ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804

Owner of the Declaration	alwitra GmbH & Co. Klaus Göbel
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-ALW-20140020-IBA1-EN
Issue date	06.05.2014
Valid to	05.05.2020

EVALON[®] V loose laid under ballast or mechanically fastened **alwitra GmbH & Co. Klaus Göbel**



www.bau-umwelt.com / https://epd-online.com

<image>



1. General Information

alwitra GmbH & Co. Klaus Göbel Programme holder IBU - Institut Bauen und Umwelt e.V.

Panoramastr. 1 10178 Berlin Germany

Declaration number

EPD-ALW-20140020-IBA1-EN

This Declaration is based on the Product Category Rules:

Plastic and elastomer roofing and sealing sheet systems, 07-2012

(PCR tested and approved by the independent expert committee)

Issue date

6 May 2014

Valid to

5 May 2020

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

MAMM

Dr.-Ing. Burkhart Lehmannt (Managing Director IBU)

2. Product

2.1 Product description

This EPD contains a description of bitumen compatible EVAC - ethylene vinyl acetate copolymer - (EVA in Germany) roofing and waterproofing membrane systems. The declared products consist of a high polymer alloy of EVA terpolymer and PVC including additives. The roofing and waterproofing membranes are manufactured with a polyester fleece backing in a calandering process. The herein declared product EVALON® V (with polyester fleece backing) is also the basis for the multifunctional roofing membranes EVALON[®] Solar. In this case, on their upper side additional photovoltaic (PV) modules are factoryintegrated to be connected via factory-mounted waterproof connection boxes and cables on the underside. The PV modules do not constitute part of this EPD.

Seam welding is carried out with hot air or solvent welding agent.

2.2 Application

The intended use of the declared product is as follows: **Roof waterproofing**

Single-ply waterproofing of non-used and used flat and low slope roofs. Depending on specification, the membranes are applied as follows:

EVALON[®]V

Owner of the Declaration

alwitra GmbH & Co. Klaus Göbel Am Forst 1 54296 Trier Germany

Declared product / Declared unit

1 m² of manufactured roofing and waterproofing membrane $\text{EVALON}^{\$}\,\text{V}$

Scope:

EVALON[®] V roofing and waterproofing membranes from alwitra GmbH & Co. Klaus Göbel are produced in 54411 Hermeskeil, Germany. 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 x externally

Matthias Schulz (Independent tester appointed by SVA)

- loose laid under ballast (e. g. gravel, tiles, vegetation)
- mechanically fastened or

- bonded Waterproofing of foundations

Single-ply waterproofing of non-waterproof foundations or constructional parts against ground moisture and non-pressing water. Depending on specification, the membranes can be applied as follows: - loose laid under ballast

- bonded

When applying, the manufacturer installation instructions must be adhered to.

2.3 Technical Data

 $\mathsf{EVALON}^{\texttt{®}}$ V roofing and waterproofing membrane Constructional data

Name	Value	Unit
Max. tensile force acc. to EN 12311-2 (A)	500	N/50mm
Elongation at max. tensile force acc. to EN 12311-2 (A)	60	%
Peel resistance of the seam joint acc. to EN 12316-2	150	N/50mm
Shear resistance of the seam joint acc. to EN12317-2	400	N/50mm



Tear propagation resistance acc. to EN 12310-1	300	Ν
Resistance to static load acc. to EN 12730 (B)	20	kg
Water tightness acc. to EN 1928	400	kPa
Artificial ageing acc. to EN 1297	class 0	-
Folding in the cold acc. to EN 495-5	-30	°C
Bitumen compatibility acc. to EN 1548	passed	-
Resistance to root penetration (for green roofs) acc. to EN 13948 or FLL (roofing membranes)	passed	-

2.4 Placing on the market / Application rules

For the placing on the market in the EU/EFTA Regulation (EU) No. 305/2011 of 9 March 2011 shall apply. A Declaration of Performance for the products is available, taking into account /EN 13956:2012 -Flexible sheets for waterproofing - Plastic and rubber sheets for roof waterproofing - Definitions and characteristics/ or EN 13967:2012 Flexible sheets for waterproofing - Plastic and rubber damp proof sheets including plastic and rubber basement tanking sheet -Definitions and characteristics, as well as CE marking.

For application, the corresponding national regulations shall apply; in Germany, application standard DIN V 20000-201 or DIN V 20000-202 shall apply.

Roofing membranes according to EN 13956:2012 and application standard DIN V 20000-201 description/marking: *e. g.* DE/E1 EVA-BV-K-PV 1,5 (*e. g.* EVALON[®] V)

Waterproofing membranes according to EN 13967: 2012 and application standard DIN V 20000-202 description/marking: *e. g.* BA EVA-BV-K-PV 1,5 FPC (Factory Production Control) Certificate No.: 1343 - BPR - 06-1432

2.5 Delivery status

Standard sizes (length x width x thickness) 25 m x 2.05/1.55/1.05/0.79/0.54 m x 1.5 mm (thickness without backing) or 25 m x 2.05/1.55/1.05/0.79/0.54 m x 1.2 mm (thickness without backing)

2.6 Base materials / Ancillary materials

EVALON[®] roofing and waterproofing membranes consist of (25 - 50%) ethylene vinyl acetate terpolymer - EVA; (25 - 40%) polyvinyl chloride PVC; (10 - 15%) mineral fire proofing; (1 - 2%) Ca/Zn stabiliser; (3 - 6%) epoxidised soybean oil; (5 - 10%) carbon black and additives; (0 - 12%) titanium dioxide; (0 - 25%) pigments - depending on colour; backing.

2.7 Manufacture

The basic materials and the pre-products (except the backing and the self-adhesive coating) are pre-mixed in a mixing machine and subsequently plastified in an extruder together with the other formulation ingredients. The plastics composition as an intermediate is fed over a mixing mill into a calander, where it is rolled out into a homogeneous roofing or waterproofing membrane; (depending on the membrane type) an underside backing layer is applied. The finished membrane is cooled down over special chill rolls and subsequently cut to its final size and fabricated into rolls. All unbacked production residues (cut-off edge strips) are recycled, *i. e.* directly refed into the production process.

Manufacture is subject to the established Quality Management System according to ISO 9001 (Certificate No. 01 100 5463). The Certification Body is TÜV Rheinland, Cert GmbH.

Further external quality controls are carried out by the Staatliche Materialprüfungsanstalt Darmstadt, Germany, as well as the BBA (British Board of Agrément) und FM (Factory Mutual Approvals).

2.8 Environment and health during manufacturing

Compliance with the national and system-specific environmental protection requirements during the manufacturing process is guaranteed. Besides, dust emitted while emptying big bags containing powder pre-products (*e. g.* EVA and PVC) is collected in filters and partially re-used. Emissions produced in the calander do not exceed the limits stipulated in the Technical Instructions on Air Pollution Control (TA Luft) and are released to the environment without any filtering.

Manufacture is also subject to the established Environmental Management System according to ISO 14001 and the Energy Management System according to ISO 50001.

2.9 Product processing/Installation

Due to their thermoplastic properties EVALON[®] V roofing and waterproofing membranes are easy to handle and to process. Usually, the overlap welding is carried out with hot air (warm gas). On the roof, no specific health protection measures for staff are required.

When joining the seam with solvent-welding agent, the following must be observed:

- avoid skin and eye contact,
- wear gloves,
- no smoking, no open fire, avoid sparking,
- do not inhale vapours, use only outdoors or in well ventilated spaces.

Homogeneous seam welding is advantageous for a permanent waterproof functionality of the parts/membranes to be connected.

When applying, the pertinent standards and guidelines as well as the Technical Rules of the German Roofing Trade Association - (Instructions for Flat Roofs) - and the installation instructions and manufacturer information must be adhered to.

 $EVALON^{\ensuremath{\mathbb{B}}}$ V roofing and waterproofing membranes are applied with mechanical fastening and also loose laid under ballast, *e. g.* gravel or paving slabs, and under vegetation layers. Also in the area of waterproofing of foundations according to DIN 18195-5.

Loose laying under ballast

(Advantage: unproblematic removal of sorted material)

The membranes are rolled out on a suitable substrate (clean, even, solid, on a protection layer, if required), aligned and welded in the overlap. Example: green roofs The declared product is used for green roofs as a

waterproofing and, at the same time, as a protection against root penetration, as a corresponding certificate



is available (resistant to root/rhizome penetration according to FLL testing - also without application of biocides).

Mechanical fastening

(Advantage: unproblematic removal of sorted material) The membranes are rolled out on a suitable substrate (clean, even, solid, on a protection layer, if required), aligned and usually fastened with approved fastening systems on the supporting structure according to the manufacturer's specification. Usually, the fastening is carried out in the membrane overlap (seam area). After installation of the fasteners, seam overlaps are welded for waterproofing. Fastening can also be carried out outside the seam overlap These fastenings must then be waterproofed according to the system. With mechanical fastening of the roofing membranes, the complete roof build-up is fixed (incl. thermal insulation, vapour control layer etc.).

Usage of system adhesives and processing aids

The handling instructions and information on container labels and Safety Data Sheets for adhesives and processing aids such as solvent-welding agent, primer or solvent-containing adhesives must be followed, *e. g.*

- ensure proper ventilation at the workplace
- keep away ignition sources no smoking

• using skin protection lotion for preventive skin protection is recommended.

2.10 Packaging

The packing materials used made of wood, paper/cardboard, polyethylene (PE foil) and PP strapping are recyclable.

If sorted, collection is carried out by INTERSEROH (INTERSEROH certificate 25288). Upon request of the sites, INTERSEROH collects the packing materials at the sites of waste generation in containers taking into account legal requirements.

- strapping: PP
- returnable / non-returnable pallets, wood
- boxes, cardboard/paper
- plastic foil (polyethylene foils (LDPE) recyclable)

2.11 Condition of use

Due to the material composition, for the usage period of the declared products no toxic substances (fungicides/biocides) for the elimination of pest biota (fungi, plants, bacteria) or special root control additives (*e. g.* when used as root-resistant waterproofing) are used in the declared products.

2.12 Environment and health during use

There is no evidence of any possible emission of substances during the service life of any type of $EVALON^{\$}$ membranes.

2.13 Reference service life

The declared roofing and waterproofing membranes have been in use for more than 35 years - exposed to standard load and professionally installed. If applied in accordance with the intended use in compliance with the generally accepted engineering standards, the declared product can reach a service life of 35 years and more.

If professionally applied under an ecological protection/wearing layer (*e. g.* green roof) this service life can be still extended.

The in-use conditions will be significantly enhanced when installed with alwitra system parts, as the system parts used in the waterproofing such as rainwater outlets, vents, coated metal sheets or rooflights are flashed against the declared membranes in a homogeneous, waterproof connection. As for adjacent constructional elements, additional system parts, *e. g.* roof edge trim and wall connection profiles complement the product system If the waterproofing consists of the declared products,

it will not be necessary to remove it in case of restoration/refurbishment. In fact, the old waterproofing usually can serve as a substrate for the new refurbishment layer.

Influences on ageing when applied in accordance with the rules of technology.

2.14 Extraordinary effects

Fire

EVALON[®] V

Name	Value
Building material class - reaction to fire EN	class E /
11925-2 / EN 13501	passed
Burning droplets	-
External fire performance ENV 1187 / EN 13501-5	B roof (t1) and (t3) passed
Smoke gas development	-

The test results for B roof (t1) and (t3) are valid for the roof build-ups tested by alwitra

Water

The substances of the sealing layer used for EVALON[®] membranes are not water-soluble.

Mechanical destruction

In case of an unexpected mechanical destruction of EVALON[®] membranes no adverse environmental impacts have been reported.

2.15 Re-use phase

EVALON[®] membranes are not re-used in their original form after their service life. If sorted, EVALON[®] membranes can be collected by the "ROOFCOLLECT" system (recycling system for synthetic roofing and waterproofing membranes). The recycled materials gained from the old roofing membranes can be reintroduced into the cycle of materials, *e. g.* usage in inspection walkway tiles. These inspection walkway tiles are used to protect the waterproofing and to mark the maintenance walkways on flat roofs. The textured surface provides a strong grip, even on sloped and wet areas.

At the end of service life thermal utilisation is also possible. The energy contained in the declared products is recovered, thus saving on additional backup firing in the waste incineration plant. The energy of 1 kg EVA roofing and waterproofing membrane (*e. g.* EVALON[®] V with polyester fleece backing) equals the energy of approx. 0.57 litres of fuel oil.

2.16 Disposal

If possible, recycling of the declared products, or at least their thermal utilisation, should be used as a way of disposal. See also 2.15.



Roofing and waterproofing membranes or residues thereof can be classified as AVV No. 170904 or No. 200139.

2.17 Further information

For further information on EVALON[®] V, *e. g.* brochures, Declaration of Performance, installation instructions, see the alwitra web page (www.alwitra.de).

3. LCA: Calculation rules

3.1 Declared Unit

The declared unit is 1 m² of installed EVALON[®] roofing and waterproofing membrane system.

Declared unit

Name	Value	Unit
Declared unit	1	m ²
Grammage	2	kg/m ²
Type of sealing	thermal welding or solvent welding	-
Conversion factor to 1 kg	0.5	-
Thickness (without backing)	1.5	mm

3.2 System boundary

In addition to the life cycle stages of the product manufacture (cradle to gate), this life cycle assessment also addresses further options as listed below:

- extraction and supply of raw materials (A1)
- transport of basic materials (A2)
- backing, if applicable (A1)
- membrane manufacture (A3)

- membrane packaging (including transport of the packing materials and end of life)

- transport to site (A4)

- installation on site (fixing with adhesives and seam welding) (A5)

- end of life of the membranes (incl. transport) – recycling and thermal utilisation (module C2, C3 and D)

3.3 Estimates and assumptions

Scenarios have been designed for the respective modules. Unless otherwise indicated, estimates of these scenarios have been provided by alwitra GmbH & Co. for calculation purposes.

Module A4: Transport to site, (on average 361 km), Module A5: Transport distance and quantities of packing materials (50 km)

Module C2: Transport after removal from the roof for scenario C2 360 km classified as "worst case" (C2/1 50 km to waste incineration plant and C2/2 737 km to EoL recycling)

Module C3: In scenario 1 100% thermal utilisation and in scenario 2 100% recycling of the membranes after removal from the roof (current percentage of scenario 1: 70% of the overall quantity, percentage of scenario 2: 30% of the overall quantity)

Module D: In the case of thermal utilisation of old roofing membranes power and steam is generated. Credits for these two energy flows have been indicated by the German data sets "DE: Electricity Mix PE" and "DE: Process Steam from Natural Gas PE". Recycling is to be understood as the manufacture of inspection walkway tiles.

3.4 Cut-off criteria

In the LCA, all collected operational data, *i. e.* all raw materials used according to the formulation, the thermal energy used as well as the power and the water consumption, have been taken into account.

Transportation expenditures for all inputs and outputs have been considered. Thus, according to PCR Part A also material and energy flows with a percentage of less than 1 percent of the total mass of the product have been taken into account.

3.5 Background data

The primary data has been provided by the company alwitra GmbH & Co. Klaus Göbel. The background data has been taken from the data base of the GaBi software of PE INTERNATIONAL (/GaBil 6 2013B/). The German electricity mix has been applied. The last revision of the used data has been carried out less than 3 years ago.

3.6 Data quality

The used data originates from the data collection performed by the manufacturer. In addition to the primary data on the manufacture of roofing and waterproofing membranes at alwitra GmbH & Co. Klaus Göbel, necessary background data on the used basic materials has been specifically modelled or taken from the GaBi database.

Production data of the manufacturer has been measured or calculated (power consumption, thermal energy, amounts of basic materials used); transport distances, however, have been partly estimated. For modelling the product stage of synthetic roofing membranes, the data collected by alwitra during the production year 2012 for the different membrane types have been used. All other relevant background data sets have been taken from the GaBi 6 software database, which are less than 6 years old. The representativeness can be rated very good. For the basic material of zinc borate, data sets had to be modelled.

3.7 Period under review

The data base of this LCA refers to data collected in 2012. The quantities used of raw materials, energy as well as auxiliary and operating materials are taken into account as average values from 12 months of production at the production plant in Hermeskeil, Germany.

3.8 Allocation

In modules A1-A3, internally re-used production residues (edge strips cut off during production) are modelled as closed-loop recycling. Within the defined system boundaries, in the manufacturing process production data for the product was determined with respect to the overall produced area. During production no further by-products occur. In case of thermal utilisation in a waste incineration plant, depending on the specific input and considering the elementary composition as well as the calorific value credits for electricity and thermal energy from

value, credits for electricity and thermal energy from module A5 and C3 are taken into account in module D. Considering the locations of the production sites, the processes credited refer to the territory of Germany. In Module D there is also a credit for the recycling of the roofing membranes.



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

The following technical information provides the basis for the declared modules or can be used for the design of specific scenarios within the context of a building assessment, if modules are not declared (MND).

Transportation to site (A4)

Name	Value	Unit
Litres of fuel	0.0015	l/100km
Transport distance	361	km
Capacity utilisation (including empty runs)	85	%
Gross density of products transported	1.333	kg/m ³
Capacity utilisation volume factor	100	-

Integration into the building (A5)

Name	Value	Unit
Auxiliary material solvent-welding agent	0.0008	kg
Electricity consumption	0.012	kWh
VOC in the air	0.0008	kg
Loss of material (due to overlaps)	5	%
	-	

Reference service life

Name	Value	Unit
Reference service life depending on the local conditions and in combination with a maintenance service contract	approx. 35	а

End of life (C1-C4)

Name	Value	Unit
Recycling (in scenario 2)	2.1	kg
Energy recovery (in scenario 1)	2.1	kg



5. LCA: Results

Following, the resulting indicators of the life cycle impact assessment, of the resource input as well as of residues and other output flows for 1 m² of roofing and waterproofing membrane are displayed.

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PER PER PENF PENF PENF SM RSF	E	[MJ] [MJ] [MJ] [MJ] [MJ] [MJ] [MJ] [MJ]	1.47E+ 0.0E+(1.47E+ 1.05E+ 5.22E+ 1.57E+ 0.0E+(0.0E+(0.0E+(-1 0 -1 -2 -1 -1 -2 -1 -2 -1 -2 -0 0 0 0 0	2.64E-2 2.64E-2 4.45E-7 4.45E-7 - - 4.45E-7 - - 0.0E+0 0.0E+0	2 1 1 1)	7.62E-1 - 7.62E-1 8.18E+0 - 8.18E+0 - 0.0E+0 0.0E+0)	2.64E-2 - 2.64E-2 4.45E-1 - 4.45E-1 - 0.0E+0 0.0E+0		1.73E-1 - 1.73E-1 2.05E+0 - 2.05E+0 - 0.0E+0 0.0E+0		.5E+0 - .5E+0 .4E+1 - .4E+1 - .0E+0 .0E+0	-3.1 -3.1 -3.1 -3.1 -3.1 -3.1 -3.1 -3.1	64E+0 - 64E+0 92E+1 - 92E+1 - - 0E+0 0E+0	-6.6E+0 - 		
PER PER PENF PENF PENF SM RSF	E	[MJ] [MJ] [MJ] [MJ] [MJ] [MJ] [MJ] [MJ]	1.47E+ 0.0E+(1.47E+ 1.05E+ 5.22E+ 1.57E+ 0.0E+(0.0E+(0.0E+(9.52E-	-1 0 -1 -2 -1 -2 0 0 0 0 2 -2 -2 -2 -2 -2 -2 -2 -2 -2	2.64E-2 - 2.64E-2 4.45E- - 4.45E- - - 0.0E+0 0.0E+0 2.54E-	2 1 1 1 1 0 0 5	7.62E-1 - 7.62E-1 8.18E+0 - 8.18E+0 - 0.0E+0 0.0E+0 5.26E-3)	2.64E-2 - 2.64E-2 4.45E-1 - 4.45E-1 - 0.0E+0 0.0E+0 2.54E-5		1.73E-1 - 1.73E-1 2.05E+0 - 2.05E+0 - 0.0E+0 9.46E-3	22 22 11 1 00 00 00	.5E+0 - .5E+0 .4E+1 - .4E+1 - .0E+0 .0E+0 .0E+0 3.7E-3	-3.0 -3.0 -3.9 -3.9 -3.9 -3.9 -3.9 -3.9 -3.9 -3.9	64E+0 - 64E+0 92E+1 - 92E+1 - 0E+0 0E+0 68E-3	-6.6E+0 - -7.4E+1 - -7.4E+1 - - 0.0E+0 0.0E+0 0.0E+0 -4.9E-2		
PER PER PENF PENF PENF SM RSF	E // // // // // // // // // // // // //	[MJ] [MJ] [MJ] [MJ] [MJ] [MJ] [MJ] [MJ]	1.47E+ 0.0E+(1.47E+ 1.05E+ 5.22E+ 1.57E+ 0.0E+(0.0E+(0.0E+(9.52E- Jse of re	1 0 -1 -1 -2 -1 -1 -2 -2 -1 -2 	2.64E-2 2.64E-2 4.45E-2 - 4.45E-2 - - 0.0E+0 2.54E-4 e primary	2 1 1 1)) 5 y energy	7.62E-1 - 7.62E-1 8.18E+0 - 8.18E+0 - 0.0E+0 0.0E+0 5.26E-3 excludir	ng rene	2.64E-2 - 2.64E-2 4.45E-1 - 4.45E-1 - 0.0E+0 0.0E+0 2.54E-5 wable pri	mary en	1.73E-1 1.73E-1 2.05E+0 - 2.05E+0 - 0.0E+0 0.0E+0 9.46E-3 ergy reso	2 2 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	.5E+0 .5E+0 .4E+1 .4E+1 .0E+0 .0E+0 .0E+0 .3.7E-3 seed as r	-3.0 -3.1 -3.1 -3.1 -3.1 -3.1 -3.1 -3.1 -3.1	64E+0 - 64E+0 92E+1 - 92E+1 - 0E+0 0E+0 68E-3 erials; PE	-6.6E+0 - 		
PER PER PENF PENF PENF SM RSF NRS FW	E M M RE RE RM RT F F F F F F F	[MJ] [MJ] [MJ] [MJ] [MJ] [MJ] [MJ] [MJ]	1.47E+ 0.0E+(1.47E+ 1.05E+ 5.22E+ 1.57E+ 0.0E+(0.0E+(9.52E- Jse of re- imary er wable p	1 0 -1 -2 -1 -1 -2 -1 -1 -2 -2 	2.64E- - 2.64E- 4.45E- - 0.0E+C 0.0E+C 0.0E+C 2.54E- 2.54E- e primar sources nergy e>	2 1 1)) 5 y energy used as ccluding	7.62E-1 - 7.62E-1 8.18E+0 - 8.18E+0 - 0.0E+0 0.0E+0 5.26E-3 excludir raw mat non rene	ng rene erials; l	2.64E-2 - 2.64E-2 4.45E-1 - - 0.0E+0 0.0E+0 2.54E-5 wable pri PERT = T primary e	mary en Total use	1.73E-1 - 1.73E-1 2.05E+0 - 2.05E+0 - 0.0E+0 0.0E+0 9.46E-3 ergy rese e of renew assources	2 2 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	.5E+0 .5E+0 .4E+1 .4E+1 .0E+0 .0E+0 .0E+0 .37E-3 sed as r. mary en raw ma	-3.1 -3.1 -3.1 -3.1 -3.1 -3.1 -3.1 -3.1	64E+0 - 64E+0 92E+1 - 92E+1 - 0E+0 0E+0 68E-3 rrials; PE ources; 1 PENRM =	-6.6E+0 - -6.6E+0 -7.4E+1 - -7.4E+1 - - 0.0E+0 0.0E+0 0.0E+0 - 4.9E-2 RM = Use of PENRE = Use of = Use of non		
PER PER PENF PENF PENF SM RSF	E M M RE RE RM RT RT F F F F rene rene	[MJ] [m3] PERE = 0 wable pr wable pick wable pick	1.47E+ 0.0E+(1.47E+ 1.05E+ 5.22E+ 1.57E+ 0.0E+(0.0E+(0.0E+(9.52E- Jse of re imary er wable p	1 0 -1 -1 -2 -1 -1 -2 -1 -2 -1 -2 -1 -2 -1 -2 -1 -2 -1 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2	2.64E- 2.64E- 4.45E- 4.45E- 0.0E+C 0.0E+C 0.0E+C 2.54E- e primar sources	2 1 1 2 1 1 2 3 3 y energy used as ccluding used as	7.62E-1 - 7.62E-1 8.18E+0 - - 0.0E+0 0.0E+0 5.26E-3 • • • • • • • • • • • • • • • • • • •	ng rene erials; l ewable terials;	2.64E-2 	mary en Total use nergy re	1.73E-1 - 1.73E-1 2.05E+0 - 2.05E+0 - 0.0E+0 9.46E-3 ergy reso sources se of nor	2 2 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	.5E+0 .5E+0 .4E+1 .4E+1 .0E+0 .0E+0 .0E+0 .37E-3 sed as ramary en raw mar	-3.1 -3.1 -3.1 -3.1 -3.1 -3.1 -3.1 -3.1	64E+0 - 64E+0 92E+1 - - 92E+1 - 0E+0 0E+0 68E-3 rrials; PE ources; 1 PENRM = rgy resou	-6.6E+0 - 		
PER PER PENF PENF PENF SM RSF NRS FW	E M M RE RE RM RT RT F F F F rene rene	[MJ] [m3] PERE = 0 wable pr wable pick wable pick	1.47E+ 0.0E+(1.47E+ 1.05E+ 5.22E+ 1.57E+ 0.0E+(0.0E+(0.0E+(9.52E- Jse of re imary er wable p	1 0 -1 -1 -2 -1 -1 -2 -1 -2 -1 -2 -1 -2 -1 -2 -1 -2 -1 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2	2.64E- 2.64E- 4.45E- 4.45E- 0.0E+C 0.0E+C 0.0E+C 2.54E- e primar sources	2 1 1 2 1 1 2 3 3 y energy used as ccluding used as	7.62E-1 - - - - - - - - - - - - - - - - - -	ng rene erials; l ewable terials; ndary fu	2.64E-2 	mary en otal use nergy re Total u F = Use	1.73E-1 - 1.73E-1 2.05E+0 - 2.05E+0 - 0.0E+0 9.46E-3 ergy reso sources se of nor	2 2 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	.5E+0 .5E+0 .4E+1 .4E+1 .0E+0 .0E+0 .0E+0 .37E-3 sed as ramary en raw mar	-3.1 -3.1 -3.1 -3.1 -3.1 -3.1 -3.1 -3.1	64E+0 - 64E+0 92E+1 - - 92E+1 - 0E+0 0E+0 68E-3 rrials; PE ources; 1 PENRM = rgy resou	-6.6E+0 - -6.6E+0 -7.4E+1 - -7.4E+1 - - 0.0E+0 0.0E+0 0.0E+0 - 4.9E-2 RM = Use of PENRE = Use of = Use of non		
PER PER PENF PENF PENF SM RSF NRS FW	E M T RE RE RM RT F F F rene of se	[MJ] [m3] PERE = I wable pr non rene wable pr econdary	1.47E+ 0.0E+(1.47E+ 1.05E+(5.22E+ 1.57E+ 0.0E+(0.0E+(0.0E+(0.0E+(9.52E- Jse of re imary er wable pr rimary et r materia	1 0 -1 -1 -2 -1 -1 -2 -1 -2 -2 	2.64E- - 2.64E- 4.45E- - - 4.45E- - - 0.0E+(0.0E+(0.0E+(2.54E- 2.55E-	2 1 1 y energy used as ccluding used as renewal	7.62E-1 - 7.62E-1 8.18E+0 - - 8.18E+0 - - 8.18E+0 - - 0.0E+0 0.0E+0 5.26E-3 excludir raw mat non rene raw mat iele secor	ng rene erials; l ewable terials; ndary fu	2.64E-2 - - 2.64E-2 4.45E-1 - - 4.45E-1 - - 0.0E+0 0.0E+0 0.0E+0 2.54E-5 wable pri PERT = T primary e PENRT = I PENRT = J PENRT = J	mary en otal use nergy re Total u F = Use r	1.73E-1 - 1.73E-1 2.05E+0 - 2.05E+0 - 2.05E+0 0.0E+0 9.46E-3 ergy rese of renew secon nor of non r	2 2 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	.5E+0 .5E+0 .4E+1 .4E+1 .0E+0 .0E+0 .0E+0 .37E-3 sed as ramary en raw mar	-3.1 -3.1 -3.1 -3.1 -3.1 -3.1 -3.1 -3.1	64E+0 - 64E+0 92E+1 - - 92E+1 - 0E+0 0E+0 68E-3 rrials; PE ources; 1 PENRM = rgy resou	-6.6E+0 - 		
PER PER PENF PENF PENF SM RSF NRS FW Captio	E M M T R R R R R F F F F F F F F F F F F F F	[MJ] [m³] PERE = I wable pr non rene wable pr econdary	1.47E+ 0.0E+(1.47E+ 1.05E+ 5.22E+ 1.57E+ 0.0E+(0.0E+(0.0E+(9.52E- Jse of re imary er wable pr rimary er r materia	1 0 -1 -2 -1 -2 -1 -2 -1 -2 -1 -2 -2 -1 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2	2.64E-7 	2 1 1 5 y energy used as renewate FLOV	7.62E-1 - 7.62E-1 8.18E+0 - 8.18E+0 - 0.0E+0 0.0E+0 0.0E+0 0.0E+0 5.26E-3 excludir raw mat non rene raw mat ole secor	ng rene erials; l ewable terials; ndary fu	2.64E-2 - - 2.64E-2 4.45E-1 - - 4.45E-1 - - 0.0E+0 0.0E+0 0.0E+0 2.54E-5 wable pri PERT = T primary e PENRT = jels; NRS wate	mary en otal use nergy re Total u F = Use r	1.73E-1 - 1.73E-1 2.05E+0 - 2.05E+0 - 2.05E+0 0.0E+0 9.46E-3 ergy rese of renew secon nor of non r	2 2 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	.5E+0 .5E+0 .4E+1 .4E+1 .0E+0 .0E+0 .0E+0 .37E-3 sed as ramary en raw mar	-3.1 -3.1 -3.1 -3.1 -3.1 -3.1 -3.1 -3.1	64E+0 - 64E+0 92E+1 - - 0E+0 0E+0 68E-3 rrials; PE ources; 1 PENRM = rgy resou	-6.6E+0 - 		
PER PER PENF PENF PENF SM RSF NRS FW Captio	E M T R R R R R R R R R R R R R R R R R R	[MJ] [m3] PERE = 0 wable pr non rene wable pr econdary OF TH	1.47E+ 0.0E+(1.47E+ 1.05E+ 5.22E+ 1.57E+ 0.0E+(0.0E+(0.0E+(9.52E- Jse of re imary er wable pr rimary er r materia	1 0 1 2 1 2 0 0 0 0 0 0 0 0 0 0 0 0 0	2.64E-7 	2 1 1 5 y energy used as renewate FLOV	7.62E-1 - 7.62E-1 8.18E+0 - 8.18E+0 - 0.0E+0 0.0E+0 0.0E+0 0.0E+0 5.26E-3 excludir raw mat non rene raw mat ole secor	ng rene erials; l ewable terials; ndary fu	2.64E-2 - - 2.64E-2 4.45E-1 - - 4.45E-1 - - 0.0E+0 0.0E+0 0.0E+0 2.54E-5 wable pri PERT = T primary e PENRT = jels; NRS wate	mary en otal use nergy re Total u F = Use r	1.73E-1 - 1.73E-1 2.05E+0 - 2.05E+0 - 2.05E+0 0.0E+0 9.46E-3 ergy rese of renew secon nor of non r	2 2 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	.5E+0 .5E+0 .4E+1 .4E+1 .0E+0 .0E+0 .0E+0 .37E-3 sed as ramary en raw mar	-3.1 -3.1 -3.1 -3.1 -3.1 -3.1 -3.1 -0. 0. -5. - aw mate ergy res terials; F aary ener dary fuel	64E+0 - 64E+0 92E+1 - - 0E+0 0E+0 68E-3 rrials; PE ources; 1 PENRM = rgy resou	-6.6E+0 - 		
PER PER PENF PENF PENF SM RSF NRS FW Captio	E M T R R R R R R R R R R R R R R R R R R	[MJ] [M] PERE = I wable proport renewable proport renewable procondary OF TH offing a Unit [kg]	1.47E+ 0.0E+ 1.47E+ 1.05E+ 5.22E+ 1.57E+ 0.0E+ 0.0E+ 0.0E+ 0.0E+ 9.52E- Jse of re imary er wable p rimary er wable p rimary er materia	1 0 1 2 1 2 1 2 0 0 0 0 2 1 1 2 0 0 0 0 2 1 1 2 0 0 0 0 0 0 0 0 0 0 0 0 0	2.64E-4 	2 1 1 y energy used as ccluding used as renewat	7.62E-1 - 7.62E-1 8.18E+0 - 8.18E+0 - 8.18E+0 - 0.0E+0 0.0E+0 0.0E+0 0.0E+0 5.26E-3 excludir raw mat non rene raw non raw non ra	D mg rene erials; l awable terials; ndary fu	2.64E-2 - - 2.64E-2 4.45E-1 - - 4.45E-1 - - 0.0E+0 0.0E+0 0.0E+0 0.0E+0 2.54E-5 wable pri PERT = T primary e PENRT = Jels; NRS wate STE C.	mary en fotal use nergy rr : Total u F = Use r ATEG	1.73E-1 - 1.73E-1 2.05E+0 - 2.05E+0 - 2.05E+0 - 9.0E+0 9.46E-3 ergy ress of renew secon res of renew secon res of non r ORIES C3/1 9.92E-2	22 11 1 00 00 3 000 00 3 000 00 00 00 00 00 00	.5E+0 - .5E+0 .4E+1 - .4E+1 - .0E+0 .0E+0 .0E+0 .0E+0 .0E+0	-3.1 -3.1 -3.1 -3.1 -3.1 -3.1 -3.1 -3.1	64E+0 - 64E+0 92E+1 - - 0E+0 0E+0 68E-3 ririals; PE ources; I 2ENRM = 2GY resou Is; FW = D/1 0E+0	-6.6E+0 - - -6.6E+0 -7.4E+1 - - -7.4E+1 - - - 0.0E+0 - - - - - - - - - - - - - - - - - - -		
PER PER PENF PENF PENF SM SM SM SM SM Captio	E M M R R R R R R R R R R R R R R R R R	[MJ] [M] [1.47E+ 0.0E+ 1.47E+ 1.05E+ 5.22E+ 1.57E+ 0.0E+(9.52E- 0.0E+(9.52E- 1.5e of re imary er wable p rimary er materia E LCA nd wa A1 - A 1.26E- 4.46E-	1 0 1 2 1 2 0 1	2.64E-2 2.64E-2 4.45E- 4.45E- - 4.45E- - 0.0E+C 0.0E+C 2.54E-2 e primary sources nergy ex- sources - USe of JTPUT Dofing A4 0.0E+C 8.8E-5	2 1 1 2 1 1 2 1 1 2 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 2 1 2 1 2 1 2 1 2 2 2 2 2 2 2 2 2 2 2 2 2	7.62E-1 - 7.62E-1 8.18E+0 - 8.18E+0 - 0.0E+0 0.0E+0 5.26E-3 excludir raw mat non rene raw mat ole secor VS ANI or ane A5 1.25E-3 2.24E-2	ng rene erials; l ewable terials; c ndary fu D WA	2.64E-2 - - 2.64E-2 4.45E-1 - - - - - - - - - - - - - - - - - -	mary en Total use nergy re Total u F = Use r ATEG	1.73E-1 - 1.73E-1 2.05E+0 - 0.0E+0 9.46E-3 ergy rest e of non r secon non of non r ORIES C3/1 9.92E-2 7.85E-4	2 2 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	.5E+0 .5E+0 .4E+1 .4E+1 .0E+0 .0E+0 .0E+0 .0E+0 .0E+0 .0E+0 .0E+0 .24E-3	aw mate ergy res terials; F aary ener dary fuel	64E+0 - 64E+0 92E+1 - 92E+1 - 92E+1 - 0E+0 68E-3 ririals; PE ources; I PENRM = rgy resou s; FW = D/1 0E+0 43E-2	-6.6E+0 - - -6.6E+0 -7.4E+1 - - -7.4E+1 - - - 0.0E+0 - - - - - - - - - - - - - - - - - - -		
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For verified LCA results of other product variants, please refer to the Annex.



6. LCA: Interpretation

In this EPD for all assessment values the product stage (A1-A3) plays the most important role. Only for the global warming potential (GWP) in the thermal utilisation scenario module C3 also considerably contributes to the total result (approx. one third). The transportation to site (A4) as well as transportation within the EOLs (C2) have only a negligibly small impact on the environment. The values are identical, as for both types of transport the same assumptions apply. From the two EOL scenarios the material recycling shows significantly more favourable outcomes, as the environmental loads of the recycling (module C3) are considerably less severe compared to thermal utilisation (approx. 4 times less) and the credits (module D) are slightly higher.

Product stage (module A1-A3): In all impact categories the raw materials provide the largest contribution to the impacts of the product stage. The largest contribution to GWP results from the manufacture of PVC, EVA and aluminium hydroxide. Merely 10% of the greenhouse gas emission are caused by the production process itself and can be attributed to the energy used (power, gas, oil). The ozone depletion potential (ODP) results almost entirely from the production of aluminium hydroxide. The greatest impact of the acidification potential (AP) results from the production of the aluminium hydroxide (approx. 30%), EVA, PVC and TiO₂. The largest contribution to the eutrophication potential (EP) is made by the epoxidised soyabean oil (approx. 30%). The potential for producing tropospheric ozone (POCP) is, for the larger part, to be attributed to the epoxidised soyabean oil. The abiotic depletion potential - elements (ADPE) is mainly dominated by the PVC. The abiotic depletion potential - fossil fuels (ADPF) results mainly from the contribution of the EVA and the PVC.

The total use of renewable primary energy resources (PERT), in particular, results from the aluminium hydroxide and the epoxidised soyabean oil. The production process itself (A3) causes only a small impact, whereby packaging in the form of cardboard and wood pallets account for approximately half of it. The total use of non-renewable primary energy resources (PENRT) is, for the larger part, to be attributed to the EVA and the PVC. The manufacture itself accounts for only a very small percentage.

7. Requisite evidence

No evidence required.

8. References

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DIN V 20000-201: 2006-11, Use of building products in construction works - Part 201: Adaption standard for

flexible sheets for waterproofing according to European standards for the use as waterproofing of roofs

DIN V 20000-202: 2007-12, Use of building products in construction works - Part 202: Adaption standard for flexible sheets for waterproofing according to European standards for the use as waterproofing

EN ISO 14001: 2009-11, Environmental management systems - Requirements with guidance for use

EN ISO 50001: 2011-12, Energy management systems - Requirements with guidance for use

AVV Abfallverbrennungsverordnung des Bundesumweltamtes [Waste Incineration Ordinance of the Federal Environment Agency]

FLL Forschungsgesellschaft Landschaftsentwicklung Landschaftsbau e.V. [Landscape Research, Development and Construction Society] "Verfahren zur Untersuchung der Wurzelfestigkeit von Bahnen und Beschichtungen für Dachbegrünungen nach dem FLL-Verfahren" [Testing of root resistance of membranes and coatings for green roofs according to the FLL method]

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Complementary data to the LCA: Results of alwitra EPD-ALW-20140020-IBA1-EN Different installation methods of EVALON[®] V

1.1 EVALON[®] V 1.2 mm, mechanically fastened or loose laid under ballast

Table 1-1: Resource input during individual life cycle stages of

1m² EVALON[®] V 1.2 mm - mechanically fastened or loose laid under ballast

Following, the resulting indicators of the life cycle impact assessment, of the resource input as well as of residues and other output flows for 1 m² of roofing and waterproofing membrane are displayed DESCRIPTION OF SYSTEM BOUNDARIES (X = INCLUDED IN LCA: MND = MODULE NOT DECLARED)

DESC	RIPT	ION O	F SYS	TEM	BOUN	DARIE	ES (X =	INC	LUDED	IN LO	CA; MN	ID = M	ODUL	Ε ΝΟΤ	DECL	LARED)
Product stage		Constr proces			Use stage End-of-life sta								fe 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	Re-use, recovery or recycling potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Х	Х	Х	Х	Х	MND	MND	MND	MND	MND	MND	MND	MND	Х	Х	MND	Х
RESL	JLTS	OF TH	IE LCA	\ - EN	VIRON	MENT	TAL IM	PAC	T: EVA	LON \	/ 1.2 –	mech.	faster	ned – I	loose	laid u. b.
Para- meter	U	nit	A1 -	A3	A4		A5		C2		C3/1		C3/2		D/1	D/2
GWP		O ₂ eq.]	5.56E		2.65E		4.22E-		2.65E-0		3.13E+0		.75E-01		09E+00	-2.47E+00
ODP		C11 eq.]	1.13		5.52E		5.71E-	-	5.52E-1		4.51E-11		.17E-10		16E-10	-5.89E-09
AP		<u>D₂ eq.]</u>	2.03		6.90E		1.06E- 1.26E-		6.90E-0		7.57E-04		44E-03		87E-03	-9.26E-03
EP POCP		D ₄) ³ - eq.] nen eq.]	2.41E 6.36E		1.57E- -1.97E		3.20E-	-	<u>1.57E-0</u> -1.97E-0		5.89E-05 4.28E-05		.74E-04 .89E-05		22E-04 65E-04	-1.12E-03 -3.31E-03
ADPE		ib eq.]	9.64		1.22E		4.86E-		1.22E-0		4.49E-00		.09E-05		13E-04	-5.04E-06
ADPF		/ <u>J)</u>	1.20E		3.62E		6.25E+		3.62E-0		1.47E+0		08E+00		76E+01	-5.62E+01
7.011																utrophication
Captio			CP = Pho	tochemi	ical Ozone	e Creatio	on Potent	ial; ADI	PE = Abioti Fossil F	ic Deple						epletion Potential –
RESL	JLTS	OF TH	IE LCA	<mark>- RE</mark>	SOUR	CE US	SE: EV	ALOI	N V 1.2	– meo	ch. fast	tened ·	– loos	e laid i	under	ballast
Param	eter	Unit	A1 - A3	3	A4		A5		C2		C3/1		C3/2		D/1	D/2
PER		[MJ]	1.19E+	01	2.15E-0	2	6.20E-0	1	2.15E-02	2 1	I.40E-01	2.	1E+00	-2.9	6E+00	-5.3E+00
PER		MJ]	0		-	_	-		-		-		-		-	-
PER		MJ]			2.15E-0		6.20E-0		2.15E-02		1.40E-01		1E+00		6E+00	-5.3E+00
PENF		MJ]	8.64E+		3.63E-01		6.77E+0	0	3.63E-01		1.67E+00		1E+01	-3.1	9E+01	-6.1E+01
PENR PENR		MJ] MJ]	4.26E+		- 3.63E-0	- 3E-01 6		~	-		-	1	- 1E+01	2.1	- 9E+01	-6.1E+01
SM		[kg]	0	02	3.03E-0	1	6.77E+0	0	3.63E-01		1.67E+00		IE+01	-3.1	96401	-0.1E+01
RSF		I∿gi MJ]	0		-		-		- 0		- 0		0		0	0
NRS		MJ]	0		0	0 0 0 0			0		0	0				0
FW)2	2.07E-0	5	4.26E-03	3	2.07E-05	5 7	7.70E-03					-4.0E-02
	FW [m³] 7.79E-02 2.07E-05 4.26E-03 2.07E-05 7.70E-03 3.0E-03 -4.62E-03 -4.0E-02 PERE = Use of renewable primary energy resources used as raw materials; permetable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of non-renewable primary energy resources; SM = Use of non-renewable primary 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: EVALON V 1.2 – mech. fastened –															
			ballas			PLOW	IS ANL	JVVA		TEG	ORIES	. EVAL		1.2 - 1	mech.	
Param	eter l	Unit	A1 - A3	3	A4		A5		C2		C3/1		C3/2		D/1	D/2
HW		[kg]	1.06E-0		0.00E+0		1.04E-03		0.00E+00		3.08E-02		00E+00		0E+00	-4.35E-03
NHW		[kg]	3.58E-0		7.18E-0		1.80E-02		7.18E-05		6.40E-04		71E-03		6E-02	-1.87E-01
RWI		[kg]	3.97E-0	03	5.21E-0	7	2.12E-04	4	5.21E-07	, E	3.05E-05	1.:	20E-03	-1.7	7E-03	-1.73E-03
CRU		[kg]	0		0		0		0		0		0		-	-
MFF		[kg]	0		0		0		0		0.00E+00		1E+00	+	-	-
									-	1	./1E+00	0.0	JUE+00			
					-		-		-		-		-			
EEI					-		-		-							
Contio	MER [kg] 0 0 0 1.71E+00 0.00E+00 - - EEE [MJ] - - - - - 6.21E+00 1.73E-01 EET [MJ] - - - - - 6.21E+00 1.73E-01 EET [MJ] - - - - 1.49E+01 4.17E-01 HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; TRWD = Total Radioactive waste disposed; CRU = - - 1.49E+01 4.17E-01 Caption Components for reuse; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Export electric energy; EET = Export															

Source: Background Report to the Environmental Product Declaration (EPD) for alwitra roofing and waterproofing membranes Page 1 of 6

1.2 EVALON[®] V 1.5 mm, mechanically fastened or loose laid under ballast

Table 1-2: Resource input during individual life cycle stages of

1m² EVALON[®] V 1.5 mm - mechanically fastened or loose laid under ballast

Following, the resulting indicators of the life cycle impact assessment, of the resource input as well as of residues and other output flows for 1 m² of roofing and waterproofing membrane are displayed DESCRIPTION OF SYSTEM BOUNDARIES (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED)

Product stage Construction process stage							ι	Jse sta	ge				End-of-li	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	Re-use, recovery or recycling potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Х	Х	Х	Х	Х	MND	MND	MND	MND	MND	MND	MND	MND	Х	Х	MND	Х
RESU ballas		OF TH	IE LCA	A - EN'	VIRON	IMENT	AL IM	PAC	T: EVAI	_ON V	1.5 –	mech.	faster	ned – I	oose	laid under
Para- meter	Ur		A1 -		A4		A5		C2		C3/1		C3/2		D/1	D/2
GWP	[kg CC		6.75		3.25		5.1E-		3.25E-2		3.85E+0		9.51E-1		56E+0	-3.04E+0
ODP [AP	[kg CFC		1.41		6.78E		7.11E-1 1.3E-3	-	6.78E-1		5.54E-11 9.3E-4		.12E-10		56E-10 .52E-3	-7.24E-9
	[kg SC [kg (PO		2.51 2.98		8.47E		1.3E-0 1.55E-		8.47E-5 1.92E-5		9.3E-4 7.24E-5		2.14E-4		.52E-3 .96E-4	-1.14E-2 -1.38E-3
POCP	[kg (PO		2.98				1.55E- 3.96E-		-2.42E-		7.24E-5 5.26E-5		6.01E-5	-	.90E-4 .25E-4	-1.38E-3 -4.06E-3
ADPE	[kg Sl		1.2		-2.42E-5 1.5E-9		6.04E-7		1.5E-9		5.51E-7		1.42E-7		.61E-7	-6.18E-6
ADPF	[M		1.45		4.44E-1		7.54E+0		4.44E-1		1.81E+0		9.92E+0		39E+1	-6.9E+1
Caption	Poten	tial; POC	CP = Pho	tochemi		e Creatio	n Potenti	ial; ADF	PE = Abioti Fossil Fu	c Deplet Jels	ion Poter	itial – Ele	ments; A	DPF = A	biotic De	utrophication pletion Potential
	ter L	Jnit	A1 - A3	3	A4		A5		C2		C3/1		C3/2		D/1	D/2
Paramet											1.73E-1	2	.5E+0	-36		
PERE	[]	MJ]	1.47E+		2.64E-2	2	7.62E-1		2.64E-2				.JL+0	0.0	64E+0	-6.6E+0
PERE	: [1 1 [1	MJ]	0.0E+0)	-		-		-		-	2	-		-	-
PERE PERM PERT	[] 1 [[- []	MJ] MJ]	0.0E+(1.47E+) ·1	- 2.64E-2	2	- 7.62E-1		- 2.64E-2		- 1.73E-1		- .5E+0	-3.6	- 64E+0	- -6.6E+0
PERE PERM PERT PENRE	E [1	MJ] MJ] MJ]	0.0E+0 1.47E+ 1.05E+) ·1 ·2	-	2	-		-		-		-	-3.6	-	-
PERE PERM PERT	E [[1 [[- [] E [[M []	MJ] MJ]	0.0E+(1.47E+) -1 -2 -1	- 2.64E-2 4.45E-1	2	- 7.62E-1		- 2.64E-2 4.45E-1		- 1.73E-1	1	- .5E+0	-3.6	- 64E+0 92E+1 -	- -6.6E+0
PERE PERM PERT PENRE PENRM	E [[1 [[5 [] E [] M [[T []	MJ] MJ] MJ] MJ]	0.0E+0 1.47E+ 1.05E+ 5.22E+) -1 -2 -1 -2 -2	- 2.64E-2 4.45E-1	2	7.62E-1 8.18E+0		- 2.64E-2 4.45E-1 -		- 1.73E-1 2.05E+0 -	1	- .5E+0 .4E+1 -	-3.6	- 64E+0	-6.6E+0 -7.4E+1
PERE PERM PERT PENRE PENRE PENR	E [[1 [] 5 [] 6 [] 7 [] 7 [] 7 []	MJ] MJ] MJ] MJ] MJ]	0.0E+(1.47E+ 1.05E+ 5.22E+ 1.57E+) -1 -2 -1 -2 -2 -2	- 2.64E-2 4.45E-1	2	7.62E-1 8.18E+0		- 2.64E-2 4.45E-1 -		- 1.73E-1 2.05E+0 -	1	- .5E+0 .4E+1 -	-3.0	- 64E+0 92E+1 -	-6.6E+0 -7.4E+1
PERE PERM PERT PENRE PENRE PENRT SM	E [[M [] E [] M [] T [] [] []	MJ] MJ] MJ] MJ] MJ] MJ]	0.0E+(1.47E+ 1.05E+ 5.22E+ 1.57E+ 0.0E+(0.0E+(0.0E+()) 1) 2) 1) 2) 0) 0)	2.64E-2 4.45E-1 4.45E-1 0.0E+0 0.0E+0		- 7.62E-1 8.18E+0 - 8.18E+0 -		2.64E-2 4.45E-1 4.45E-1 0.0E+0 0.0E+0		- 1.73E-1 2.05E+0 - 2.05E+0 - 0.0E+0 0.0E+0	1 1 0 0	- .5E+0 .4E+1 .4E+1 .4E+1 .0E+0 .0E+0	-3.6 -3.9 -3.9 -3.9 0.0	- 64E+0 92E+1 - 92E+1 - 0E+0 0E+0 0E+0	- -6.6E+0 -7.4E+1 - - -7.4E+1
PERE PERM PERT PENRE PENRE SM RSF	E (1 7 (1 7 (1) 7	MJ] MJ] MJ] MJ] MJ] MJ] MJ] MJ] m ³]	0.0E+(1.47E+ 1.05E+ 5.22E+ 1.57E+ 0.0E+(0.0E+(9.52E-	D 1 2 1 2 2 1 2 2 1 2 1 1 1 2 1 1 1 2 1 1 1 2 1 1 1 2 1 2 1 2 1	2.64E-2 4.45E-1 4.45E-1 - 4.45E-1 - 0.0E+0 2.54E-5		- 7.62E-1 8.18E+0 - 8.18E+0 - 0.0E+0 0.0E+0 5.26E-3		2.64E-2 4.45E-1 4.45E-1 - 0.0E+0 0.0E+0 2.54E-5		- 1.73E-1 2.05E+0 - 2.05E+0 - 0.0E+0 0.0E+0 9.46E-3	1 1 0 0 3	- .5E+0 .4E+1 .4E+1 .4E+1 .0E+0 .0E+0 .0E+0 .3.7E-3	-3.0 -3.9 -3.9 -3.9 -3.9 -3.9 -3.9 -3.9 -3.9	- 64E+0 92E+1 - 92E+1 - 92E+1 - 0E+0 0E+0 68E-3	
PERE PERM PENRE PENRE PENRE SM RSF NRSF FW Caption	Image: Constraint of the second	MJ CRE = 0 wable proon-rene* wable procondary OF TH	0.0E+(1.47E+ 1.05E+ 5.22E+ 1.57E+ 0.0E+(0.0E+(9.52E- Use of re imary er wable pr imary er wable pr imary er wable pr imary er	0 1 2 1 2 2 0 0 0 0 0 0 0 0 0 0 0 0 0	2.64E-2 4.45E-1 - - - - - - - - - - - - - - - - - -	2 2 2 2 2 2 2 2 2 2 2 3 5 5 5 5 5 5 5 5 5 5 5 5 5	- 7.62E-1 8.18E+0 - 8.18E+0 - 0.0E+0 0.0E+0 5.26E-3 excludir raw mate pon-rene raw mate	ng rene erials; ewable terials; ndary fu	2.64E-2 4.45E-1 - - - - - - - - - - - - - - - - - -	mary en otal use nergy re Total u F = Use	- 1.73E-1 2.05E+0 - 2.05E+0 - 0.0E+0 0.0E+0 9.46E-3 ergy reso of renew sources se of non-r	1 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	- .5E+0 .4E+1 - .4E+1 - .0E+0 .0E+0 .0E+0 .0E+0 .7E-3 sed as ra mary ene raw mate ble prim. e second	-3.(-3.(-3.(0.(0.(0.(0.(0.(0.(0.(0.(0.(0	- 64E+0 92E+1 - - 92E+1 - - 0E+0 0E+0 0E+0 0E+0 0E+0 - Fals; PE ources; I ENRM = ENRM = s; FW =	-6.6E+0 -7.4E+1 -7.4E+1 -7.4E+1 -0.0E+0 0.0E+0
PERE PERM PENRI PENRI SM RSF NRSF FW Caption	E [[] E [[] M [] T [] F []	MJ MJ MJ MJ MJ Kg MJ MJ ERE = I wable pr on-rene wable pr condary OF TH under	0.0E+(1.47E+ 1.05E+ 5.22E+ 1.57E+ 0.0E+(0 1 2 1 2 2 2 2 2 2 2 2 2 2 2 2 2	2.64E-2 4.45E-1 - - - - - - - - - - - - - - - - - -	2 2 2 2 2 2 2 2 2 2 2 3 5 5 5 5 5 5 5 5 5 5 5 5 5	7.62E-1 8.18E+0 8.18E+0 0.0E+0 0.0E+0 5.26E-3 excludir raw mate on-rene raw mate on-rene raw mate	ng rene erials; ewable terials; ndary fu	2.64E-2 4.45E-1 - - - - - - - - - - - - - - - - - -	mary en otal use nergy re Total u F = Use	1.73E-1 2.05E+0 	1 0 0 3 ources ui vable prii used as i-renewa enewable EVAL	.5E+0 .4E+1 .4E+1 .0E+0 .0E+0 .7E-3 sed as ra mary ene raw mat ble prima e second	-3.6 -3.9 -3.9 -3.9 -3.9 -3.9 -3.9 -3.9 -3.9	- 64E+0 92E+1 - - 92E+1 - 0E+0 0E+0 0E+0 68E-3 rials; PE ources; i ENRM = rgy resou s; FW =	
PERE PERM PENT PENRE PENRE SM RSF FW Caption	Image: Constraint of the second sec	MJ MJ MJ MJ MJ MJ MJ ERE = (wable pr condary OF TH Under	0.0E+(1.47E+ 1.05E+ 1.05E+ 1.05E+ 1.57E+ 0.0E+(0.0E+(0.0E+(0.0E+(0.0E+(9.52E- Use of re imary er wable pr rimary er v materia IE LCA ballas A1 - A2	0 1 2 1 2 2 2 2 2 2 2 2 2 2 2 2 2	2.64E-2 4.45E-1 4.45E-1 0.0E+C 0.0E+C 0.0E+C 2.54E-C e primary sources nergy ex sources = Use of TPUT	2 2 2 2 2 2 2 2 2 2 2 2 2 2	7.62E-1 8.18E+0 - - 0.0E+0 0.0E+0 5.26E-3 excludir raw mat oon-rene raw mat ole secon	ng rene erials; wable terials; ndary fu	2.64E-2 4.45E-1 - - - - - - - - - - - - - - - - - -	mary en otal use nergy re Total u F = Use	- 1.73E-1 2.05E+0 - 0.0E+0 0.0E+0 0.0E+0 0.0E+0 9.46E-3 ergy resc of renew sources se of nor of non-r DRIES: C3/1	1 0 0 3 Durces us vable prin used as i-renewa enewable EVAL	.5E+0 .4E+1 	-3.6 -3.9 -3.9 -3.9 -3.9 -3.9 -3.9 -3.9 -3.9	- 64E+0 92E+1 - 92E+1 - 0E+0 0E+0 0E+0 0E+0 0E+0 0E+0 0E+0 0E	
PERE PERM PERT PENRE PENRE SM RSF NRSF FW Caption	LTS (MJ MJ	0.0E+(1.47E+ 1.05E+ 5.22E+ 1.57E+ 0.0E+(0 1 2 1 2 1 2 0 0 0 0 0 0 0 0 0 0 0 0 0	2.64E-2 4.45E-7 	2 2 2 2 2 2 2 2 2 2 2 2 2 2	7.62E-1 8.18E+0 8.18E+0 0.0E+0 0.0E+0 5.26E-3 excludir raw mate on-rene raw mate ole secon /S ANE A5 1.25E-3	org rene erials; wable terials; ndary fu	2.64E-2 4.45E-1 - - - - - - - - - - - - - - - - - -	mary en otal use nergy re Total u F = Use	- 1.73E-1 2.05E+0 - 2.05E+0 0.0E+0 0.0E+0 9.46E-3 ergy resc of renew sources se of nor-r of non-r DRIES: C3/1 9.92E-2	1 0 0 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3		-3.6 -3.9 0.1 0.1 -5.1 aw mate erigy rese rerials; P ary ener lary fuel 1.5 – 1 0.1	- 64E+0 92E+1 - - 92E+1 - 0E+0 0E+0 68E-3 Trials; PE 00tres; FW = rgy resou s; FW = mech.	
PERE PERM PENR PENR PENR SM RSF FW Caption Caption RESU OOSE Paramet HWD		MJ MJ MJ MJ Kg MJ Kg MJ ERE = I MJ ERE = I vable pr condary OF TH Under Jnit kg	0.0E+(1.47E+ 1.05E+ 1.57E+ 0.0E+(0 1 2 2 1 2 2 1 2 2 1 1 2 2 1 1 2 2 1 1 2 2 1 2 2 1 1 2 2 2 1 2 2 2 2 2 2 2 2 2 2 2 2 2	2.64E-2 4.45E-1 - - - - - - - - - - - - - - - - - -	2 2 2 2 2 2 2 2 2 2 2 2 2 2	- 7.62E-1 8.18E+0 - 8.18E+0 - - 0.0E+0 0.0E+0 5.26E-3 excludir raw mate on-rene raw mate raw mate on-rene raw mate raw mate raw mate raw mate	ng rene erials; wable erials; ndary fr	2.64E-2 4.45E-1 - - 4.45E-1 - - 0.0E+0 2.54E-5 wable prin PERT = T primary e PERT = T primary e STE CA STE CA	mary en otal use bergy re Total u F = Use	- 1.73E-1 2.05E+0 - 2.05E+0 - 0.0E+0 0.	1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 8.		-3.6 -3.9 -3.9 -3.9 -3.9 -3.9 -3.9 -3.9 -3.9	- 64E+0 92E+1 - - 0E+0 0E+0 0E+0 68E-3 rials; PE ources; I ENRM = rgy resou s; FW = mech. D/1 0E+0 43E-2	
PERE PERM PENR PENR PENR SM RSF FW Caption Caption RESU 00SE Paramet HWD NHWE RWD	Image: state	MJ Reg Kg Kg	0.0E+(1.47E+ 1.05E+ 1.05E+ 1.57E+ 0.0E+(0 1 2 2 1 2 2 1 2 2 1 2 2 1 1 2 2 2 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2	2.64E-2 4.45E-1 - - 0.0E+C 0.0E+C 2.54E-5 e primary sources = Use of TPUT A4 0.0E+C 8.8E-5 6.39E-7	2 2 2 2 2 2 2 2 2 2 2 2 2 2	7.62E-1 8.18E+0 - - 0.0E+0 5.26E-3 excludir raw mate on-rene raw mate raw mate on-rene raw mate on-rene raw mate on-rene raw mate on-rene raw mate on-rene raw mate raw mate on-rene raw mate raw mate raw mate ra	ng rene erials; wable erials; ndary fr	2.64E-2 4.45E-1 - - 4.45E-1 - - 0.0E+0 2.54E-5 wable prin PERT = T PERT = T PERT = T PERT = PERT = STE CA STE CA 0.0E+0 8.8E-5 6.39E-7	mary en otal use nergy re Total u F = Use	- 1.73E-1 2.05E+0 - 2.05E+0 0.0E+0 0.0E+0 9.46E-3 ergy resc of renew sources se of nor-r of non-r DRIES: C3/1 9.92E-2	1 1 0	- .5E+0 .4E+1 - .0E+0 .0E+0 .7E-3 sed as ra mary ener raw mat ble prima e second .ON V .0E+0 24E-3 48E-3	-3.6 -3.9 -3.9 -3.9 -3.9 -3.9 -3.9 -3.9 -3.9	- 64E+0 92E+1 - 92E+1 - 0E+0 0E+0 68E-3 rials; PE ources; ENRM = rgy resou s; FW = mech. 0E+0 43E-2 17E-3	
PERE PERM PENRE PENRE PENRE SM RSF NRSF FW Caption Caption RESU	Image: state	MJ ERE = I wable proon-renee* condary OF TH Inder Jnit kg] kg] kg]	0.0E+(1.47E+ 1.05E+ 1.57E+ 0.0E+(0 1 2 1 2 2 1 2 0 0 0 0 0 0 0 0 0 0 0 0 0	2.64E-2 4.45E-1 - - - - - - - - - - - - - - - - - -	2 2 2 2 2 2 2 2 2 2 2 2 2 2	- 7.62E-1 8.18E+0 - 8.18E+0 - - 0.0E+0 0.0E+0 5.26E-3 excludir raw mate on-rene raw mate raw mate on-rene raw mate raw mate raw mate raw mate	ng rene erials; wable erials; ndary fr	2.64E-2 4.45E-1 - - 4.45E-1 - - 0.0E+0 2.54E-5 wable prin PERT = T primary e PERT = T primary e STE CA STE CA	mary en otal use hergy re Total u F = Use	- 1.73E-1 2.05E+0 - 2.05E+0 - 0.0E+0 0.0E+0 9.46E-3 ergy resc of renev sources se of nor-r of non-r DRIES C3/1 9.92E-2 7.85E-4 9.89E-5	1 1 0 0 0 0 3 3 ources us vable pri used as i-renewable EVAL 0 0 8 1 0		-3.6 -3.9 -3.9 -3.9 -3.9 -3.9 -3.9 -3.9 -3.9	- 64E+0 92E+1 - - 0E+0 0E+0 0E+0 68E-3 rials; PE ources; I ENRM = rgy resou s; FW = mech. D/1 0E+0 43E-2	
PERE PERM PERT PENRE PENRE SM RSF FW Caption Caption RESU OOSE Paramet HWD NHWE RWD CRU	Image: state	MJ Reg Kg Kg	0.0E+(1.47E+ 1.05E+ 1.05E+ 1.57E+ 1.57E+ 0.0E+(0.0E+(9.52E- 1.57E+ 0.0E+(9.52E- 1.57E+ 0.0E+(0 1 1 2 1 2 2 1 2 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0	2.64E-2 4.45E-1 - - - - - - - - - - - - - - - - - -	2 / energy used as cluding r used as renewab	7.62E-1 8.18E+0 - 8.18E+0 - 0.0E+0 5.26E-3 excludir raw mate ble secon S ANIE A5 1.25E-3 2.24E-2 2.55E-4 0.0E+0	ng rene erials; wable erials; ndary fr	2.64E-2 4.45E-1 - - - - - - - - - - - - - - - - - -	mary en otal use hergy re Total u F = Use	- 1.73E-1 2.05E+0 - 2.05E+0 - 0.0E+0 0.0E+0 9.46E-3 ergy resc of renew sources se of non-r of non-r DRIES C3/1 9.92E-2 7.85E-4 9.89E-5 0.0E+0	1 1 0 0 0 0 3 3 ources us vable pri used as i-renewal EVAL EVAL 0 0 0 8 1 1 0 2 2	.5E+0 .4E+1 .4E+1 .0E+0 .0E+0 .0E+0 .7E-3 sed as ramatu ble prim. e second .ON V C3/2 .0E+0 .48E-3 .0E+0	-3.6 -3.9 -3.9 -3.9 -3.9 -3.9 -3.9 -3.9 -3.9	- 64E+0 92E+1 - 92E+1 - 0E+0 0E+0 68E-3 rials; PE ources; ENRM = rgy resou s; FW = mech. 0E+0 43E-2 17E-3	
PERE PERM PERT PENRE PENRE SM RSF FW Caption Caption RSF FW Caption RSF FW Caption RSF FW Caption RSF FW Caption RCC RWD RWD RWD RWD RWD RWD RWD	Image: Constraint of the second sec	MJ MJ MJ MJ MJ MJ Kg MJ Kg MJ ERE = I wable pr condary OF TH under Jnit kg kg kg kg kg kg kg	0.0E+(1.47E+ 1.05E+ 1.05E+ 1.57E+ 0.0E+(0 1 1 2 1 2 2 1 2 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0	2.64E-2 4.45E-1 - - - - - - - - - - - - - - - - - -	2 / energy used as cluding r used as renewab	7.62E-1 8.18E+0 - - 0.0E+0 5.26E-3 excludir raw mat ble secon /S ANIE A5 1.25E-3 2.24E-2 2.55E-4 0.0E+0 0.0E+0	ng rene erials; wable erials; ndary fr	2.64E-2 4.45E-1 - - - - - - - - - - - - - - - - - -	mary en otal use hergy re Total u F = Use		1 1 0 0 0 0 3 3 ources us vable pri used as i-renewal EVAL EVAL 0 0 0 8 1 1 0 2 2		-3.6 -3.9 -3.9 -3.9 -3.9 -3.9 -3.9 -3.9 -3.9	- 64E+0 92E+1 - 02E+1 - 02E+0 0E+0 0E+0 068E-3 rials; PE ources; FW = mech. D/1 0E+0 0E+0 0E+0 17E-3 0E+0 - 0E+0 - 0E+0 0E+0 - - - - - - - - - - - - -	
PERE PERM PENRI PENRI PENRI SM RSF FW Caption Caption Caption Caption Paramet HWD NHWE RWD CRU MER MER	LTS (laid (b) (c) (c) (c) (c) (c) (c) (c) (c	MJ MJ	0.0E+(1.47E+ 1.05E+ 5.22E+ 1.57E+ 0.0E+(0.0E+(0.0E+(0.0E+(0.0E+(0.0E+(0.12E+ 1.26E- 1.26E- 4.46E- 4.48E- 4.48E- 0.0E+(0 1 2 1 2 2 2 2 2 2 2 2 2 2 2 2 2	2.64E-2 4.45E-7 	2 / energy used as cluding r used as renewab	7.62E-1 8.18E+0 - - 0.0E+0 5.26E-3 excludir raw mat ble secon /S ANIE A5 1.25E-3 2.24E-2 2.55E-4 0.0E+0 0.0E+0	ng rene erials; wable erials; ndary fr	2.64E-2 4.45E-1 - - 0.0E+0 2.54E-5 - - - - - - - - - - - - - - - - - -	mary en otal use hergy re Total u F = Use		1 1 0 0 0 0 3 3 ources us vable pri used as i-renewal EVAL EVAL 0 0 0 8 1 1 0 2 2	.5E+0 .4E+1 .4E+1 .0E+0 .0E+0 .0E+0 .0E+0 .0E+0 24E-3 .0E+0 .0E+0 .1E+0 .0E+0	-3.6 -3.9 -3.9 -3.9 -3.9 -3.9 -3.9 -3.9 -3.9	- 64E+0 92E+1 - - 92E+1 - 0E+0 0E+0 0E+0 68E-3 FINRM = rgy resources; FW = mech. 0E+0 43E-2 17E-3 0E+0 - - -	

2.1 EVALON[®] V 1.2 mm, bonded with L 40

Table 2-1: Resource input during individual life cycle stages of

 $1m^2 EVALON^{\ensuremath{\mathbb{R}}} V 1.2 \text{ mm}$ - bonded with alwitra adhesive L 40

Following, the resulting indicators of the life cycle impact assessment, of the resource input as well as of residues and other output flows for 1 m² of roofing and waterproofing membrane are displayed DESCRIPTION OF SYSTEM BOUNDARIES (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED)

Produ	uct stage		ruction s stage				Use sta	ge		-		End-of-li	ife stage		Benefits and load 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	Re-use, recovery or recycling potential		
A1 A	A2 A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D		
X	х х	Х	Х	MND	MND	MND	MND	MND	MND	MND	MND	Х	Х	MND	Х		
RESUL	TS OF T	HE LCA	4 - EN	VIRON	MENT	AL IM	PAC	Γ: EVAI	LON \	/ 1.2 –	L 40						
Para- meter	Unit	A1 -	A3	A4		A5		C2		C3/1		C3/2		D/1	D/2		
	[kg CO ₂ eq.]	6.75		3.25E		5.1E-		3.25E-2		3.85E+0		9.51E-1		.56E+0	-3.04E+0		
	g CFC11 eq [kg SO ₂ eq.]] 1.41 2.51		6.78E 8.47E		<u>7.11E-</u> 1.3E-		6.78E-1 8.47E-{		5.54E-11 9.3E-4		5.12E-10 1.77E-3		56E-10 .52E-3	-7.24E-9 -1.14E-2		
	(g (PO ₄) ³ eq.	2.31		1.92E		1.55E		1.92E-5		7.24E-5		2.14E-4		.96E-4	-1.38E-3		
	kg Ethen eq.			-2.42		3.96E		-2.42E-		5.26E-5		6.01E-5		.25E-4	-4.06E-3		
ADPE [[kg Sb eq.]		1.2E-5 1.5E-9		-9	6.04E-7		1.5E-9)	5.51E-7		1.42E-7		.61E-7	-6.18E-6		
\DPF	[MJ]	1.45	E+2	4.44E	-1	7.54E+	H0	4.44E-1	1	1.81E+0				9.92E+0		.39E+1	-6.9E+1
			tochemi	cal Ozone	e Creatio	n Potent	ial; ADF	PE = Abioti Fossil F	ic Deple uels	tion Poter							
RESULT	Potential;	DCP = Pho	tochemi A - RE 3	cal Ozone	e Creatio	n Potent	ial; ADF	PE = Abioti Fossil F	ic Deple uels	tion Poter	ntial – El		DPF = A				
Parameter PERE PERM	Potential;	DCP = Pho HE LC/ A1 - A 1.47E+ 0.0E+	-1	cal Ozone SOUR(A4 2.64E-2 -	e Creatic	E: EV A5 7.62E-1	ial; ADF	PE = Abioti Fossil Fi N V 1.2 C2 2.64E-2	ic Deple uels	tion Poter C3/1 1.73E-1 -	ntial – El	c3/2 2.5E+0	DPF = A	biotic De D/1 64E+0 -	D/2 -6.6E+0		
Parameter PERE PERM PERT	Potential;	DCP = Pho HE LCA A1 - A 1.47E+ 0.0E++ 1.47E+	3 -1 -1	Cal Ozone SOUR(A4 2.64E-2 - 2.64E-2	e Creatic	6 Potenti 6 E: EV A5 7.62E-1 7.62E-1	ALON	PE = Abioti Fossil Fi V 1.2 C2 2.64E-2 - 2.64E-2	ic Deple uels - L 4(tion Poter C3/1 1.73E-1 - 1.73E-1	ntial – El	C3/2 2.5E+0 - 2.5E+0	DPF = A	biotic De D/1 64E+0 - 64E+0	D/2 -6.6E+0 - -6.6E+0		
Parameter PERE PERM PERT PENRE	Potential;	DCP = Pho HE LCA A1 - A 1.47E+ 0.0E+ 1.47E+ 1.05E+	3 -1 -1 -1 -1 -1 -2	cal Ozone SOUR(A4 2.64E-2 -	e Creatic	E: EV A5 7.62E-1	ALON	PE = Abioti Fossil Fi N V 1.2 C2 2.64E-2	ic Deple uels - L 4(tion Poter C3/1 1.73E-1 -	ntial – El	c3/2 2.5E+0	DPF = A	biotic De D/1 64E+0 -	D/2 -6.6E+0		
Parameter PERE PERM PERT PENRE PENRM	r Unit [MJ] [MJ] [MJ] [MJ] [MJ] [MJ]	DCP = Pho HE LCA A1 - A 1.47E+ 0.0E+ 1.47E+ 1.05E+ 5.22E+	A - RE 3 -1 -1 -2 -1 -2	Cal Ozone SOUR(A4 2.64E-2 - 2.64E-2	e Creatic	E: EV A5 7.62E-1 7.62E-1 8.18E+0	ALON	PE = Abioti Fossil Fi V 1.2 C2 2.64E-2 - 2.64E-2		tion Poter C3/1 1.73E-1 - 1.73E-1 2.05E+0 -	ntial – El	C3/2 2.5E+0 - 2.5E+0	DPF = A	biotic De D/1 64E+0 - 64E+0 92E+1 -	D/2 -6.6E+0 - -6.6E+0 -7.4E+1 -		
PERE PERM PERT PENRE PENRM PENRT SM	Potential;	DCP = Pho HE LCA A1 - A 1.47E+ 0.0E+ 1.47E+ 1.05E+ 5.22E+ 1.57E+ 0.0E+	A - RE 3 1 0 -1 -2 0 -1	cal Ozone SOUR(A4 2.64E-2 - 2.64E-2 4.45E-1 - 4.45E-1 -	e Creatio	6 Potenti 6 E: EV A5 7.62E-1 7.62E-1	ALON	PE = Abioti Fossil Fi V 1.2 2.64E-2 - 2.64E-2 4.45E-1 - 4.45E-1		C3/1 1.73E-1 1.73E-1 2.05E+0 - 2.05E+0 -	Litial – El	C3/2 2.5E+0 - 2.5E+0 1.4E+1 - 1.4E+1 -	DPF = A	biotic De D/1 64E+0 - 64E+0	D/2 -6.6E+0 -6.6E+0 -7.4E+1 - -7.4E+1 -		
Parameter PERE PERM PERT PENRE PENRM PENRT SM RSF	r Unit [MJ] [MJ] [MJ] [MJ] [MJ] [MJ] [MJ] [MJ]	HE LCA A1 - A 1.47E+ 0.0E++ 1.47E+ 1.47E+ 1.05E+ 1.57E+ 0.0E++ 0.0E++	A - RE 3 -1 0 -1 -2 -1 -2 0 -1 -2 0 0 0	Cal Ozone SOUR(A4 2.64E-2 - 2.64E-2 4.45E-1 - 4.45E-1 - 0.0E+0	e Creatio	n Potenti E: EV A5 7.62E-1 7.62E-1 8.18E+0 - 8.18E+0 - 0.0E+0		PE = Abioti Fossil Fi V 1.2 2.64E-2 - 2.64E-2 - 2.64E-2 - 4.45E-1 - 0.0E+0		C3/1 C3/1 1.73E-1 1.73E-1 2.05E+0 - 2.05E+0 - 0.0E+0	Litial – El	C3/2 2.5E+0 2.5E+0 1.4E+1 1.4E+1 - 0.0E+0		D/1 64E+0 - 64E+0 92E+1 - 92E+1 - 92E+1 - 0E+0	D/2 -6.6E+0 - -6.6E+0 -7.4E+1 - -7.4E+1 - 0.0E+0		
PERE PERM PERT PENRE PENRM PENRT SM	r Unit [MJ] [MJ] [MJ] [MJ] [MJ] [MJ] [MJ] [MJ]	DCP = Phc A1 - A 1.47E+ 0.0E+ 1.47E+ 1.05E+ 1.05E+ 1.57E+ 0.0E++ 0.0E++ 0.0E++	A - RE 3 - -1 - 0 - -1 - -2 - -1 - -2 - 0 - 0 - 0 - 0 - 0 - 0 - 0 -	Cal Ozone SOUR 2.64E-2 2.64E-2 4.45E-1 - 0.0E+0 0.0E+0 0.0E+0	e Creatic	n Potenti E: EV A5 7.62E-1 7.62E-1 8.18E+0 - 8.18E+0 - 0.0E+0 0.0E+0		PE = Abioti Fossil Fi V 1.2 2.64E-2 - 2.64E-2 4.45E-1 - - 4.45E-1 - - 0.0E+0 0.0E+0		C3/1 1.73E-1 1.73E-1 1.73E-1 2.05E+0 - 2.05E+0 - 0.0E+0 0.0E+0	Litial – El	C3/2 2.5E+0 2.5E+0 1.4E+1 1.4E+1 - 0.0E+0 0.0E+0	DPF = A	biotic De D/1 64E+0 - 64E+0 92E+1 - 92E+1 - 0E+0 0E+0 0E+0	D/2 -6.6E+0 - 		
PERE PERE PERM PERT PENRE PENRE PENRM PENRT SM RSF NRSF FW	r Unit [MJ] [MJ] [MJ] [MJ] [MJ] [MJ] [MJ] [MJ]	HE LCA A1 - A 1.47E+ 0.0E+ 1.47E+ 1.05E+ 1.57E+ 0.0E++ 0.0E++ 0.0E++ 0.0E++ 0.0E++ 0.0E++ 0.0E++ 0.0E++ 9.52E- Use of reprimary enewable primary enewable p	A - RE 3 -1 0 -1 -1 -2 -1 -2 -1 -2 -1 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2	Cal Ozone SOUR A4 2.64E-2 - 2.64E-2 - 2.64E-2 - 2.64E-2 - - 2.64E-2 - - 2.64E-2 - - 2.64E-2 - - 2.64E-2 - - - 2.64E-2 - - - - - - - - - - - - -	Creation CEUS CEU	A5 7.62E-1 7.62E-1 8.18E+0 - 0.0E+0 0.0E+0 5.26E-3 excludir raw mat	ALON ALON Designed and the second sec	PE = Abioti Fossil Fi C2 2.64E-2 - 2.64E-2 4.45E-1 - - 0.0E+0 0.0E+0 2.54E-5 wable pri PERT = T primary e PENRT =	mary er Total us F = Use	C3/1 1.73E-1 - 1.73E-1 2.05E+0 - 0.0E+0 0.0E+0 9.46E-3 ergy ress e of nor sec of nor	Durces i vable pi used an-renew	C3/2 2.5E+0 - 2.5E+0 1.4E+1 - 1.4E+1 - 0.0E+0 0.0E+0 0.0E+0 3.7E-3 Ised as raimate as raimate as the second s	DPF = A	biotic De D/1 64E+0 - 64E+0 92E+1 - 0E+0 0E+0 68E-3 ritals; PE ources; F ENRM = ENRM =	D/2 -6.6E+0 - -6.6E+0 -7.4E+1 - -7.4E+1 - 0.0E+0		
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ESUL PERE PERT PENRE PENRT SM RSF FW Caption Caption Caption NHWD RWD CRU MFR	r Unit MJ MJ MJ MJ MJ MJ MJ MJ MJ MJ	HE LCA A1 - A 1.47E+ 0.0E+ 1.47E+ 1.05E+ 5.22E+ 1.57E+ 0.0E++ 0.0E++ 0.0E++ 0.0E++ 0.0E++ 0.0E++ 0.0E++ 9.52E- Use of reprimary end primary end A1 - A 1.26E- 4.46E- 4.83E- 0.0E++ 0.0E++	A - RE 3	Cal Ozone SOUR A4 2.64E-2 - 2.64E-2 4.45E-1 - 0.0E+0 0.0E+0 8.8E-5 6.39E-7 0.0E+0 0.0E+0 0.8E-5 6.39E-7 0.0E+0	CEUS	A5 7.62E-1 - 7.62E-1 - 7.62E-1 8.18E+0 - 8.18E+0 - 8.18E+0 - 8.18E+0 - 0.0E+0 0.0E+0 0.0E+0 S ANI A5 1.25E-3 2.24E-2 2.55E-4 0.0E+0 0.0E+0 0.0E+0	ALON ALON ALON ALON ALON ALON ALON ALON	PE = Abioti Fossil Fi C2 2.64E-2 - 2.64E-2 4.45E-1 - - 4.45E-1 - - 0.0E+0 0.0E+0 0.0E+0 5.1E CA C2 0.0E+0 8.8E-5 6.39E-7 0.0E+0 0.0E+0 0.0E+0 0.0E+0 0.0E+0	mary er Total use r	C3/1 1.73E-1 - 1.73E-1 2.05E+0 - 2.05E+0 - 2.05E+0 - 2.05E+0 - 0.0E+0 9.46E-3 ergy rese of renew se of nor-r ORIES C3/1 9.92E-2 7.85E-4 9.89E-5 0.0E+0	burces l vable p used as i-renewat EVA	C3/2 2.5E+0 - 2.5E+0 1.4E+1 - 1.4E+1 - 0.0E+0 3.7E-3 ised as ra imary en- is raw mat able prim le second LON V C3/2 0.0E+0 3.24E-3 1.48E-3 0.0E+0 2.2E+0 1.48E-4 3.24E-3 1.48E-4	DPF = A	biotic De D/1 64E+0 - 64E+0 92E+1 - 92E+1 - 92E+1 - 00E+0 0E+0 0E+0 0E+0 0E+0 17E-3 0E+0 - 0E+0	D/2 -6.6E+0 - -6.6E+0 -7.4E+1 - -7.4E+1 - 0.0E+0 0.0E+0 -4.9E-2 RM = Use of >ENRE = Use Use of non- rcces; SM = U: Use of net fre -5.35E-3 -2.29E-1 -2.12E-3 0.0E+0		

2.2 EVALON[®] V 1.5 mm, bonded with L 40

Table 2-2: Resource input during individual life cycle stages of $1m^2$ EVALON[®] V 1.5 mm - bonded with alwitra adhesive L 40

Following, the resulting indicators of the life cycle impact assessment, of the resource input as well as of residues and other output flows for $1 m^2$ of roofing and waterproofing membrane are displayed

DESC	RIPT	ION O	F SYS	TEM I	BOUNI	DARIE	ES (X =	INCI	LUDED		CA; MN	D = M	ODUL	E NOT	DECL	ARED)
Pro	oduct st	age	Constr process	ruction s stage			ι	Use sta	ge				End-of-li	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	Re-use, recovery or recycling potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Х	Х	Х	Х	Х	MND	MND	MND	MND	MND	MND	MND	MND	Х	Х	MND	Х
RESU	ILTS	OF TH	IE LCA	\ - EN'	VIRON	MENT	AL IM	PAC	T: EVA	LON	/ 1.5 –	L 40				
Para- meter	U	nit	A1 -	A3	A4		A5		C2		C3/1		C3/2		D/1	D/2
GWP	[kg C	O ₂ eq.]	6.75E	+00	3.25E	-02	1.07E+	-00	3.25E-0	2	3.85E+00		.51E-01	-2.5	56E+00	-3.04E+00
ODP		C11 eq.]	1.41		6.78E		7.51E-		6.78E-1		5.54E-11		12E-10		56E-10	-7.24E-09
AP EP		O ₂ eq.] O ₄) ³ eq.]	2.51E 3.01E		8.47E 1.92E		2.62E- 2.65E-		8.47E-0 1.92E-0		9.30E-04 7.24E-05		.77E-03 .14E-04		52E-03 96E-04	-1.14E-02 -1.38E-03
POCP		nen eq.]	8.00		-2.42E		1.41E-		-2.42E-0)5	5.26E-05		.01E-05		25E-04	-4.06E-03
ADPE		b eq.]	1.20		1.50E		2.74E-		1.50E-C		5.51E-07		42E-07		61E-07	-6.18E-06
ADPF		/J]	1.45E		4.44E		2.71E+		4.44E-0		1.81E+0		92E+00		39E+01	-6.90E+01
	n Poter	ntial; PO0	CP = Pho	tochemi	cal Ozone	e Creatio	n Potenti	ial; ADF		ic Deple uels	tion Poter					utrophication pletion Potential –
Parame		Unit	A1 - A		A4		A5		C2		C3/1		C3/2		D/1	D/2
PERI		[MJ]	1.47E+		2.64E-0	2	9.71E-0 ²	1	2.64E-02		1.73E-01		5E+00		4E+00	-6.6E+00
PER		[MJ]	0		-		-		-	·	-	2.	-	-0.0	-	-0.02+00
PER		[MJ]	1.47E+		2.64E-0		9.71E-0'		2.64E-02		1.73E-01		5E+00		4E+00	-6.6E+00
PENR		[MJ]	1.05E+		4.45E-0	1	2.80E+0	1	4.45E-01	2	2.05E+00	1.	4E+01	-3.9	2E+01	-7.4E+01
PENR PENR		[MJ] [MJ]	5.22E+		- 4.45E-0	1	- 2.80E+0	1	- 4.45E-01		- 2.05E+00	1.	- 4E+01	-3.0	- 2E+01	-7.4E+01
SM		[kg]	0	02	-		-	·	-		-	1.	-	0.0	-	-
RSF	:	[MJ]	0		0		0		0		0		0		0	0
NRS		[MJ]	0		0	_	0	_	0		0		0	-	0	0
FW		[m ³]	9.52E-0		2.54E-0		6.71E-03		2.54E-05		9.46E-03		7E-03		8E-03	-4.9E-02 RM = Use of
Caption	rene n rene of se	wable pr ion-rene wable p econdary	rimary er wable pr rimary er / materia	nergy res imary er nergy re I; RSF =	sources (nergy exi sources = Use of (used as cluding i used as renewat	raw mate non-rene raw mate ble secor	erials; ewable terials; ndary fu	PERT = T primary e PENRT =	otal us nergy r Total ι F = Use r	e of renev esources ise of nor e of non-r	vable pri used as n-renewa enewabl	mary ene raw mate able prima e second	ergy res erials; P ary ener dary fuel	ources; I ENRM = gy resou	PENRE = Use of Use of non- irces; SM = Use Use of net fresh
Parame		Unit	A1 - A	1	A4		A5		C2		C3/1		C3/2		D/1	D/2
HWE		[kg]	1.26E-0		0.00E+0	0	1.73E-03	3	0.00E+00		9.92E-02	0.00E		0.00E·		-5.35E-03
NHW		[kg]	4.46E-0		8.80E-0		2.44E-02		8.80E-05		7.85E-02		24E-03		+00 I3E-02	-2.29E-01
RWE		[kg]	4.83E-0		6.39E-0		3.69E-04		6.39E-07		9.89E-05		48E-03		7E-03	-2.12E-03
CRL		[kg]	0		0		0		0		0		0		-	-
MFR		[kg]	0		0		0		0		0.00E+00		0E+00		-	-
MER EEE		[kg] [MJ]	0		0		0	-+	0	- 2	2.10E+00 -	0.0	00E+00 -	76	- 3E+00	- 2.12E-01
EET		[MJ]			-		-		-				-		3E+00 3E+01	5.11E-01
	Н	WD = H						; MER :		s for er				active wa	aste disp	osed; CRU = gy; EET = Export

3.1 EVALON[®] V 1.2 mm, bonded with PUR D

Table 3-1: Resource input during individual life cycle stages of $1m^2\,\text{EVALON}^{\circledast}\,V$ 1.2 mm - bonded with alwitra adhesive PUR D

Following, the resulting indicators of the life cycle impact assessment, of the resource input as well as of residues and other output flows for 1 m² of roofing and waterproofing membrane are displayed DESCRIPTION OF SYSTEM BOUNDARIES (X = INCLUDED IN LCA: MND = MODULE NOT DECLARED)

DESC	RIPT	ION C	OF SYS	TEM	BOUN	DARIE	ES (X =	INC :	LUDED	IN L	CA; MN	ID = M	ODUL	E NOT	DECL	_ARED)
Pro	oduct sta	age		ruction s stage			l	Use sta	age			End-of-li	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	Re-use, recovery or recycling potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Х	Х	Х	Х	Х	MND	MND	MND	MNE	D MND	MND	MND	MND	Х	Х	MND	Х
RESU	LTS	OF TH	IE LCA	4 - EN	VIRON	MENT	AL IM	PAC	T:EVAL	ON V	/ 1.2 –	PUR D)			
Para- meter	U	nit	A1 -	A3	A4		A5		C2		C3/1		C3/2		D/1	D/2
GWP		O ₂ eq.]	5.56E		2.65E		1.07E+		2.65E-0		3.13E+0		′.75E-01		09E+00	-2.47E+00
		<u>C11 eq.]</u>	1.13		5.52E		6.79E-		5.52E-1		4.51E-1		.17E-10		16E-10	-5.89E-09
AP EP		O₂ eq.] O₄) ³ eq.]	2.03		6.90E 1.57E		2.21E- 2.85E-		6.90E-0 1.57E-0		7.57E-04 5.89E-05		.44E-03 .74E-04		87E-03 22E-04	-9.26E-03 -1.12E-03
POCP		nen eq.]	6.46		-1.97E		2.85E- 3.99E-		-1.97E-0		4.28E-05		.89E-05		65E-04	-3.31E-03
ADPE		ib eq.]	9.64		1.22E		2.58E-		1.22E-0		4.49E-07		.16E-07		13E-07	-5.04E-06
ADPF		/J]	1.20		3.62E		1.95E+		3.62E-0		1.47E+0		.08E+00		76E+01	-5.62E+01
									PE = Abiot Fossil F N V 1.2	uels		ntial – Ele	ements; A	.DPF = A	biotic De	pletion Potential -
Parame	eter l	Unit	A1 - A	3	A4		A5		C2		C3/1		C3/2		D/1	D/2
PERE		MJ]	1.19E+	01	2.15E-0	2	1.13E+0	0	2.15E-02	2	7.27E-02	2	.1E+00	-7.1	19E-01	-5.3E+00
PERM PERT		[MJ] [MJ]	0 1.19E+	01	- 2.15E-0	2	- 1.13E+0	0	- 2.15E-02	>	- 1.40E-01	2	- .1E+00	-2 9	- 6E+00	-5.3E+00
PENR		MJ]	8.64E+		3.63E-0		2.07E+0		3.63E-01		1.67E+00		.1E+01		9E+01	-6.1E+01
PENRI		MJ]	4.26E+		-		-		-		-		-		-	-
PENR	T [MJ]	1.29E+	02	3.63E-0	1	2.07E+0	1	3.63E-01		1.67E+00	1	.1E+01	-3.1	9E+01	-6.1E+01
SM		[kg]	0		-		-		-		-		-		-	-
RSF		MJ]	0		0		0		0		0		0		0	0
NRSF FW		[MJ] [m³]	0 7.68E-(02	0 2.07E-0	5	0 7.42E-0	3	0 2.07E-05	;	0 7.70E-03	3	0 .0E-03	-1 6	0 52E-03	0 -4.0E-02
1 1 1																RM = Use of
Caption	renev n rene of se	wable pi on-rene wable p condary	rimary er wable pr rimary er y materia	nergy re rimary e nergy re Il; RSF =	sources i nergy exe sources = Use of	used as cluding used as renewat	raw mat non-rene raw mat ble secor	erials; ewable terials; ndary f	PERT = T primary e PENRT = fuels; NRS wate	otal us nergy r Total i F = Us	e of renev esources use of nor e of non-r	wable pr used as n-renewa renewab	imary en s raw mat able prim le secono	ergy res erials; P ary ener dary fuel	ources; ENRM = rgy resou ls; FW =	PENRE = Use of - Use of non- urces; SM = Use Use of net fresh
RESU	LTS	OF TH	IE LCA	<u>- OU</u>	TPUT	FLOW	/S ANI	O WA	STE CA	ATEG	ORIES	: EVA	LON V	1.2 -	PUR D	
Parame		Unit	A1 - A		A4		A5		C2		C3/1		C3/2		D/1	D/2
HWD		[kg]	1.06E-0		0.00E+0		2.48E-03		0.00E+00		8.08E-02		E+00	0.00E		-4.35E-03
NHWE		[kg]	3.58E-0		7.18E-0		2.46E-02		7.18E-05		6.40E-04		71E-03		16E-02	-1.87E-01
RWD CRU		[kg] [kg]	<u>3.97E-</u> 0	03	5.21E-0 0	1	<u>5.17E-04</u> 0	4	5.21E-07 0		8.05E-05 0	1.	20E-03 0	-1./	7E-03	-1.73E-03
MFR		[kg] [kg]	0		0		0		0		0 0.00E+00	1	0 71E+00	+	-	-
MER		[kg]	0		0		0		0		1.71E+00		00E+00		-	+ -
EEE		[Kg] [MJ]	-		-		-		-		-	0.	-	62	- 1E+00	1.73E-01
EET		MJ]	-		-		-		-		-		-		9E+01	4.17E-01
	H	WD = H								ls for ei				active wa	aste disp	oosed; CRU = gy; EET = Expor
		-	-		-							-			-	

3.2 EVALON[®] V 1.5 mm, bonded with PUR D

Table 3-2: Resource input during individual life cycle stages of $1m^2\,\text{EVALON}^{\$}\,V$ 1.5 mm - bonded with alwitra adhesive PUR D

Following, the resulting indicators of the life cycle impact assessment, of the resource input as well as of residues and other output flows for 1 m² of roofing and waterproofing membrane are displayed DESCRIPTION OF SYSTEM BOUNDARIES (X = INCLUDED: MND = MODULE NOT DECLARED)

					BOUN					,						1
Product stage Construction process stage								Use sta	age				End-of-li		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	Re-use, recovery or recycling potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Х	Х	Х	Х	Х	MND	MND	MND	MN	D MND	MND	MND	MND	Х	Х	MND	Х
RESU	RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: EVALON V 1.5 – PUR D															
Para- meter	Ui	nit	A1 -	A3	A4		A5		C2		C3/1		C3/2		D/1	D/2
GWP	[kg C0	O₂ eq.]	6.74E	+00	3.25E	-02	1.15E+	·00	3.25E-0	2	3.85E+00) 9	51E-01	-2.5	56E+00	-3.04E+00
		C11 eq.]	1.41		6.78E		8.19E-		6.78E-1		5.54E-11		12E-10		56E-10	-7.24E-09
AP		$D_2 eq.]$	2.51		8.47E		2.45E-		8.47E-0		9.30E-04		77E-03		52E-03	-1.14E-02
EP POCP	[kg (PC), eq.] nen eq.]	3.01E 8.00E		1.92E -2.42E		3.14E-		1.92E-0 -2.42E-0		7.24E-05 5.26E-05		14E-04		96E-04 25E-04	-1.38E-03 -4.06E-03
ADPE	[kg S		1.20		-2.42E 1.50E		4.07E-03 2.70E-06		1.50E-0		5.51E-05		6.01E-05 1.42E-07		23E-04 61E-07	-4.06E-03 -6.18E-06
ADPF	. 0	1J]	1.45E		4.44E		2.08E+01		4.44E-0		1.81E+00		9.92E+00		39E+01	-6.90E+01
		_														utrophication
Caption	n Poten	tial; POC	CP = Pho	tochemi	cal Ozone	e Creatio	n Potent	ial; AD	PE = Abioti	c Deple	ion Poter	itial – Ele	ments; A	DPF = A	biotic De	pletion Potential –
									Fossil Fu	uels .						•
RESU	LTS	OF TH	IE LCA	- RE	SOUR	CE US	E: EV	ALO	N V 1.5	– PUF	R D					
Parame	eter l	Jnit	A1 - A3	3	A4		A5		C2		C3/1		C3/2		D/1	D/2
PERE		MJ]	1.47E+	01	2.64E-0	2	1.27E+0	0	2.64E-02	1	.73E-01	2.	5E+00	-3.6	4E+00	-6.6E+00
PERM		MJ]	0	~ /	-	_	-	_	-		-		-		-	-
PERT PENRI		MJ] MJ]	1.47E+		2.64E-0 4.45E-0		1.27E+0 2.21E+0		2.64E-02 4.45E-01		.73E-01 .05E+00		5E+00 4E+01		4E+00 2E+01	-6.6E+00 -7.4E+01
PENRI		MJ]	5.22E+		4.432-0	1	2.21E+0	1	4.43E-01	2	-	1.	-	-3.9	20+01	-7.4E+01
PENR			0.2221		4.45E-0	1	2.21E+0	1	4.45E-01	2	.05E+00	1.	4E+01	-3.9		
	ТП	MJI	1.57E+	02											2E+01	- -7.4E+01
SM		MJ] [kg]	1.57E+0 0	02	-		-	-	4.45E-01 -		-		-		2E+01 -	-7.4E+01
SM RSF	[MJ] [kg] MJ]		02	- 0		- 0		<u>4.43E-01</u> - 0		- 0		- 0		2E+01 - 0	-7.4E+01 -7.00
SM RSF NRSF	[= [[kg] MJ] MJ]	0 0 0		- 0 0		- 0 0		- 0 0		- 0 0		0		- 0 0	- 0 0
SM RSF	= [[kg] MJ] MJ] [m ³]	0 0 9.67E-0)2	- 0 2.54E-0	5	- 0 0 8.48E-03	3	- 0 2.54E-05	g	- 0 0 .46E-03		0 7E-03	-5.6	- 0 0 8E-03	- 0 0 -4.9E-02
SM RSF NRSF FW Caption	F [F [F [F [F [F [F [F [F [F [[kg] MJ] MJ] ERE = I wable pr on-rene wable pr wable pr condary	0 0 9.67E-(Use of re rimary er wable pr rimary er v materia	02 newable hergy res imary en hergy re l; RSF =	- 0 2.54E-0 e primary sources nergy ex sources = Use of	5 / energy used as cluding used as renewat	- 0 8.48E-03 r excludir raw mat non-rene raw mat ple secor	3 ng ren erials; ewable terials; ndary f	- 0 2.54E-05 ewable prin PERT = T primary ei ; PENRT = fuels; NRS wate	mary en otal use nergy re Total u F = Use r	- 0 0 46E-03 ergy reso of renew sources se of nor of non-r	ources u vable pri used as i-renewa enewabl	0 7E-03 sed as ra mary ene raw mate ble prima e second	-5.6 aw mate ergy reso erials; P ary ener dary fuel	- 0 0 38E-03 rials; PE ources; I ENRM = gy resou s; FW =	- 0 -4.9E-02 RM = Use of PENRE = Use of use of non- urces; SM = Use Use of net fresh
SM RSF NRSF FW Caption	F [F [F [F [F [F [F [F [F [F [[kg] MJ] MJ] ERE = I wable pr on-rene wable pr wable pr condary	0 0 9.67E-(Use of re rimary er wable pr rimary er v materia	02 newable hergy res imary en hergy re l; RSF =	- 0 2.54E-0 e primary sources nergy ex sources = Use of	5 / energy used as cluding used as renewat	- 0 8.48E-03 r excludir raw mat non-rene raw mat ple secor	3 ng ren erials; ewable terials; ndary f	- 0 2.54E-05 ewable prin PERT = T primary er ; PENRT = fuels; NRS	mary en otal use nergy re Total u F = Use r	- 0 0 46E-03 ergy reso of renew sources se of nor of non-r	ources u vable pri used as i-renewa enewabl	0 7E-03 sed as ra mary ene raw mate ble prima e second	-5.6 aw mate ergy reso erials; P ary ener dary fuel	- 0 0 38E-03 rials; PE ources; I ENRM = gy resou s; FW =	- 0 -4.9E-02 RM = Use of PENRE = Use of s Use of non- urces; SM = Use Use of net fresh
SM RSF NRSF FW Caption RESU Parame	P renev of se	[kg] MJ] MJ] ERE = I wable pr on-rene wable pr oon-rene wable pr oon-rene production wable pr oon-rene production p	0 0 9.67E-(Use of re imary er wable pr rimary er materia IELCA	02 newable hergy re- imary en hergy re l; RSF = l; RSF =	- 0 2.54E-0 e primary sources nergy ex- sources = Use of TPUT A4	5 v energy used as cluding used as renewal FLOW	- 0 0 8.48E-03 rexcludir raw mat non-rene raw mat ole secor /S ANII A5	3 ng ren erials; ewable terials; ndary f	- 0 2.54E-05 ewable prin PERT = T primary er ; PENRT = fuels; NRS wate ASTE CA	mary en otal use nergy re Total u F = Use r TEG	- 0 0 .46E-03 ergy resc of renew sources se of nor- of non-r DRIES	vable pri used as i-renewa enewabl	0 7E-03 sed as ra mary ene raw mate ble prima e second ON V C3/2	-5.6 aw mate ergy rese erials; P ary ener lary fuel 1.5 – 1	- 0 0 8E-03 rials; PE ources; I ENRM = gy resou s; FW = PUR D	- 0 0 -4.9E-02 RM = Use of PENRE = Use of Use of non- urces; SM = Use Use of net fresh
SM RSF NRSF FW Caption RESU Parame HWD	P renev of se	[kg] MJ] MJ] ERE = I wable pr on-rene wable pr condary OF TH Jnit [kg]	0 0 9.67E-(Use of re- rimary er wable pr rimary er materia IE LCA A1 - A: 1.26E-(02 newablaergy rea imary en nergy re inergy re l; RSF =	- 0 2.54E-0 e primary sources sources = Use of TPUT A4 0.00E+0	5 v energy used as cluding used as renewat	- 0 0 8.48E-03 r excludir raw mat non-rene raw mat ole secor /S ANI A5 1.73E-03	3 ng ren erials; ewable terials; ndary f D WA 3	- 0 2.54E-05 ewable prin PERT = T primary er ; PENRT = fuels; NRS wate STE CA C2 0.00E+00	mary en otal use nergy re Total u F = Use r \TEG(- 0 0 .46E-03 ergy rese of renev sources se of non-r of non-r DRIES C3/1 .92E-02	vable pri used as i-renewa enewabl	0 7E-03 sed as ra mary ene raw matu ble prima e second ON V C3/2 00E+00	-5.6 aw mate ergy reso erials; P ary ener lary fuel 1.5 – 1 0.00	- 0 0 8E-03 rials; PE ources; I ENRM = gy resou s; FW = PUR D D/1 0E+00	- 0 0 -4.9E-02 RM = Use of PENRE = Use of Use of non- urces; SM = Use Use of net fresh D/2 -5.35E-03
SM RSF NRSF FW Caption RESU Parame HWD NHWE	Prenew renew of se	[kg] MJ] MJ] MJ] PERE = I wable pr on-rene wable pr condary OF TH Jnit [kg]	0 0 9.67E-C Use of re- imary er wable pr rimary er v materia IELCA A1 - A: 1.26E-C 4.46E-C	02 newable hergy resimary en hergy resimary en h	- 0 2.54E-0 e primary sources nergy ex: sources = Use of TPUT A4 0.00E+C 8.80E-0	5 v energy used as cluding used as renewat FLOW	- 0 8.48E-00 v excludir raw mat non-rene raw mat ole secor /S ANII A5 1.73E-00 2.44E-02	3 ng ren erials; ewable terials; ndary f D WA 3 2	- 0 2.54E-05 ewable prin PERT = T primary ei ; PENRT = fuels; NRS wate STE CA C2 0.00E+00 8.80E-05	mary en otal use nergy re Total u F = Use r ATEG	- 0 0 -46E-03 ergy reso of renew sources se of nor- of non-r DRIES C3/1 	enewable EVAL	0 7E-03 sed as ra mary ene raw matu ble prima e second _ON V C3/2 00E+00 24E-03	-5.6 aw mate ergy rese erials; P ary ener lary fuel 1.5 – 1 0.00 -1.4	- 0 0 8E-03 rials; PE purces; I ENRM = gy resou s; FW = PUR D D/1 0E+00 i3E-02	- 0 0 -4.9E-02 RM = Use of PENRE = Use of Use of non- urces; SM = Use Use of net fresh D/2 -5.35E-03 -2.29E-01
SM RSF FW Caption RESU Parame HWD NHWE RWD	Prenework renework of se	[kg] MJ] MJ] MJ] PERE = I wable pr on-rene wable pr condary OF TH Jnit [kg] [kg]	0 0 9.67E-(Use of re imary er wable pr rimary er v materia 1E LCA A1 - A: 1.26E-(4.46E-(4.83E-()	02 newable hergy resimary en hergy resimary en h	- 0 2.54E-0 e primary sources = sources = Use of TPUT A4 0.00E+C 8.80E-0 6.39E-0	5 v energy used as cluding used as renewat FLOW	- 0 0 8.48E-03 rexcludir raw mat non-rene raw mat ble secor /S ANI A5 1.73E-03 2.44E-03 3.69E-04	3 ng ren erials; ewable terials; ndary f D WA 3 2	- 0 2.54E-05 ewable prin PERT = T primary er ; PENRT = fuels; NRS wate STE CA C2 0.00E+00 8.80E-05 6.39E-07	mary en otal use nergy re Total u F = Use r ATEG	- 0 0 -46E-03 ergy resc of renew sources se of nor-r DRIES C3/1 .92E-02 .85E-04 .89E-05	enewable EVAL	0 7E-03 sed as ra mary ene raw matu ble prima e second .ON V C3/2 00E+00 24E-03 18E-03	-5.6 aw mate ergy rese erials; P ary ener lary fuel 1.5 – 1 0.00 -1.4	- 0 0 8E-03 rials; PE ources; I ENRM = gy resou s; FW = PUR D D/1 0E+00	- 0 0 -4.9E-02 RM = Use of PENRE = Use of Use of non- Urces; SM = Use Use of net fresh D/2 -5.35E-03
SM RSF NRSF FW Caption RESU Parame HWD NHWE	Prenevo renevo of se ULTS etter	[kg] MJ] MJ] MJ] MJ] Walle pronon-rene wable pronon-rene wable pronon-rene Wable pronon-rene Wable pronon-rene MB MB MB Wable pronon-rene Wable pronon-rene Wable pronon-rene MB MB MB MB MB Kg] [kg] [kg]	0 0 9.67E-C Use of re- imary er wable pr rimary er v materia IELCA A1 - A: 1.26E-C 4.46E-C	02 newable hergy resimary en hergy resimary en h	- 0 2.54E-0 e primary sources nergy ex: sources = Use of TPUT A4 0.00E+C 8.80E-0	5 v energy used as cluding used as renewat FLOW	- 0 8.48E-00 v excludir raw mat non-rene raw mat ole secor /S ANII A5 1.73E-00 2.44E-02	3 ng ren erials; ewable terials; ndary f D WA 3 2	- 0 2.54E-05 ewable prin PERT = T primary ei ; PENRT = fuels; NRS wate STE CA C2 0.00E+00 8.80E-05	mary en otal use nergy re Total use r ATEG	- 0 0 .46E-03 ergy resc o frenev sources se of nor-r DRIES C3/1 .92E-02 .85E-04 .89E-05 0	EVAL	0 7E-03 sed as ra mary ene raw mat- ble prima e second .ON V C3/2 00E+00 24E-03 18E-03 0	-5.6 aw mate ergy rese erials; P ary ener lary fuel 1.5 – 1 0.00 -1.4	- 0 0 8E-03 rials; PE purces; I ENRM = gy resou s; FW = PUR D D/1 0E+00 i3E-02	- 0 0 -4.9E-02 RM = Use of PENRE = Use of Use of non- urces; SM = Use Use of net fresh D/2 -5.35E-03 -2.29E-01 -2.12E-03 -
SM RSF FW Caption RESU Parame HWD NHWD RWD CRU	Eter U	[kg] MJ] MJ] MJ] PERE = I wable pr on-rene wable pr condary OF TH Jnit [kg] [kg]	0 0 9.67E-(Use of re- rimary er wable pr wable pr wable pr imary er (1.26E-(4.46E-(4.83E-(0	02 newable hergy resimary en hergy resimary en h	- 0 2.54E-0 e primary sources sources Use of TPUT A4 0.00E+0 8.80E-0 6.39E-0 0	5 v energy used as cluding used as renewat FLOW	- 0 8.48E-03 rexcludir raw mat non-rene raw mat ole secor (S ANII A5 1.73E-03 2.44E-03 3.69E-04 0	3 ng ren erials; ewable terials; ndary f D WA 3 2	- 0 2.54E-05 ewable prin PERT = T primary ei ; PENRT = fuels; NRS wate STE CA C2 0.00E+00 8.80E-05 6.39E-07 0	mary en otal use mergy re Total u F = Use r ATEC	- 0 0 -46E-03 ergy resc of renew sources se of nor-r DRIES C3/1 .92E-02 .85E-04 .89E-05	EVAL	0 7E-03 sed as ra mary ene raw matu ble prima e second .ON V C3/2 00E+00 24E-03 18E-03	-5.6 aw mate ergy rese erials; P ary ener lary fuel 1.5 – 1 0.00 -1.4	- 0 0 8E-03 rials; PE purces; I ENRM = gy resou s; FW = PUR D D/1 0E+00 i3E-02	- 0 0 - 4.9E-02 RM = Use of PENRE = Use of Use of non- urces; SM = Use Use of net fresh D/2 -5.35E-03 -2.29E-01
SM RSF FW Caption RESU Parame HWD NHWE RWD CRU MFR MER EEE	P P renev of se LTS (ter U D [kg MJ MJ MJ MJ MJ Wable propriation on-rene wable propriation wable propriation OFTH Jnit [kg] [kg] [kg] [kg]	0 0 9.67E-(Use of re- imary er wable pr rimary er v materia 1.26E-(4.46E-(4.46E-(0 0 0	02 newable hergy resimary en hergy resimary en h	- 0 2.54E-0 e primary sources = Use of TPUT A4 0.00E+C 8.80E-0 6.39E-0 0 0	5 v energy used as cluding used as renewat FLOW	- 0 8.48E-00 excludir raw mat non-rene raw mat ble secor (S ANII A5 1.73E-00 2.44E-00 3.69E-00 0 0	3 ng ren erials; ewable terials; ndary f D WA 3 2	- 0 2.54E-05 ewable prin PERT = T primary ei PENRT = fuels; NRS wate STE C/ 0.00E+00 8.80E-05 6.39E-07 0 0	mary en otal use mergy re Total u F = Use r ATEC	- 0 0 .46E-03 ergy resc of renev sources se of non-r of non-r DRIES C3/1 .92E-02 .85E-04 .89E-05 0 .00E+00	EVAL	0 7E-03 sed as ra mary ene raw matu ble prima e second C3/2 00E+00 24E-03 18E-03 0 0E+00	-5.6 aw mate ergy resc erials; P ary ener lary fuel 1.5 – 1 0.00 -1.4 -2.1 -7.63	- 0 0 88E-03 rials; PE pources; I ENRM = gy resou s; FW = PUR D 0E+00 33E-02 7E-03 - - - - - - -	- 0 0 - 4.9E-02 RM = Use of PENRE = Use of Use of non- Urces; SM = Use Use of net fresh5.35E-03 -2.29E-01 -2.12E-03 2.12E-01 - 2.12E-01
SM RSF FW Caption Parame HWD NHWD RWD CRU MFR MER	Image: Constraint of the second sec	kg MJ MJ MJ MJ Walle pronon-rene wable prono-rene	0 0 9.67E-(Use of re imary er wable pr rimary er materia IE LCA A1 - A : 1.26E-(4.46E-(4.83E-(0 0 0 - -	02 inergy re- imary energy ener	- 0 2.54E-0 e primary sources + sources + sources + TPUT A4 0.00E+C 8.80E-0 6.39E-0 0 0 0 0 -	5 v energy used as cluding used as renewat FLOW 00 5 7 	- 0 0 8.48E-03 excludir raw mat non-rene raw mat ole secor (S ANI A5 1.73E-03 2.44E-03 3.69E-04 0 0 0	3 ng ren erials; wable terials ndary f	- 0 2.54E-05 ewable prin PERT = T primary ei ; PENRT = fuels; NRS wate STE CA C2 0.00E+00 8.80E-05 6.39E-07 0 0 0 0 -	generation of the second	- 0 0 -46E-03 ergy resc of renew issources se of non-r ORIES: 0 0 0 0 0 0 0 0 0 0 0 0 0	EVAI	0 7E-03 sed as ra mary ene raw matuble prima e second C3/2 00E+00 0E+00 00E+00 00E+00 0 0E+00 00E+00	-5.6 aw mate erigly resc erials; P ary ener lary fuel 1.5 – 1 0.00 -1.4 -2.1 	- 0 0 88E-03 rials; PE pources; I ENRM = gy resou s; FW = PUR D 0E+00 33E-02 7E-03 - - - - - - - - - - - - - - - - - -	- 0 0 -4.9E-02 RM = Use of PENRE = Use of Use of non- urces; SM = Use Use of net fresh D/2 -5.35E-03 -2.29E-01 -2.12E-03

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$\diamond \diamond \diamond$ End of translation $\diamond \diamond \diamond$

I, Christina Baumeyer, certified translator for the English language, certify that the translation of this document is true, correct and complete.

Schwetzingen, 25 July 2014