Environmental Product Declaration

as per ISO 14025 and EN 15804 +A1

Owner of the declaration:	HUESKER Synthetic GmbH
Publisher:	Kiwa BCS Öko-Garantie GmbH - Ecobility Experts
Programme holder:	Kiwa BCS Öko-Garantie GmbH - Ecobility Experts
Declaration number:	EPD-HUESKER-098-EN
Issue date:	19.05.2021
Valid to:	18.05.2026

Stabilenka®

Highly resilient woven geotextile for reinforcement, separation and filtration

1. General information

HUESKER Synthetic GmbH

Programme holder
Kiwa BCS Öko-Garantie GmbH
- Ecobility Experts
Marientorbogen 3-5
90402 Nürnberg
Germany

Declaration number
EPD-HUESKER-098-EN

This declaration is based on the Product Category Rules
PCR B - Technical textiles (draft) 2020-10-01

Issue date
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Valid to
18.05.2026

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Stabilenka®

Owner of the declaration
HUESKER Synthetic GmbH
Fabrikstraße 13-15
48712 Gescher
Germany

Declared product / declared unit
1 m^2 woven geotextile

Scope
Stabilenka® is a higly resilient woven geotextile for reinforcement, separation and filtration. The product based on PET fiber and manufactured in Gescher and Dülmen, Germany. The EPD is based on the composition of the product grade Stabilenka® 400/50 (unit weight 780 g/m^2). The LCA results can also be transferred by scaling to all other Stabilenka® products grades (e.g. 100/50, 150/45, 200/45, 300/45, 600/50, 800/100, 1000/100), which mainly differ only in their unit weights.
Kiwa BCS Öko-Garantie GmbH – Ecobility Experts shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

Verification
The CEN Norm EN 15804:2012+A1:2013 serves as the core PCR

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

☐internally ☒externally

PhD Niels Jonkers
(External verifier – PLUK sustainability)

2. Product

2.1 Product description

Stabilenka® is a woven geotextile for soil reinforcement. The high-strength, low-creep Stabilenka® woven reduces deformations of the structure under permanently high loads. Stabilenka exhibits an extremely low creep strain of less than 1% when subjected to a permanent load equal to 50% of the short-term strength after the construction phase. This makes Stabilenka® suitable for a wide range of applications such as the reinforcement of earthworks or sludge lagoon covers. Stabilenka® is woven or knitted from polyester in longitudinal direction (MD) and in transverse direction (CMD). The use of high-modulus polyester multifilament yarns and special weaving techniques guarantee that Stabilenka® mobilises high tensile forces at low elongation. Stabilenka® is manufactured in eight standard versions with a maximum tensile strength of up to 1000 kN/m in the main direction of stress.

- Stabilenka® 100/50 (woven)
- Stabilenka® 150/45 (woven)
- Stabilenka® 200/45 (woven)
- Stabilenka® 300/45 (knitted)
- Stabilenka® 400/50 (knitted)
- Stabilenka® 600/50 (knitted)
- Stabilenka® 800/100 (knitted)
- Stabilenka® 1000/100 (knitted)

2.2 Application

The Stabilenka® product group is installed and used as primary reinforcement in a wide variety of earthwork structures. Typical fields of application are:

- Embankments on soft soils
- Sludge lagoon covers
- Land reclamation
- Supporting structures for reinforced soil

2.3 Technical data

The technical data is listed in the table below. The values for the unit weight depend on the product type and its corresponding tensile strength. For this reason, only the value ranges for Stabilenka® are given here.

Characteristic	Value	Unit
Unit weight (DIN EN ISO 9864)	250 - 1680	g/m²
Tensile Strength (DIN EN ISO 10319) MD*	100 - 1000	kN/m
Tensile Strength (DIN EN ISO 10319) CMD	45 - 100	kN/m
Strain at Nominal Tensile Strength (DIN EN ISO 10319) MD	≤ 10	%
Strain at Nominal Tensile Strength (DIN EN ISO 10319) CMD	≤ 20	%
Characteristic opening size O_{90} (DIN EN ISO 12956)	70 - 260	µm
Standard roll dimension (width x length)	5,0 x 300 / 5,0 x 200 / 5,0 x 100	m x m
Water permeability (DIN EN ISO 11058)	4 - 30	l/(m² x s)
Chemical Resistance (DIN EN ISO 13438 and DIN EN 14030)	n.a.*	-
Durability (DIN EN 13249ff, Appendix B)	Predicted to be durable for 100 years in natural soils with 4 ≤ pH ≤ 9 and soil temperatures ≤ 25 °C	

*EN ISO 13438 describes a test method that is used in a modified form to assess the durability of PP, PE, AR, PA and PVA according to EN 13249 ff.

2.4 Placing on the market/ Application rules

For quality assurance purposes, geotextiles for use in earthworks and foundation engineering are regulated according to EN13249 ff. and marked with a CE mark by the manufacturer. For the placing on the market the regulation (EU) No. 305/2011 of March 9, 2011 applies. For the use of the products the national regulations apply.

2.5 Base materials / Ancillary materials

PET fibres are used as raw materials for all yarns used (CMD, MD and binding chains).

Raw material	Value	Unit
Polyester (PET)	100	m%

2.6 Manufacture

Production takes place at the Dülmen and Gescher sites. The yarn, which is required as the basic material for the production of geotextile, is delivered by truck from a distance of 950 km to the production site in Dülmen. There the yarn is conducted to the twisting process and transported to Gescher for further processing. There the processed yarn is delivered on pallets. This simplifies the internal transport and further processing of the yarn in the weaving / warp-knitting process.

The woven structure is produced on weaving or knitting machines. The product items Stabilenka® 100/50 to 200/45 are woven, the product items Stabilenka® 300/45 to 1000/100 are knitted. The transverse threads (weft) and the longitudinal threads (warp) are made entirely of polyester.

In the warp knitting process, a textile fabric is produced from several thread systems (e.g. warp, weft and binding thread) by stitch formation. It is possible to produce structures with very low elongation. Depending on the type, the roll size of the geotextile is between 500 and 1,500m² with a width of 5 metres. The geotextile is rolled up on steel pipes. The manufacturing processes for the various Stabilenka® products can be seen in Figure 1 and Figure 2.

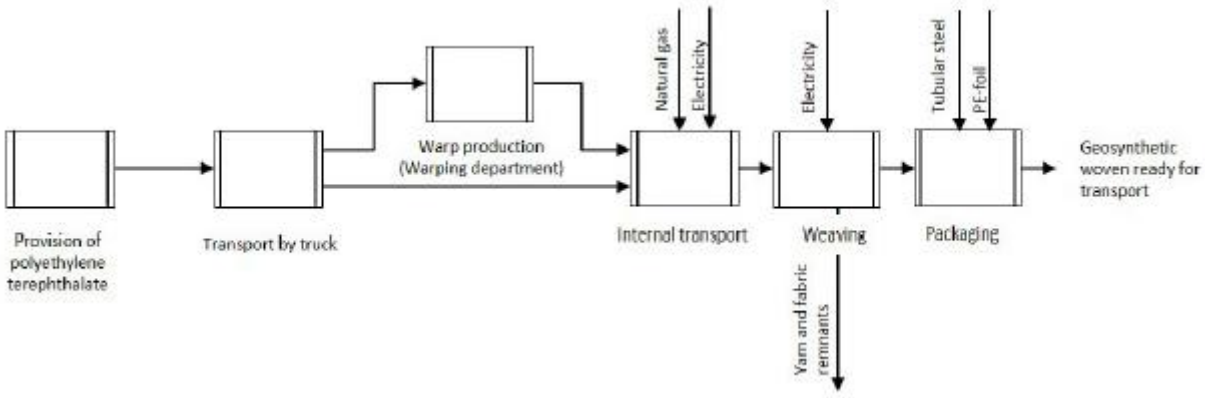


Figure 1: Simplified process flow chart of the declared product system Stabilenka® 100/50 to 200/45

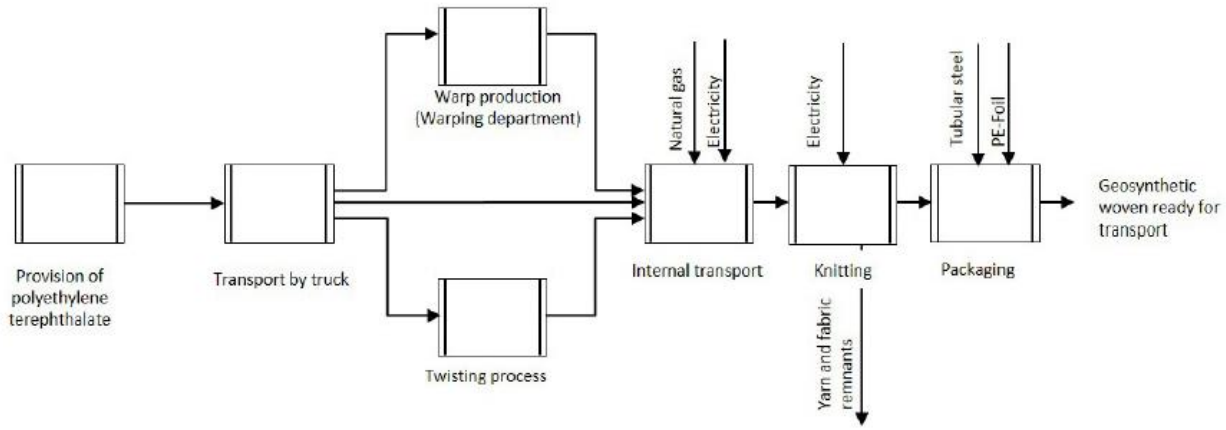


Figure 2: Simplified process flow chart of the declared product system Stabilenka® 300/45 to 1000/100

2.7 Packaging

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

2.8 Reference Service Life (RSL)

There's no RSL state in the 'SBR levensdurengids voor bouwproducten'. Therefore the RSL of 50 years is used as stated in the generic dataset 'Polyester weefsel' (EN: polyester fabric) out of chapter 22.46 Grondwapening en grondscheiding (EN: 22.46 Soil reinforcement and soil separation) of the program DuboCalc with database version NMD versie 1.8 - 5.01.14052018. The typical design life is up to 120 years.

3. LCA: Calculation rules

3.1 Declared unit

In accordance with the PCR B 1 m^2 geotextile is chosen as the declared unit.

Product	Unit weight [g/m^2]	Conversion factor to 1 kg
Stabilenka® 400/50 (representive product grade)	780	1,2820513

3.2 System boundary

Tthe 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, pre-cursors, energy and auxiliary materials) as well as the by-products and waste are considered for all life cycle phases. On the basis of experience (with the exception of raw material extraction and extraction of sand and gravel) it was assumed that the provision of the infrastructure accounts for less than 5% of the environmental impacts. 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 50 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 2018 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
- Transports between the Dülmen and Gescher plants
- Production of the geotextile (twisting process, warp-knitting production, coating)
- Packaging of the geotextiles
- Transport to the place of use
- Installation and removal of the geotextiles
- Disposal of packaging
- End-of-life (including transport)

Secondary materials and 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

As explained, the material composition of the product type Stabilenka® 400/50 is assumed to be the representative product of all Stabilenka® products. The energy consumption was averaged over the production quantity (production quantity in m2). It was assumed that the same amount of energy is required for the production of all product items. The same applies to the packaging materials.

The distances for transport could be recorded for almost all raw materials. For all truck transports (suppliers, disposal transports and internal transports) A payload factor of 50%, is used for large HGVs (loading capacity '>32t'), which have about 60% share in the 'market for Transport, freight, lorry, unspecified {GLO}|' process, which effectively corresponds to delivering full and going back empty (SBK 2019). The return journey and the payload factor have already been incorporated into the Ecoinvent transport processes. 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_2 certificates were taken into account.

According the SBK 2019, the average transport distance between the production site to the customer is assumed to be 150 km (truck).

For A5 the process and amount of the generic dataset 'Polyester weefsel' (EN: polyester fabric) out of chapter 22.46 Grondwapening en grondscheiding (EN: 22.46 Soil reinforcement and soil separation) of the program DuboCalc with database version NMD version 1.8 - 5.01.14052018. In this generic dataset 0.0013hr of the process Gr.mach.hydr. (gemiddeld) (EN: Hydraulic excavator (average)) stated for module A5 Construction.

Output materials as result of waste processing at the building site is 5% of Stabilenka®. The extra needed 5% of raw material supply (A1), transport to the production location (A2), production (A3), transport to the construction site (A4) and end of life scenario (C1-D) by loss at the building site are included in module A5.

For C1 the process and amount of the generic dataset 'Polyester weefsel' (EN: polyester fabric) out of chapter 22.46 Grondwapening en grondscheiding (EN: 22.46 Soil reinforcement and soil separation) of the program DuboCalc with database version NMD version 1.8 - 5.01.14052018. In this generic dataset 0.0013hr of the process Gr.mach.hydr. (gemiddeld) (EN: Hydraulic excavator (average)) stated for module C1 demolition.

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 % 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 % to the impact categories considered.

3.5 Period under review

All process-specific data was collected for the operating year 2018.

3.6 Data quality

All process-specific data was collected for the 2018 operating year and is therefore up-to-date. The data is based on the annual average. The secondary data was taken from the database Ecoinvent (version 3.5). The database is checked regularly and thus meets the requirements of EN 15804+A1 (background data not older than 10 years). The data quality can be classified as high, since values could be specified for all process-specific data.
Exception. For the environmental profile polyester yarn, the version from the Ecoinvent 3.6 database was used, because Ecoinvent 3.5 did not include the environmental profile.

3.7 Allocation

The yarn or woven textile residues arising during production are collected by type and recycled into polyester fibres. In relation to the total production volume, about 3 to 4 % yarn or fabric waste is generated, 4 % was assumed in the life cycle assessment. The recycling is carried out by a company in Gronau, approx. 35 km away. The treatment process includes the shredding of the yarn and fabric residues. The product of the treatment is secondary polyester fibre. The waste that cannot be recycled makes up less than 1.0 % by mass of the final product and is not included in the balance sheet due to the small quantity.
A standard waste scenario for plastic (“plastic, other”) was considered for the end-of-life. This scenario takes into account a thermal recovery of 90 percent of the waste and a recycling of only 10 of the waste. As in the standard waste scenarios of SBK 2019, truck transport distance 150 km to the treatment plant is assumed. Further details can be found in SBK 2019 and the amendments. In the interpretation, the results of different waste management approaches in the modelling are discussed.
The finished geotextiles are wound onto steel pipes. The environmental impact of the provision of the steel pipes was taken into account in the "packaging" process. Some of the steel pipes are transported from the construction sites back to the plant and reused here. According to the waste scenario for steel (steel, heavy) (SBK 2019), the modelling assumes that 51 percent of the steel pipes are recycled and 49 percent of the steel pipes are reused. This is a very conservative value for Stabilenka, the actual percentage of reused pipes is > 80 percent.
No further allocations were assumed for the entire production process (information modules A1 - A3). There are no multi-input processes. Allocations were avoided in the LCA. There are no by-products. Except for the allocation procedures for reuse, recycling and recovery, no further allocations were assumed for the entire manufacturing process (information modules A1 - A3).

3.8 Comparability

In principle, a comparison or evaluation of EPD data is only possible if all data sets to be compared have been created in accordance with EN 15804 and the building context or the product-specific performance characteristics have been taken into account.

4. LCA: Reports

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.

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 manu-facturer to place of use	Construction-installation process	Use	Maintenance	Repair	Replacement	Refurbishmen	Operational energy use	Operational water use	De-construction / demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
X	X	X	X	X	X	X	X	MND	MND	MND	MND	X	X	X	X	X
X=Module declared | MND=Module not declared																

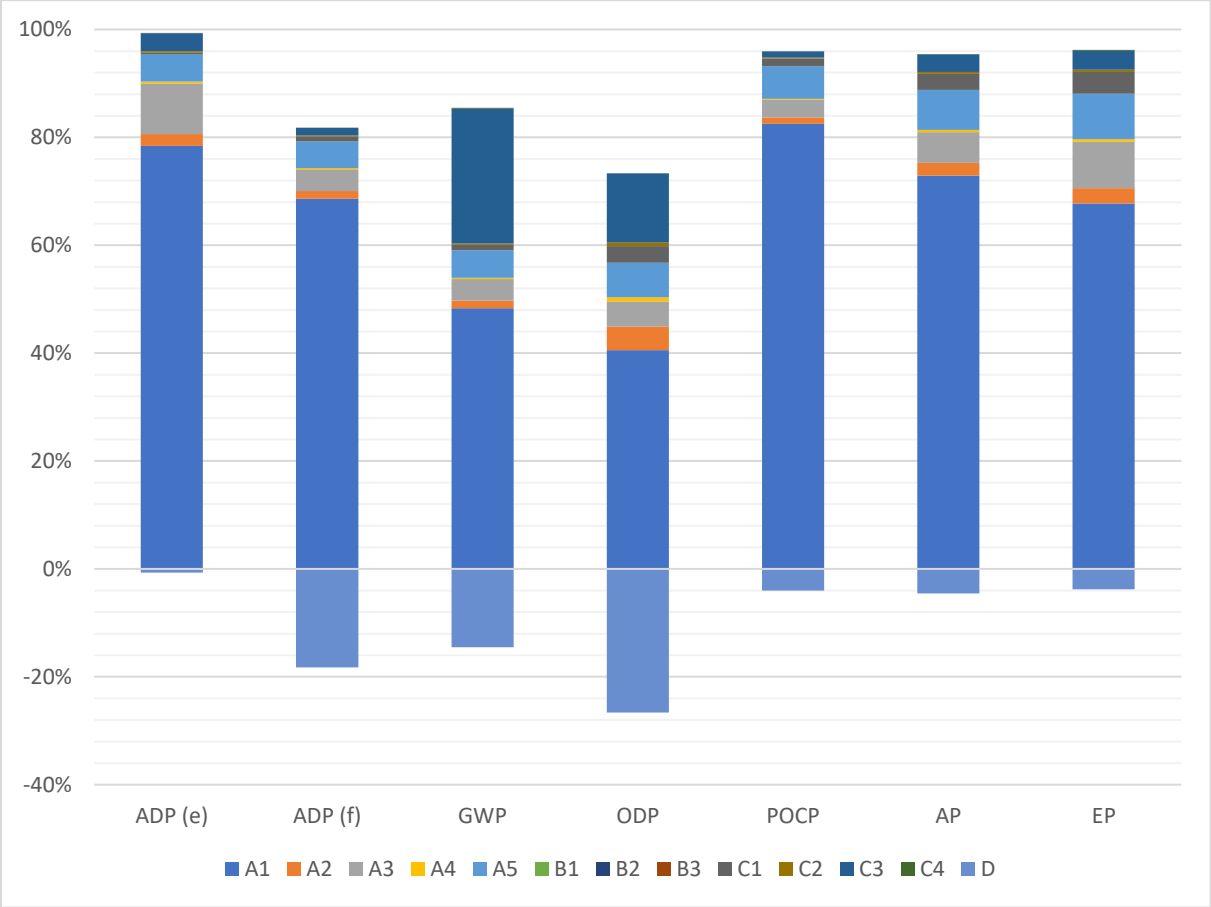
Results of the LCA – Environmental impact: 1 m² geotextile Stabilenka®														
Parameter	**Unit**	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**C1**	**C2**	**C3**	**C4**	**D**
ADP(e)	[kg Sb-eq]	9,69E-06	2,68E-07	1,16E-06	4,51E-08	6,34E-07	0,00E+00	0,00E+00	0,00E+00	2,30E-08	3,96E-08	4,11E-07	1,54E-09	-8,40E-08
ADP(f)	[kg Sb-eq]	3,39E-02	7,06E-04	2,00E-03	1,18E-04	2,42E-03	0,00E+00	0,00E+00	0,00E+00	4,72E-04	1,04E-04	6,48E-04	1,45E-05	-9,03E-03
GWP	[kg CO_2-eq]	3,23E+00	9,43E-02	2,67E-01	1,58E-02	3,43E-01	0,00E+00	0,00E+00	0,00E+00	6,82E-02	1,39E-02	1,67E+00	1,21E-02	-9,73E-01
ODP	[kg CFC 11eq]	1,62E-07	1,76E-08	1,84E-08	2,96E-09	2,56E-08	0,00E+00	0,00E+00	0,00E+00	1,24E-08	2,59E-09	5,11E-08	3,16E-10	-1,06E-07
POCP	[kg Ethen-eq]	3,95E-03	5,59E-05	1,55E-04	9,39E-06	2,89E-04	0,00E+00	0,00E+00	0,00E+00	6,91E-05	8,24E-06	5,34E-05	2,91E-06	-1,92E-04
AP	[kg SO_2-eq]	1,27E-02	4,08E-04	1,00E-03	6,86E-05	1,29E-03	0,00E+00	0,00E+00	0,00E+00	5,18E-04	6,02E-05	5,76E-04	8,18E-06	-7,92E-04
EP	[kg $(PO_4)^{3-}$eq]	1,95E-03	8,24E-05	2,48E-04	1,38E-05	2,42E-04	0,00E+00	0,00E+00	0,00E+00	1,16E-04	1,21E-05	1,02E-04	4,04E-06	-1,09E-04
ADPe=Depletion of abiotic resources-elements | ADPf=Depletion of abiotic resources-fossil fuels | AP=Acidification of soil and water | ODP=Ozone layer depletion | GWP=Global warming | EP=Eutrophication | POCP=Photochemical oxidants creation														

Results of the LCA – Resource Use: 1 m² geotextile Stabilenka®														
Parameter	**Unit**	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	[MJ]	2,47E+00	1,54E-02	2,67E-01	2,59E-03	1,55E-01	0,00E+00	0,00E+00	0,00E+00	5,78E-03	2,27E-03	1,19E-01	5,07E-04	-4,92E-02
PERM	[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	0,00E+00	0,00E+00	0,00E+00
PERT	[MJ]	2,47E+00	1,54E-02	2,67E-01	2,59E-03	1,55E-01	0,00E+00	0,00E+00	0,00E+00	5,78E-03	2,27E-03	1,19E-01	5,07E-04	-4,92E-02
PENRE	[MJ]	4,65E+01	1,57E+00	2,97E+00	2,63E-01	3,90E+00	0,00E+00	0,00E+00	0,00E+00	1,06E+00	2,31E-01	1,29E+00	3,20E-02	-1,84E+01
PENRM	[MJ]	2,52E+01	0,00E+00	1,05E+00	0,00E+00	1,26E+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
PENRT	[MJ]	7,17E+01	1,57E+00	5,75E+00	2,63E-01	5,16E+00	0,00E+00	0,00E+00	0,00E+00	1,06E+00	2,31E-01	1,40E+00	0,00E+00	-2,27E+01
SM	[kg]	0,00E+00	0,00E+00	2,32E-02	0,00E+00	1,16E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-1,16E-02
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	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	0,00E+00	0,00E+00	0,00E+00
FW	[m³]	3,16E-02	2,50E-04	1,54E-03	4,20E-05	1,99E-03	0,00E+00	0,00E+00	0,00E+00	1,30E-04	3,68E-05	2,36E-03	3,00E-05	-1,09E-03
PERE=renewable primary energy ex. raw materials | PERM=renewable primary energy used as raw materials | PERT=renewable primary energy total | PENRE=non-renewable primary energy ex. raw materials | PENRM=non-renewable primary energy used as raw materials | PENRT=non-renewable primary energy total | SM=use of secondary material | RSF=use of renewable second-ary fuels | NRSF=use of non-renewable secondary fuels | FW=use of net fresh water														

Results of the LCA – Output flows and waste categories: 1 m² geotextile Stabilenka®														
Parameter	**Unit**	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**C1**	**C2**	**C3**	**C4**	**D**
HWD	[kg]	4,04E-03	9,36E-07	2,59E-05	1,57E-07	2,12E-04	0,00E+00	0,00E+00	0,00E+00	4,45E-07	1,38E-07	3,12E-06	2,35E-08	-2,70E-05
NHWD	[kg]	2,90E-01	8,97E-02	4,74E-02	1,51E-02	3,17E-02	0,00E+00	0,00E+00	0,00E+00	1,06E-03	1,32E-02	2,38E-02	1,10E-01	-7,30E-03
RWD	[kg]	1,00E-04	9,91E-06	1,11E-05	1,66E-06	1,36E-05	0,00E+00	0,00E+00	0,00E+00	6,93E-06	1,46E-06	4,47E-06	1,81E-07	-8,08E-06
CRU	[kg]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,42E-02	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	3,04E-03	0,00E+00	5,38E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,60E-03	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	0,00E+00	0,00E+00	0,00E+00
EE	[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	0,00E+00	0,00E+00	1,07E+01
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														

5. LCA: Interpretation

The following figure show the influence of the different life stages. As shown in figure below, the raw material (A1) and the manufacture (A3) have the greatest influence on the life cycle of Stabilenka



6. Scaling

Total environmental impacts (Module A1-D) of specific product grades of Stabilenka® are shown in the following table. For other Stabilenka® product grades the scaling function (last column) can be used.

	Unit	100/50	150/45	200/45	300/45	400/50	600/50	800/100	1000/100	Scaling function
Unit weight	**[g/m²]**	**250**	**320**	**410**	**630**	**780**	**1040**	**1390**	**1680**	**x**
ADP(e)	[Kg Sb]	4,78E-06	5,88E-06	7,19E-06	1,01E-05	1,22E-05	1,61E-05	2,13E-05	2,55E-05	1,44E-08x + 1,15E-06
ADP(f)	[Kg Sb]	1,20E-02	1,41E-02	1,73E-02	2,44E-02	3,14E-02	3,91E-02	5,16E-02	6,19E-02	3,50E-05x + 3,00E-03
GWP	[Kg CO_2 Equiv.]	1,79E+00	2,21E+00	2,73E+00	3,89E+00	4,75E+00	6,27E+00	8,30E+00	9,98E+00	5,71E-03x + 3,50E-01
ODP	[Kg CFC-11 Equiv.]	8,83E-08	1,01E-07	1,18E-07	1,55E-07	1,87E-07	2,32E-07	2,98E-07	3,52E-07	1,84E-10x + 4,15E-08
POCP	[Kg Ethene Equiv.]	1,61E-03	1,97E-03	2,45E-03	3,52E-03	4,40E-03	5,71E-03	7,58E-03	9,13E-03	5,26E-06x + 2,76E-04
AP	[Kg SO_2 Equiv.]	6,46E-03	7,72E-03	9,36E-03	1,30E-02	1,58E-02	2,04E-02	2,68E-02	3,20E-02	1,79E-05x + 1,94E-03
EP	[Kg PO_4^{3-} Equiv.]	1,18E-03	1,39E-03	1,65E-03	2,23E-03	2,66E-03	3,41E-03	4,43E-03	5,26E-03	2,85E-06x + 4,64E-04

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