



# Environmental Product Declaration

as per ISO 14025 and EN 15804+A2



Owner of the declaration:	HUESKER Synthetic GmbH
Publisher:	Kiwa-Ecobility Experts
Programme operator:	Kiwa-Ecobility Experts
Registration number:	EPD-HUESKER-224-EN
Issue date:	23.07.2022
Valid to:	23.07.2027



## **SamiGrid® XP 50 S**

Flexible, high-strength, temperature-resistant grid for effective reinforcement of asphalt layers.

## 1. General information

### HUESKER Synthetic GmbH

**Programme holder**

Kiwa-Ecobility Experts  
 Voltastr. 5  
 13355 Berlin  
 Germany

**Registration number**

EPD-HUESKER-224-EN

**This declaration is based on the Product**
**Category Rules**

PCR B - Technical textiles (draft) 2020-10-01

**Issue date**

23.07.2022

**Valid to**

23.07.2027



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 Kiwa-Ecobility Experts)

### SamiGrid® XP 50 S

**Owner of the declaration**

HUESKER Synthetic GmbH  
 Fabrikstraße 13-15  
 48712 Gescher  
 Germany

**Declared product / declared unit**

1 m<sup>2</sup> technical geotextile

**Scope**

SamiGrid® is an asphalt reinforcement grid made of high-modulus polyvinyl alcohol (PVA) yarns. The product is manufactured in Gescher and Dülmen, Germany. The product has a unit weight of 520 g/m<sup>2</sup> and a tensile strength of ≥ 50 kN/m. This EPD is a specific EPD with the type: Cradle to grave.

Kiwa GmbH – Ecobility Experts shall not be liable with respect to manufacturer information, life cycle assessment data and evidence.

**Verification**

The European standard EN 15804+A2:2019 serves as the core PCR.

Independent verification of the declaration and data according to ISO 14025:2011-10 .

 internal

 external



PhD Nils Jonkers  
 (Third party verifier – PLUK sustainability)

## 2. Product

### 2.1 Product description

SamiGrid is a composite product consisting of an asphalt reinforcement grid made from high-modulus polyvinyl alcohol (PVA) fibres in combination with a nonwoven fabric. Saturation of the nonwoven with bitumen means that SamiGrid also performs a sealing function to complement the reinforcing action of the grid.

### 2.2 Application

SamiGrid® is ideal for the rehabilitation of concrete pavements by using an asphalt overlay. Through the active retardation of reflective cracking, SamiGrid significantly extends the service life of asphalt resurfaced concrete pavements.

### 2.3 Technical data



Figure 1: Asphalt pavement with SamiGrid® (second top layer)

Characteristic	Unit	Value
Unit weight (DIN EN ISO 9864)	g/m <sup>2</sup>	520
Tensile Strength (DIN EN ISO 10319) MD	kN/m	≥ 50
Tensile Strength (DIN EN ISO 10319) CMD	kN/m	≥ 50
Strain at Nominal Tensile Strength (DIN EN ISO 10319) MD	%	≤ 6
Strain at Nominal Tensile Strength (DIN EN ISO 10319) CMD	%	≤ 6
Mesh size (approx.)	mm	40 x 40
Water permeability (EN ISO 11058)	Velocity Index (VIH50) ms <sup>-1</sup>	n.a.*
Chemical Resistance (EN ISO 13438 and EN 14030)	-	n.a.*
Alkali resistance (residual strength) (EN 14030 method B)	%	100
Bitumen content of the coating	%	≥ 65
Residual strength after installation damage test (DIN EN ISO 10722:2020)	%	≥ 80

\* Parameter is not relevant for asphalt reinforcement

### 2.4 Placing on the market/ Application rules

The products are supplied to site in rolls and installed acc. to the manufacturer's installation guideline. To ensure a good bond of the reinforcement to the surrounding asphalt, the composite must be completely coated with a bituminous coating (bitumen content ≥65%). The tensile strength and installation damage must be tested on the finished product in accordance with EN 15381 and Working Paper FGSV

No. 770. The results are to be proven by a test certificate from an accredited testing institute with the tender submission.

The grids should be allowed to be installed on a milled surface. The mechanical properties of the asphalt reinforcement must be verified by in-house and external monitoring in accordance with DIN 18200. Each delivered roll shall be marked with at least one roll label according to ISO 10320. The Quality management certificate of the manufacturer acc. to EN ISO 9001:2015 must cover the development, production, assessment, sale and application technology of geosynthetics and technical textiles.

### 2.5 Base materials / Ancillary materials

PVA fibres are used as raw materials in MD and CMD while PET fibres are used for the binding chains.

Raw material	Unit	Value
PVA	m%	29
Polyester fibre (PET)	m%	2
PP nonwoven fabric	m%	25
Bitumen	m%	44

There is no biogenic carbon in the products. The product does not contain substances from the “Candidate list of substances of very high concern for authorisation” (SVHC).

### 2.6 Manufacturing

A part of the yarn is delivered to the Dülmen plant and prepared for further processing in Gescher by means of a twisting process. The yarn that has already been processed is then transported to Gescher, where it is further processed using the Warp knitting process together with the remaining yarn, which is delivered directly there. Warp knitting is a process in which a net structure is created by intermeshing a binding thread around a longitudinal warp direction (machine direction) and a transversal weft direction (cross machine direction). In the warp knitting process, a textile fabric is produced by combining several thread systems (e.g. warp, weft and binding thread) by stitch formation on the nonwoven fabric. It is possible to produce structures with very low elongation. After the yarn and the nonwoven have been processed into a composite, the entire product is dip coated with a bitumen. After drying, the asphalt reinforcement mesh is rolled up on cardboard rolls, packed and stored until delivery.

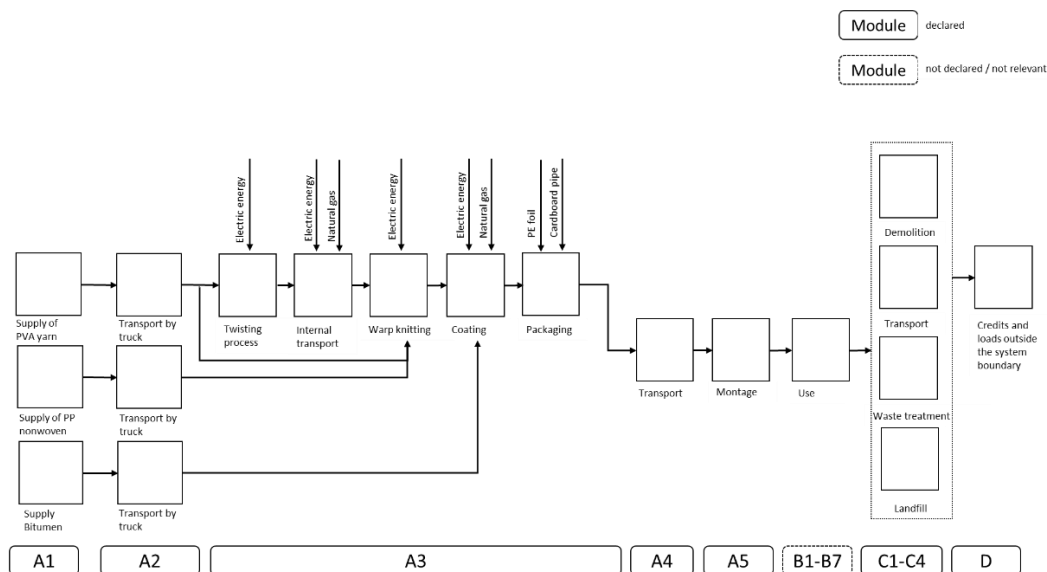


Figure 2: Simplified process flow chart of the production of SamiGrid®

## 2.7 Packaging

Packaging is carried out by rolling the product onto board pipes and then wrapping it in PE foil.

## 2.8 Reference Service Life (RSL)

The service life of the reinforcement grid depends on the service life of the entire asphalt pavement. This is dependent on both the exact pavement structure and the intensity of use.

An average service life of 20 years is assumed as RSL, which is also used as a standard value in a study on the quality and service life of asphalt wearing courses by Rosauer (2010).

## 2.9 Other Information

For further information on this product please visit the official HUESKER webpage under the following link: <https://www.huesker.com/>

## 3. LCA: Calculation rules

### 3.1 Declared unit

In accordance with the PCR B 1 m<sup>2</sup> technical textile is chosen as the declared unit.

Product	Unit	Value
Declared Unit	m <sup>2</sup> technical textile	1
Unit weight	g/m <sup>2</sup>	520
Conversion factor to 1 kg	-	1,923

### 3.2 System boundary

The Environmental Product Declaration is a complete life cycle with a functional unit. It considers all potential environmental impacts of the product from the cradle to the end of life. The manufacturing phase includes the production or extraction of the source materials, the transport to the respective production plant and the production of the geotextiles. All inputs (raw materials, precursors, energy and auxiliary materials) as well as the by-products and waste are considered for all life cycle phases. Furthermore, only production-related energy consumption (excluding administration and social rooms) is considered.

It was assumed that no activities for maintenance, repair, transport and replacement, refurbishment or other material and energy flows take place during the useful life of 20 years (RSL). Modules B1 to B3 are therefore assumed to be zero. Product replacement (B4) and renovation (B5) only apply when the product is considered in a lifespan (of a building, work, etc.). Operational water and energy use are not considered.

The year 2021 represents the time reference. Due to the production locations and the main economic connections, Germany and The Netherlands are considered as the geographical reference area. However, environmental effects such as the greenhouse effect can occur with a strong spatial and temporal offset.

The following production steps are considered during the manufacturing phase:

- Production of the synthetic yarn
- Preparation of the coating paste
- Transports between the Dülmen and Gescher plants
- Production of the geotextile (twisting process, warp-knitting production, coating)



- Packaging of the reinforcement grid
- Transport to the place of use
- Installation and removal of the reinforcement grids
- Disposal of packaging
- End-of-life (including transport)

Secondary fuels are not included in the production process and are therefore not considered. The waste materials and quantities produced are included in the respective modules.

### 3.3 Estimates and assumptions

It was possible to record the transport distances for all raw materials used (raw materials, operating materials, packaging). A payload factor of 50 percent was used for all truck transports (suppliers, disposal transports and internal transports), which in fact corresponds to a full delivery and empty return trip. A data set for a non-specific truck was used.

Due to the bitumen coating of the finished product, which does not allow the components to be sorted into a pure PVA, PET or PP fraction, no mechanical recycling is possible. In relation to the total production quantity, 3 percent of waste of coated grid is generated. Other waste accounts for less than 1 percent by mass of the final product and is not included in the balance due to its small volume.

The electricity mix was chosen according to the geographical reference area (Germany) and time reference. As only the conventional electricity mix is used, no other energy sources were considered. No CO<sub>2</sub> certificates were considered. An average transport distance between the production site to the customer is assumed to be 250 km (truck). This distance covers a large part of the customer base (such as the Netherlands and North Rhine-Westphalia).

### 3.4 Cut-off criteria

For the process modules A1 to A3 all process-specific data was collected. Nearly all flows could be assigned potential environmental impacts through the Ecoinvent database. All flows that contribute to more than 1 percent of the total mass, energy or environmental impact of the system were considered in the LCA. It can be assumed that the neglected processes would have contributed less than 5 percent to the impact categories considered.

### 3.5 Period under review

All process-specific data was collected for the operating year 2021.

### 3.6 Data quality

All process-specific data was collected for the 2021 operating year and is therefore up-to-date. The data is based on the annual average. In order to ensure comparability of the results, only consistent background data of the Ecoinvent database V3.6 was used in the LCA (e.g., records on energy, transportation, supplies and supplies), which refers to reference year 2019. The database is regularly reviewed and thus complies with the requirements of EN 15804 (background data not older than 10 years). All consistent datasets contained in the Ecoinvent database are documented and can be viewed in the online Ecoinvent documentation. The primary data were provided by HUESKER. The life cycle was modelled with the Nibe EPD App. Geographical reference space of the background data is Germany. The overall representativeness and the precision for all datasets were determinate with the DQR formula, a ranking method based on the PEF approach.

### 3.7 Allocation

Allocations were avoided in the LCA, so there are no by-products and multi-input processes. Allocation with regarding to reuse, recycling and recovery were considered in the waste scenarios.

### 3.8 Comparability

In principle, a comparison or assessment of the environmental impacts of different products is only possible if they have been prepared in accordance with EN 15804. For the evaluation of the comparability, the following aspects have to be considered in particular: PCR used, functional or declared unit, geographical reference, definition of the system boundary, declared modules, data selection (primary or secondary data, background database, data quality), scenarios used for use and disposal phases, and the life cycle inventory (data collection, calculation methods, allocations, validity period). PCRs and general program instructions of different EPDs programs may differ. A comparability needs to be evaluated. For further guidance see EN 15804+A2 (5.3 Comparability of EPD for construction products) and ISO 14025 (6.7.2 Requirements for comparability).

#### 4. LCA: Scenarios and additional technical information

When installing asphalt reinforcement grid, a site vehicle is used to roll out the product onto the road structure. Apart from rolling out, no further installation measures are necessary, which would otherwise be required during road construction. A reject or unused portion of 5 percent of the asphalt reinforcement is assumed.

At the end of the service life of an asphalt reinforcement, the asphalt including the asphalt reinforcement is milled off. As a rule, 100 percent of the milled material is recycled and reused. During processing, approx. 20 percent by mass of the asphalt reinforcement is screened off and sent for thermal recycling. The remaining 80 M-% remains in the milled material and is reused, for example, as base course material or in the production of new asphalt mix. Since the proportion of asphalt reinforcement in the reused milled material is max. 0,2 percent by mass, the milling process does not allocate the asphalt reinforcement.

The transport distances of the waste are based on the standard waste scenarios of the NMD Determination Method (SBK 2019): incineration 150 km/ recycling 50 km / landfill 100 km; vehicle: truck, unspecified. For energy recovery, it is assumed that only fossil raw materials are substituted, considering the calorific values of the raw materials of the declared product and energy and thermal efficiencies of 18 percent and 32 percent. The scenario calculates for recycling that the material "polyethylene, HDPE, granulate" is substituted. According the EN 15804, loads are credited in A3 or C3 to C4 and benefits are credited in module D.

#### 5. LCA: Results

The following tables show the results of the impact assessment indicators, resource use, waste and other output streams. The results presented here refer to the declared average product.

Disclaimer on ADP-e, ADP-f, WDP, ETP-fw, HTP-c, HTP-nc, SQP: The results of these environmental impact indicators must be used with caution, as the uncertainties in these results are high or as there is limited experience with the indicator.

Disclaimer on IR: This impact category mainly addresses the potential effect of low dose ionizing radiation on human health in the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents and occupational exposures, nor does it consider radioactive waste disposal in underground facilities. Potential ionizing radiation from soil, radon, and some building materials is also not measured by this indicator.



**Description of the system boundary**

Product stage			Construction process stage		Use stage							End of life stage				Benefits and loads beyond the system boundaries
Raw material supply	Transport	Manufacturing	Transport from manufacturer to place of use	Construction - installation process	Use	Maintenance	Repair	Replacement	Refurbishmen	Operational energy use	Operational water use	Deconstruction / demolition	Transport	Waste processing	Disposal	Reuse- Recovery- Recycling- potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	MNR	MNR	MNR	MND	MND	MND	MND	X	X	X	X	X

X=Module declared | MND=Module not declared | MNR= Module not relevant

**Results of the LCA – Environmental impact: 1 m<sup>2</sup> asphalt reinforcement SamiGrid® XP 50 S**

Parameter	Unit	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
<b>Core environmental impact indicators (EN 15804+A2)</b>											
ADP-mm	kg Sb-eqv	1,11E-05	3,57E-07	7,97E-07	2,69E-07	4,96E-07	0,00E+00	1,24E-07	2,07E-06	0,00E+00	-9,20E-08
ADP-f	MJ	3,16E+01	3,94E-01	3,13E+00	1,60E-01	1,63E+00	0,00E+00	7,38E-02	1,62E+00	0,00E+00	-2,37E+00
AP	mol H+ eqv.	3,44E-03	7,25E-04	4,37E-04	6,17E-05	5,43E-04	0,00E+00	2,84E-05	5,32E-04	0,00E+00	-1,34E-04
EP-fw	kg PO4 eqv.	2,20E-05	1,67E-07	1,24E-05	1,07E-07	1,27E-06	0,00E+00	4,94E-08	2,97E-06	0,00E+00	-2,27E-07
EP-m	kg N eqv.	5,89E-04	1,73E-04	8,66E-05	2,17E-05	2,01E-04	0,00E+00	1,00E-05	1,48E-04	0,00E+00	-4,00E-05
EP-t	mol N eqv.	6,55E-03	1,93E-03	1,10E-03	2,40E-04	2,22E-03	0,00E+00	1,10E-04	1,63E-03	0,00E+00	-4,58E-04
GWP-b	kg CO2 eqv.	-7,20E-04	-6,06E-06	5,94E-03	4,91E-06	7,80E-03	0,00E+00	2,26E-06	-5,90E-04	0,00E+00	3,21E-04
GWP-f	kg CO2 eqv.	7,80E-01	2,97E-02	2,07E-01	1,06E-02	8,34E-02	0,00E+00	4,89E-03	4,13E-01	0,00E+00	-1,42E-01
GWP-luluc	kg CO2 eqv.	4,93E-04	2,03E-05	1,46E-04	3,90E-06	2,60E-05	0,00E+00	1,79E-06	9,94E-05	0,00E+00	-9,27E-06
GWP-total	kg CO2 eqv.	7,80E-01	2,97E-02	2,13E-01	1,06E-02	9,12E-02	0,00E+00	4,90E-03	4,12E-01	0,00E+00	-1,42E-01
ODP	kg CFC 11 eqv.	6,60E-08	6,07E-09	1,50E-08	2,35E-09	1,13E-08	0,00E+00	1,08E-09	1,61E-08	0,00E+00	-1,85E-08
POCP	kg NMVOC eqv.	2,90E-03	5,08E-04	3,01E-04	6,84E-05	6,43E-04	0,00E+00	3,15E-05	5,09E-04	0,00E+00	-1,42E-04
WDP	m3 world eqv.	2,15E+00	8,22E-04	7,85E-02	5,74E-04	6,90E-02	0,00E+00	2,64E-04	3,74E-02	0,00E+00	-2,42E-02
<b>Additional environmental impact indicators (EN 15804+A2)</b>											
ETP-fw	CTUe	1,21E+01	2,82E-01	2,25E+00	1,43E-01	8,90E-01	0,00E+00	6,58E-02	3,55E+00	0,00E+00	-2,67E-01
HTP-c	CTUh	2,66E-10	1,69E-11	3,76E-11	4,64E-12	4,75E-11	0,00E+00	2,13E-12	2,04E-10	0,00E+00	-1,09E-11
HTP-nc	CTUh	9,25E-09	2,53E-10	1,12E-09	1,56E-10	6,89E-10	0,00E+00	7,20E-11	2,91E-09	0,00E+00	-1,93E-10
IR	kBq U235 eqv.	1,13E+00	1,68E-03	4,14E-02	6,72E-04	3,76E-02	0,00E+00	3,09E-04	5,03E-03	0,00E+00	-8,27E-04
PM	disease incidence	2,48E-08	1,28E-09	2,45E-09	9,56E-10	1,13E-08	0,00E+00	4,40E-10	8,27E-09	0,00E+00	-6,10E-10
SQP		3,97E+00	1,26E-01	6,03E-01	1,39E-01	2,48E-01	0,00E+00	6,40E-02	1,25E+00	0,00E+00	-5,17E-01

ADP-mm= Abiotic depletion potential for non-fossil resources | ADP-f=Abiotic depletion for fossil resources potential | AP= Acidification potential, Accumulated Exceedance | EP-fw = Eutrophication potential, fraction of nutrients reaching freshwater end compartment | EP-m= Eutrophication potential, fraction of nutrients reaching marine end compartment | EP-T= Eutrophication potential, Accumulated Exceedance | GWP-b=Global Warming Potential biogenic | GWP-f=Global Warming Potential fossil fuels | GWP-luluc=Global Warming Potential land use and land use change | GWP-total=Global Warming Potential total | ODP=Depletion potential of the stratospheric ozone layer | POCP=Formation potential of tropospheric ozone | WDP=Water (user) deprivation potential, deprivation- weighted water consumption | ETP-fw=Potential Comparative Toxic Unit for ecosystems | HTP-c=Potential Toxic Unit for Humans toxicity, cancer | HTP-nc= Potential Toxic Unit for humans, non-cancer | IRP=Potential Human exposure efficiency relative to U235, human health | PM=Potential incidence of disease due to Particulate Matter emissions | SQP=Potential soil quality index

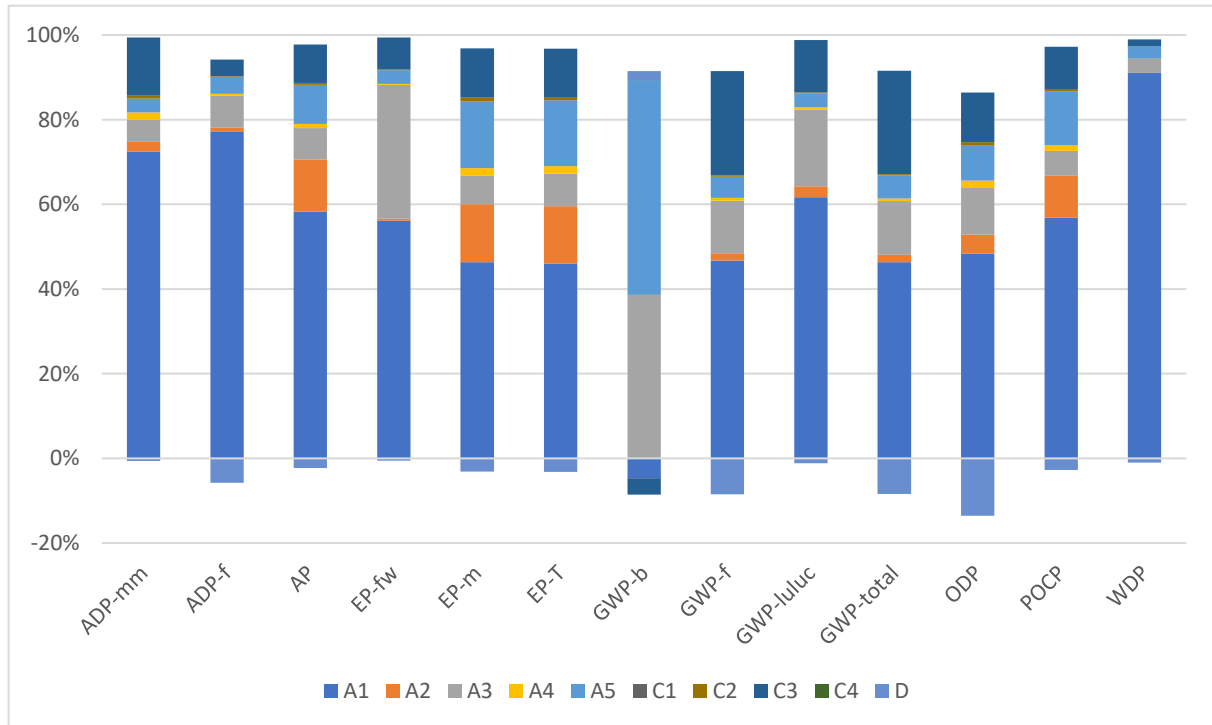
**Results of the LCA – Resource use and environmental information: 1 m<sup>2</sup> asphalt reinforcement SamiGrid® XP 50 S**

Parameter	Unit	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
PERE	MJ	6,38E-01	3,36E-03	1,09E-01	2,01E-03	2,82E-02	0,00E+00	9,24E-04	8,64E-02	0,00E+00	-9,29E-02
PERM	MJ	0,00E+00	0,00E+00	9,55E-02	0,00E+00	2,87E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-8,65E-03
PERT	MJ	6,38E-01	3,36E-03	2,05E-01	2,01E-03	3,10E-02	0,00E+00	9,24E-04	8,64E-02	0,00E+00	-1,02E-01
PENRE	MJ	1,77E+01	4,18E-01	2,80E+00	1,70E-01	1,24E+00	0,00E+00	7,84E-02	1,73E+00	0,00E+00	-2,62E+00
PENRM	MJ	1,61E+01	0,00E+00	5,81E-01	0,00E+00	4,99E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-1,76E-03
PENRT	MJ	3,38E+01	4,18E-01	3,38E+00	1,70E-01	1,74E+00	0,00E+00	7,84E-02	1,73E+00	0,00E+00	-2,63E+00
SM	Kg	0,00E+00	0,00E+00	2,64E-03	0,00E+00	7,92E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	M3	4,95E-02	2,85E-05	2,24E-03	1,95E-05	1,62E-03	0,00E+00	8,99E-06	1,07E-03	0,00E+00	-4,63E-04
HWD	Kg	6,02E-05	5,26E-07	3,60E-06	4,06E-07	3,42E-06	0,00E+00	1,87E-07	2,61E-06	0,00E+00	-3,01E-06
NHWD	Kg	4,77E-02	6,96E-03	8,55E-03	1,02E-02	5,63E-03	0,00E+00	4,68E-03	7,78E-02	0,00E+00	-1,25E-03
RWD	Kg	3,26E-05	2,70E-06	6,25E-06	1,05E-06	4,98E-06	0,00E+00	4,85E-07	6,17E-06	0,00E+00	-1,21E-06
CRU	Kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	Kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,31E-02	0,00E+00	0,00E+00	4,14E-01	0,00E+00	0,00E+00
MER	Kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EE	MJ	0,00E+00	0,00E+00	2,60E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,69E+00

PERE=Use of renewable primary energy excluding renewable primary energy resources used as raw materials | PERM= Use of renewable primary energy resources used as raw materials | PERT=Total use of renewable primary energy resources | PENRE= Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials | PENRM= Use of non-renewable primary energy resources used as raw materials | PENRT= Total use of non-renewable primary energy resources | SM=Use of secondary material | RSF=Use of renewable secondary fuels | NRSF=Use of non-renewable secondary fuels | FW=Use of fresh water | HWD=Hazardous waste disposed | NHWD=Non-hazardous waste disposed | RWD=Radioactive waste disposed | CRU=Components for re-use | MFR=Materials for recycling | MER=Materials for energy recovery | EE=Exported energy

## 6. LCA: Interpretation

As shown in figure below, the raw material (A1) has the greatest influence on the life cycle of Sami-Grid® XP 50 S. Manufacturing (A3) and the installation process (A5) have similarly high values in most categories. A5 is very dependent on the assumption (here 5 % products reject and diesel consumption construction site vehicle) and can therefore deviate greatly from the actual result. All transports (A2, A4, C2) have only a minor impact.



**Figure 3: SamiGrid® XP 50 S - Impact of the individual modules on the environmental core indicator**

The data quality can be classified as good overall. All relevant process-specific data could be collected in the operational data collection. Consistent data sets from the Ecoinvent database were available for almost all inputs and outputs. The background data meet the requirements of EN 15804, and the production data were recorded for the 2021 operating year. The quantities of raw materials and supplies used as well as energy consumption were recorded for the entire operating year. The life cycle assessment was carried out for all the product items listed.

Data quality was calculated using the Data Quality Rating method according to the PEF approach. The DQRs range from 1,75 to 2,0 for all inputs.

## 7. References

European Commission Joint Research Centre Institute for Prospective Technological Studies (JCR 2014): End-of-waste criteria for waste plastic for conversion, Seville, 2014, doi:10.2791/13033

Rosauer, V. (2010): Abschätzung der herstellungsbedingten Qualität und Lebensdauer von Asphalt-deckschichten mit Hilfe der Risikoanalyse (Estimation of the production-related quality and service life of asphalt wearing courses with the aid of risk analysis). Technischen Universität Darmstadt, 2010

Stichting Bouwkwaliiteit (SBK) – Foundation for Building Quality; “Determination Method: Environmental Performance of Buildings and Civil Engineering Works”

NMD determination method: Stichting Nationale Milieudatabase; Bepalingsmethode Milieuprestatie Bouwwerken; Version 1.0; July 2020; Berekeningswijze voor het bepalen van de milieuprestatie van bouwwerken gedurende hun gehele levensduur, gebaseerd op de EN 15804.

### Standards and laws

ISO 14040:2006, Environmental management - Life cycle assessment - Principles and framework

ISO 14044:2006, Environmental management - Life cycle assessment - Requirements and guidelines

ISO 14025:2006: Environmental labels and declarations — Type III environmental declarations — Principles and procedures EN 13249

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

PCR A: General Program Category Rules for Construction Products from the EPD program Kiwa-Ecobility Experts, R.O\_2021-07-16

PCR B: Product Category Rules (PCR) from the Kiwa-Ecobility Experts EPD program: “Geosynthetic products”, edition 2022-02-08 (draft)

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