Statement of Verification

BREG EN EPD No.: 000386 Issue 01

This is to verify that the

Environmental Product Declaration

provided by:

Sika Services AG

BRE Global Verified EPD

is in accordance with the requirements of:

EN 15804:2012+A2:2019

and

BRE Global Scheme Document SD207

This declaration is for:

1 kg Sika MonoTop®-4012

Company Address

Tueffenwies 16
Zurich
8048
Switzerland

BUILDING TRUST

Signed for BRE Global Ltd	Emma Baker Operator	07 February 2022 Date of this Issue
07 February 2022 Date of First Issue		06 February 2027 Expiry Date

Environmental Product Declaration

EPD Number: 000386

General Information

EPD Programme Operator	Applicable Product Category Rules
BRE Global Watford, Herts WD25 9XX United Kingdom	BRE Environmental Profiles 2013 Product Category Rules for Type III environmental product declaration of construction products to EN 15804+A2 PN 514
Commissioner of LCA study	**LCA consultant/Tool**
Sika Services AG Tueffenwies 16 Zurich 8048 Switzerland	Sika Technology AG Tueffenwies 16 Zurich 8048 Switzerland www.sika.com/sustainability
Declared Unit	**Applicability/Coverage**
1 kg of concrete repair mortar	Product Average.
EPD Type	**Background database**
Cradle to Gate with options	GaBi

Demonstration of Verification
CEN standard EN 15804 serves as the core PCR [a]
Independent verification of the declaration and data according to EN ISO 14025:2010 ☐Internal ☒ External
(Where appropriate [b])Third party verifier: Nigel Jones
a: Product category rules b: Optional for business-to-business communication; mandatory for business-to-consumer communication (see EN ISO 14025:2010, 9.4)

Comparability
Environmental product declarations from different programmes may not be comparable if not compliant with EN 15804:2012+A2:2019. Comparability is further dependent on the specific product category rules, system boundaries and allocations, and background data sources. See Clause 5.3 of EN 15804:2012+A2:2019 for further guidance

Information modules covered

Product			Construction		Use stage							End-of-life					Benefits and loads beyond the system boundary
					Related to the building fabric					Related to the building							
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4		D
Raw materials supply	Transport	Manufacturing	Transport to site	Construction – Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction demolition	Transport	Waste processing	Disposal		Reuse, Recovery and/or Recycling potential
☑	☑	☑	☑	☑	☐	☐	☐	☐	☐	☐	☐	☑	☑	☑	☑		☑

Note: Ticks indicate the Information Modules declared.

Manufacturing site(s)

The environmental product declaration is for 1 kg of Sika MonoTop®-4012 produced by Sika Österreich GmbH at following manufacturing facilities:

Sika Österreich GmbH
Bingser Dorfstraße 23
Postfach 168
6700 Bludenz
Austria

Construction Product

Product Description

Sika MonoTop®-4012 is a 1-part, cementitious, fibre reinforced, low shrinkage repair mortar. It contains recycled materials (supplementary cementitious materials). Sika MonoTop®-4012 can be applied in layers with thickness between 6 and 120 mm, with a fresh density of 2.1 kg/L.

Technical Information

Property	Value, Unit
Compressive strength after 28 days	~56 MPa
Modulus of elasticity in compression	≥ 20 GPa
Tensile strength in flexure after 28 days	~ 8 MPa
Tensile Adhesion Strength	≥ 2 MPa
Shrinkage after 28 days	~500 µm/m
Restrained shrinkage/ Expansion	≥ 2 MPa
Thermal compatibility, part 1 Freeze-Thaw	≥ 2 MPa
Coefficient of Thermal expansion	~16 x 10^{-6} 1/k
Reaction to fire	Euro class A1
Capillary absorption	≤ 0.5 kg/(m^2.$h^{0.5}$)
Chloride ion diffusion resistance	Low, <2000 Coulombs

Property	Value, Unit
Carbonation resistance	dk≤ control concrete MC (0.45)
Electrical resistivity	< 100 kΩ.cm

Further information about the product including product data sheet can be accessed via www.sika.com

Main Product Contents

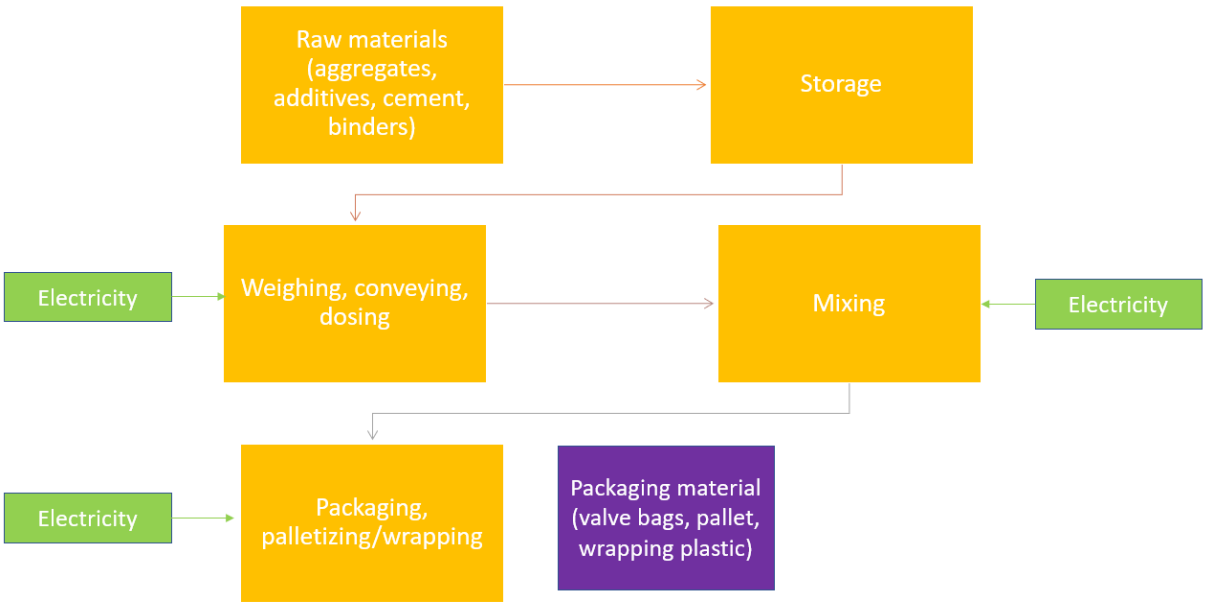
Material/Chemical Input	%
Hydraulic Binders	20 - 25
Functional Fillers	60 - 70
Supplementary cementitious material (SCM) Reactive Binders	10 – 15
Polymers and Additives	0 – 1

Manufacturing Process

The Sika MonoTop®-4012 is manufactured in a conventional mortar plant in Bludenz, Austria.

The raw materials are stored after the quality control testing is passed. The majority of the raw materials are dosed automatically into the mixers after the weighing and dosing phase. If resulting material does not pass the quality test, it will be reworked and send back to the mixing station. After confirming expected results it is send to the packaging station.

Process flow diagram



Construction Installation

Sika MonoTop®-4012 is a structural concrete repair mortar that is applied over the prepared concrete substrate after a proper mixing with water. The material can be hand applied or machine applied depending on the volume and area to be applied. The consumption of the material will depend on the roughness and quality of the substrate, as average is 2.1 kg/m^2/mm. The product is only intended for professional use. Please refer to the product data sheet and method statement for detailed instructions.

Use Information

During the services life of the building or infrastructure there is no extraordinary maintenance, repair/refurbishment or replacement required, if Sika MonoTop®-4012 is correctly and properly applied.

The high durability and reliability of the structural concrete repair mortar Sika MonoTop®-4012 will limit any repair work to a minimum.

End of Life

At the end of its service life the building is demolished and as the Sika MonoTop®-4012 is attached to the concrete it is generally taken to landfill. The demolition process concerns mainly the concrete structure of which Sika MonoTop®-4012 is a minor part.

Life Cycle Assessment Calculation Rules

Declared unit description

1 kg Sika MonoTop®-4012.

System boundary

In accordance with the modular approach as defined in EN 15804, this cradle to gate with options EPD includes the product stage (A1-A3), construction process stage (A4-A5), end-of-life stage (C1-C4) and benefits beyond the system boundary (D).

Data sources, quality and allocation

The primary data provided by Sika derive from the plant in Bludenz, Austria for 2020. Mass allocation was applied to generate data per declared unit of product. Background LCI datasets are taken from the databases of GaBi software and ecoinvent Version 3.7.1. All datasets are less than10 years old.

Benefits from incineration of packaging are included as benefits in Module D; this also applies to the reuse of wooden pallets.

Cut-off criteria

All data was taken into consideration (recipe constituents, thermal energy used, electricity used). Transportation was considered for all inputs and outputs. The manufacturing of the production machines and systems and associated infrastructure were not considered in the LCA.

LCA Results

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Parameters describing environmental impacts									
			GWP-total	GWP-fossil	GWP-biogenic	GWP-luluc	ODP	AP	EP-freshwater
			kg CO_2 eq	kg CO_2 eq	kg CO_2 eq	kg CO_2 eq	kg CFC11 eq	mol H^+ eq	kg $(PO_4)^{3-}$ eq
Product stage	Raw material supply	A1	AGG	AGG	AGG	AGG	AGG	AGG	AGG
	Transport	A2	AGG	AGG	AGG	AGG	AGG	AGG	AGG
	Manufacturing	A3	AGG	AGG	AGG	AGG	AGG	AGG	AGG
	Total (of product stage)	A1-3	3.40E-01	3.48E-01	-8.02E-03	4.46E-04	8.74E-10	1.44E-03	3.35E-06
Construction process stage	Transport	A4	7.56E-03	7.51E-03	-9.57E-06	6.15E-05	9.59E-19	2.35E-05	2.23E-08
	Construction	A5	3.70E-03	1.04E-03	2.67E-03	3.06E-07	-1.33E-10	-1.13E-05	-1.06E-10
Use stage	Use	B1	MND	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND	MND
End of life	Deconstruction, demolition	C1	6.18E-04	6.41E-04	-2.81E-05	5.06E-06	7.89E-20	3.04E-06	1.83E-09
	Transport	C2	7.52E-03	7.46E-03	-9.52E-06	6.11E-05	9.53E-19	2.33E-05	2.22E-08
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	1.47E-02	1.51E-02	-4.39E-04	4.45E-05	5.94E-17	1.08E-04	2.55E-08
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	3.58E-02	-8.41E-03	4.42E-02	-5.15E-07	-8.42E-10	-5.31E-05	-2.21E-06

GWP-total = Global warming potential, total;
GWP-fossil = Global warming potential, fossil;
GWP-biogenic = Global warming potential, biogenic;
GWP-luluc = Global warming potential, land use and land use change;

ODP = Depletion potential of the stratospheric ozone layer;
AP = Acidification potential, accumulated exceedance; and
EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment

LCA Results (continued)

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Parameters describing environmental impacts									
			EP-marine	EP-terrestrial	POCP	ADP-mineral& metals	ADP-fossil	WDP	PM
			kg N eq	mol N eq	kg NMVOC eq	kg Sb eq	MJ, net calorific value	m^3 world eq deprived	disease incidence
Product stage	Raw material supply	A1	AGG	AGG	AGG	AGG	AGG	AGG	AGG
	Transport	A2	AGG	AGG	AGG	AGG	AGG	AGG	AGG
	Manufacturing	A3	AGG	AGG	AGG	AGG	AGG	AGG	AGG
	Total (of product stage)	A1-3	1.93E-04	2.11E-03	5.72E-04	2.44E+00	9.77E-08	1.12E-02	1.16E+00
Construction process stage	Transport	A4	1.08E-05	1.21E-04	2.11E-05	9.99E-02	5.71E-10	6.52E-05	7.22E-02
	Construction	A5	-4.35E-07	-3.49E-06	-2.09E-06	-2.65E-02	4.46E-12	7.28E-04	2.57E-03
Use stage	Use	B1	MND	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND	MND
End of life	Deconstruction, demolition	C1	1.43E-06	1.58E-05	4.03E-06	8.22E-03	4.70E-11	5.36E-06	5.94E-03
	Transport	C2	1.07E-05	1.20E-04	2.10E-05	9.93E-02	5.68E-10	6.48E-05	7.18E-02
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	2.80E-05	3.07E-04	8.47E-05	2.01E-01	1.43E-09	1.62E-03	1.14E-01
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-7.04E-04	-1.31E-04	-5.18E-05	-1.67E-01	-2.83E-08	-5.28E-03	-1.80E-01

EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment;
EP-terrestrial = Eutrophication potential, accumulated exceedance;
POCP = Formation potential of tropospheric ozone;
ADP-mineral&metals = Abiotic depletion potential for non-fossil resources;
ADP-fossil = Depletion potential of the stratospheric ozone layer;
WDP = Water (user) deprivation potential, deprivation-weighted water consumption; and
PM = Particulate matter.

LCA Results (continued)

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Parameters describing environmental impacts							
			IRP	ETP-fw	HTP-c	HTP-nc	SQP
			kBq U^{235} eq	CTUe	CTUh	CTUh	dimensionless
Product stage	Raw material supply	A1	AGG	AGG	AGG	AGG	AGG
	Transport	A2	AGG	AGG	AGG	AGG	AGG
	Manufacturing	A3	AGG	AGG	AGG	AGG	AGG
	Total (of product stage)	A1-3	4.44E-11	2.64E-09	1.43E+00	0.00E+00	0.00E+00
Construction process stage	Transport	A4	1.46E-12	8.55E-11	3.43E-02	0.00E+00	0.00E+00
	Construction	A5	-7.04E-14	3.74E-12	2.17E-04	0.00E+00	0.00E+00
Use stage	Use	B1	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND
End of life	Deconstruction, demolition	C1	1.20E-13	7.21E-12	2.82E-03	0.00E+00	0.00E+00
	Transport	C2	1.45E-12	8.50E-11	3.41E-02	0.00E+00	0.00E+00
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	1.69E-11	1.86E-09	4.24E-02	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-2.69E-11	-1.46E-10	-3.05E+00	0.00E+00	0.00E+00

IRP = Potential human exposure efficiency relative to U235;
ETP-fw = Potential comparative toxic unit for ecosystems;
HTP-c = Potential comparative toxic unit for humans;
HTP-nc = Potential comparative toxic unit for humans; and
SQP = Potential soil quality index.

LCA Results (continued)

Parameters describing resource use, primary energy								
			PERE	PERM	PERT	PENRE	PENRM	PENRT
			MJ	MJ	MJ	MJ	MJ	MJ
Product stage	Raw material supply	A1	AGG	AGG	AGG	AGG	AGG	AGG
	Transport	A2	AGG	AGG	AGG	AGG	AGG	AGG
	Manufacturing	A3	AGG	AGG	AGG	AGG	AGG	AGG
	Total (of product stage)	A1-3	7.70E-01	1.11E-01	5.33E-01	3.80E+00	7.77E-03	2.44E+00
Construction process stage	Transport	A4	5.58E-03	0.00E+00	5.58E-03	1.00E-01	0.00E+00	1.00E-01
	Construction	A5	1.03E-01	-1.11E-01	-7.77E-03	7.77E-03	-7.77E-03	0.00E+00
Use stage	Use	B1	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND
End of life	Deconstruction, demolition	C1	4.59E-04	0.00E+00	4.59E-04	8.23E-03	0.00E+00	8.23E-03
	Transport	C2	5.54E-03	0.00E+00	5.54E-03	9.95E-02	0.00E+00	9.95E-02
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	2.71E-02	0.00E+00	2.71E-02	2.01E-01	0.00E+00	2.01E-01
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-5.43E-01	0.00E+00	-5.43E-01	-1.67E-01	0.00E+00	-1.67E-01

PERE = Use of renewable primary energy excluding renewable primary energy 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 resource

LCA Results (continued)

Parameters describing resource use, secondary materials and fuels, use of water						
			SM	RSF	NRSF	FW
			kg	MJ net calorific value	MJ net calorific value	m^3
Product stage	Raw material supply	A1	AGG	AGG	AGG	AGG
	Transport	A2	AGG	AGG	AGG	AGG
	Manufacturing	A3	AGG	AGG	AGG	AGG
	Total (of product stage)	A1-3	0.00E+00	0.00E+00	0.00E+00	5.96E-04
Construction process stage	Transport	A4	0.00E+00	0.00E+00	0.00E+00	6.38E-06
	Construction	A5	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use stage	Use	B1	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	5.25E-07
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	6.35E-06
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	4.94E-05
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	-1.24E-04

SM = Use of secondary material;
RSF = Use of renewable secondary fuels;
NRSF = Use of non-renewable secondary fuels;
FW = Net use of fresh water

LCA Results (continued)

Other environmental information describing waste categories					
			HWD	NHWD	RWD
			kg	kg	kg
Product stage	Raw material supply	A1	AGG	AGG	AGG
	Transport	A2	AGG	AGG	AGG
	Manufacturing	A3	AGG	AGG	AGG
	Total (of product stage)	A1-3	1.27E-09	1.59E-02	3.55E-05
Construction process stage	Transport	A4	5.04E-12	1.49E-05	1.21E-07
	Construction	A5	5.69E-14	5.98E-06	-2.16E-06
Use stage	Use	B1	MND	MND	MND
	Maintenance	B2	MND	MND	MND
	Repair	B3	MND	MND	MND
	Replacement	B4	MND	MND	MND
	Refurbishment	B5	MND	MND	MND
	Operational energy use	B6	MND	MND	MND
	Operational water use	B7	MND	MND	MND
End of life	Deconstruction, demolition	C1	4.15E-13	1.22E-06	9.96E-09
	Transport	C2	5.01E-12	1.48E-05	1.20E-07
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	2.14E-11	1.00E+00	2.07E-06
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-3.57E-12	-6.56E-06	-9.32E-07

HWD = Hazardous waste disposed;
NHWD = Non-hazardous waste disposed;
RWD = Radioactive waste disposed

LCA Results (continued)

Other environmental information describing output flows – at end of life								
			CRU	MFR	MER	EE	Biogenic carbon (product)	Biogenic carbon (packaging)
			kg	kg	kg	MJ per energy carrier	kg C	kg C
Product stage	Raw material supply	A1	AGG	AGG	AGG	AGG	AGG	AGG
	Transport	A2	AGG	AGG	AGG	AGG	AGG	AGG
	Manufacturing	A3	AGG	AGG	AGG	AGG	AGG	AGG
	Total (of product stage)	A1-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	-2.30E-3
Construction process stage	Transport	A4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MNR	MNR
	Construction	A5	0.00E+00	0.00E+00	0.00E+00	3.18E-03	MNR	MNR
Use stage	Use	B1	MND	MND	MND	MND	MNR	MNR
	Maintenance	B2	MND	MND	MND	MND	MNR	MNR
	Repair	B3	MND	MND	MND	MND	MNR	MNR
	Replacement	B4	MND	MND	MND	MND	MNR	MNR
	Refurbishment	B5	MND	MND	MND	MND	MNR	MNR
	Operational energy use	B6	MND	MND	MND	MND	MNR	MNR
	Operational water use	B7	MND	MND	MND	MND	MNR	MNR
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MNR	MNR
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MNR	MNR
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MNR	MNR
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MNR	MNR
Potential benefits and loads beyond the system	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MNR	MNR

CRU = Components for reuse;
MFR = Materials for recycling

MER = Materials for energy recovery;
EE = Exported Energy

Scenarios and additional technical information

Scenarios and additional technical information			
Scenario	Parameter	Units	Results
A4 – Transport to the building site	Transport of Sika MonoTop®-4012 to the building site		
	Diesel / Euro 5 Truck	L/100 km	0.0025
	Distance	km	100
	Capacity utilisation (incl. empty returns)	%	61
	Bulk density of transported products	kg/m^3	1.3
A5 – Construction installation	Treatment of packaging material (incineration)	%	100
C1 to C4 End of life,	Dismantling and transport of Sika MonoTop®-4012 to final disposal		
	Transport of the product to site of disposal	km	50
	Diesel	L/100 km	0.0025
	Capacity utilization	%	61
	Waste for final disposal to landfill	%	100
Module D	The benefits from incineration of waste produced during installation are credited in Module D as avoided generation of electricity and thermal. The partial reuse of pallets from packaging is also included in Module D as avoided production of new pallets.		

Summary, comments and additional information

Interpretation

Figure 1 shows the relative contributions of the different modules to the various environmental impact categories and to primary energy use in a dominance analysis.

As can be seen from the results, the product stage (Modules A1-A3) contributes the most significantly to all environmental impact categories and primary energy use. For this reason, the product stage is examined more closely in the following interpretation.

The dominant influence in all environmental impact categories arises from the raw materials involved in the production of the membrane, which represent at least 90% of the impacts in each environmental impact category. The exceptions are ODP, EP-freshwater and PERT. For ODP, 53% of the impacts arise from the production process, 12% from the packaging and 35% from the raw materials. For EP-freshwater, 35% of the impacts arise from the production process, 26% from the packaging and 40% from the raw materials. For ADPE, 10% of the impacts arise from the production process, 17% from the packaging and 73% from the raw materials. For PERT, 10% of the impacts arise from the production process, 29% from the packaging and 61% from the raw materials.

Within the raw materials, the binders play an important role in terms of GWP-total (80%), AP (87%), EP -marine (44%), EP- marine (59%), EP-terrestrial (59%), POCP (66%), and PERT (73%). The influence of the additives can be seen in ODP (100%), EP – freshwater (81%), and ADPE (77%). The influence of the fillers is minimal compared to the other material components, although they make up a relatively high proportion of the total product formulation.

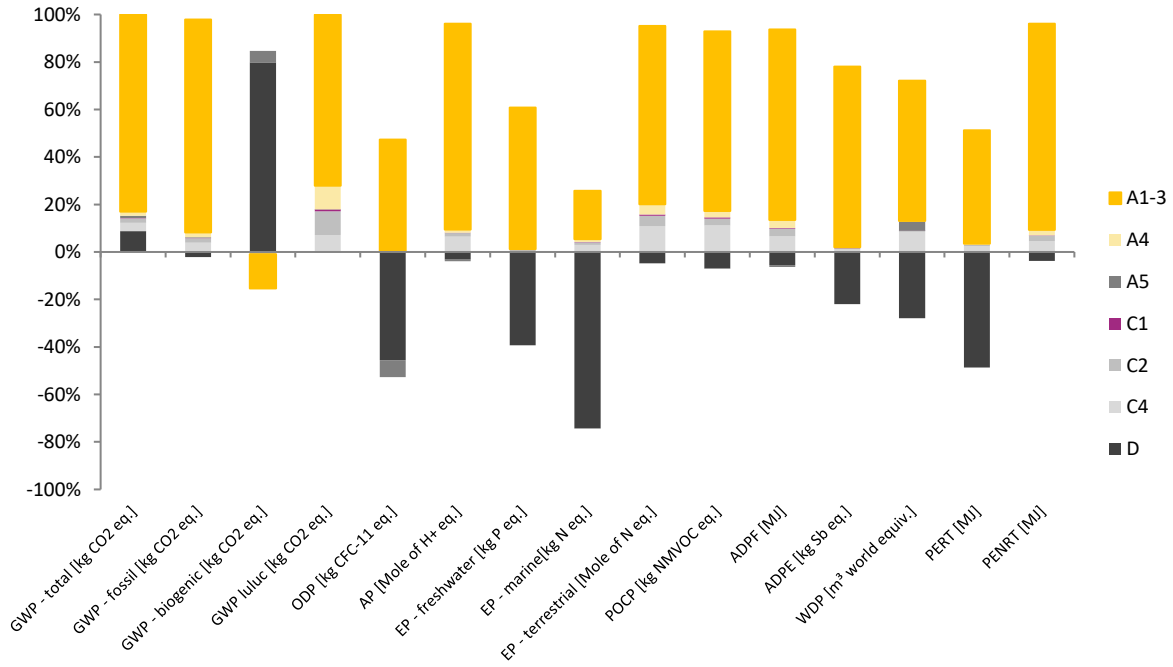


Figure 1: Relative contribution of the modules to the impact categories and primary energy demand for 1 kg Sika MonoTop®-4012.

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