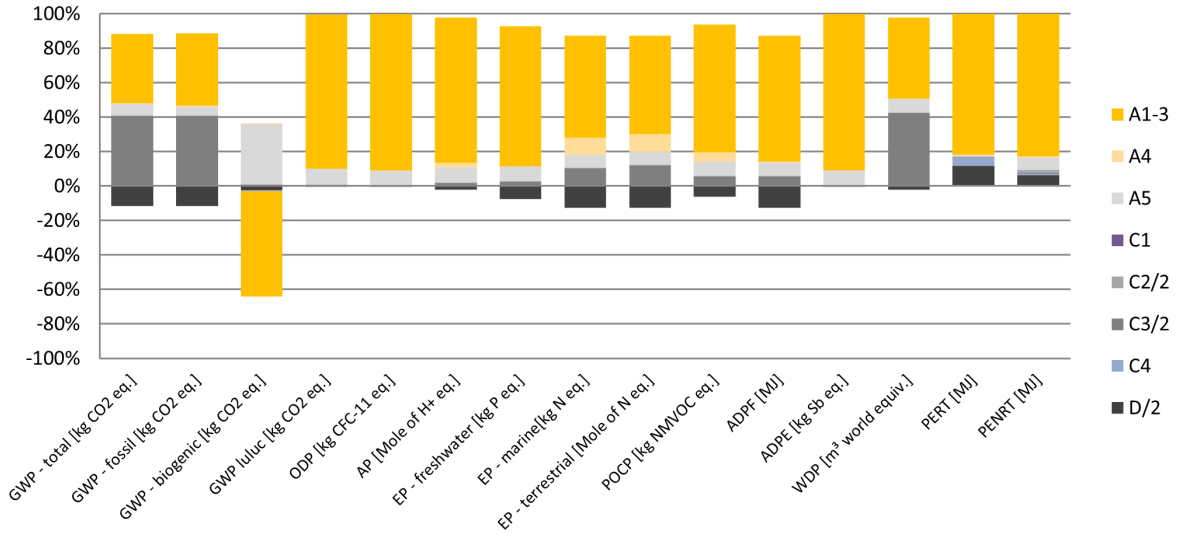
Caption	PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index

6. LCA: Interpretation

The following chart shows the relative contributions of the different modules to the various LCA categories and to primary energy use in a dominance analysis.



Relative contribution of the modules to the environmental impacts and primary energy use of 1m² Sikaplan VGWT-12 (100% incineration)



Examining the results for Sikaplan® VGWT, it can be concluded that the most significant contributor to the impact categories is the product stage (Module A1-A3). This is true for all impact categories except GWP (total and fossil), where greenhouse gas emissions from the incineration of the membrane in Module C3 of Scenario 2 (100% Incineration) contribute to the results from this impact category. The modules A1-A3 are further investigated in the following paragraphs.

Indicators of the inventory analysis:
Due to electricity and natural gas use, the production process (16%), pre-product manufacturing (67%) and packaging (16%) account for most of the use of renewable primary energy resources (**PERT**). The manufacturing of polymers and plasticisers in the production stage has the greatest impact (96%) on the use of non-renewable primary energy resources (**PENRT**), while the impact of the production process (energy) is 3%.

Indicators of the impact assessment:
Examining the results for module A1-3 in further detail, the raw materials involved in the production of Sikaplan® VGWT represent greater than 86 % across each of the different impact categories. The exceptions are GWP - biogenic, ODP, EP - freshwater and PERT. For GWP - biogenic, 12% of the impacts arise from the formulation and 87% of the impacts arise from the packaging. For ODP, 26% of the impacts arise from the formulation and 63% of the impacts arise from the packaging. For EP - freshwater, 66% of the impacts arise from the formulation and 29% of the impacts arise from the packaging. For PERT, 67% of the impacts arise from the formulation and 16% of the impacts arise from the packaging.

Within pre-product manufacturing, polymers play an important role regarding GWP-total and GWP-fossil (38%), EP freshwater, marine and terrestrial (31 - 39%), WDP (21%) and ADPF (41%). Plasticisers significantly influence GWP (33%), EP (21%), POCP (33%), WDP (32%) and ADPF (38%). Flame retardants affect the AP (88%), ADPE (100%), POCP (22%) and WDP (55%), and stabilisers affect the GWP-biogenic at highest contribution (100%), GWP-luluc (96%), ODP (89%) and EP-freshwater (55%). Pigments and fillers make a low contribution to the impacts (below 7%). In addition, the carrier material contributes mostly to GWP-total and GWP-fossil (15%), EP freshwater, marine and terrestrial (12 - 14 %) and ADPF (13%). The raw materials with the greatest overall effect on the impacts also show the greatest percentage by mass of the waterproofing membrane: polymers and plasticisers. The manufacturing process (due to electricity use) contributes the most to ODP (11%), WDP (7%) and GWP-total (4%).

7. Requisite evidence

No requisite evidence is required for Sikaplan VGWT polymeric waterproofing membrane.

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