Environmental Product Declaration

as per ISO 14025 and EN 15804

Owner of the declaration:	Officine Maccaferri S.p.A.
Publisher:	Kiwa-Ecobility Experts
Programme operator:	Kiwa-Ecobility Experts
Registration number:	EPD-Kiwa-EE-000373-EN
Issue date:	22.05.2024
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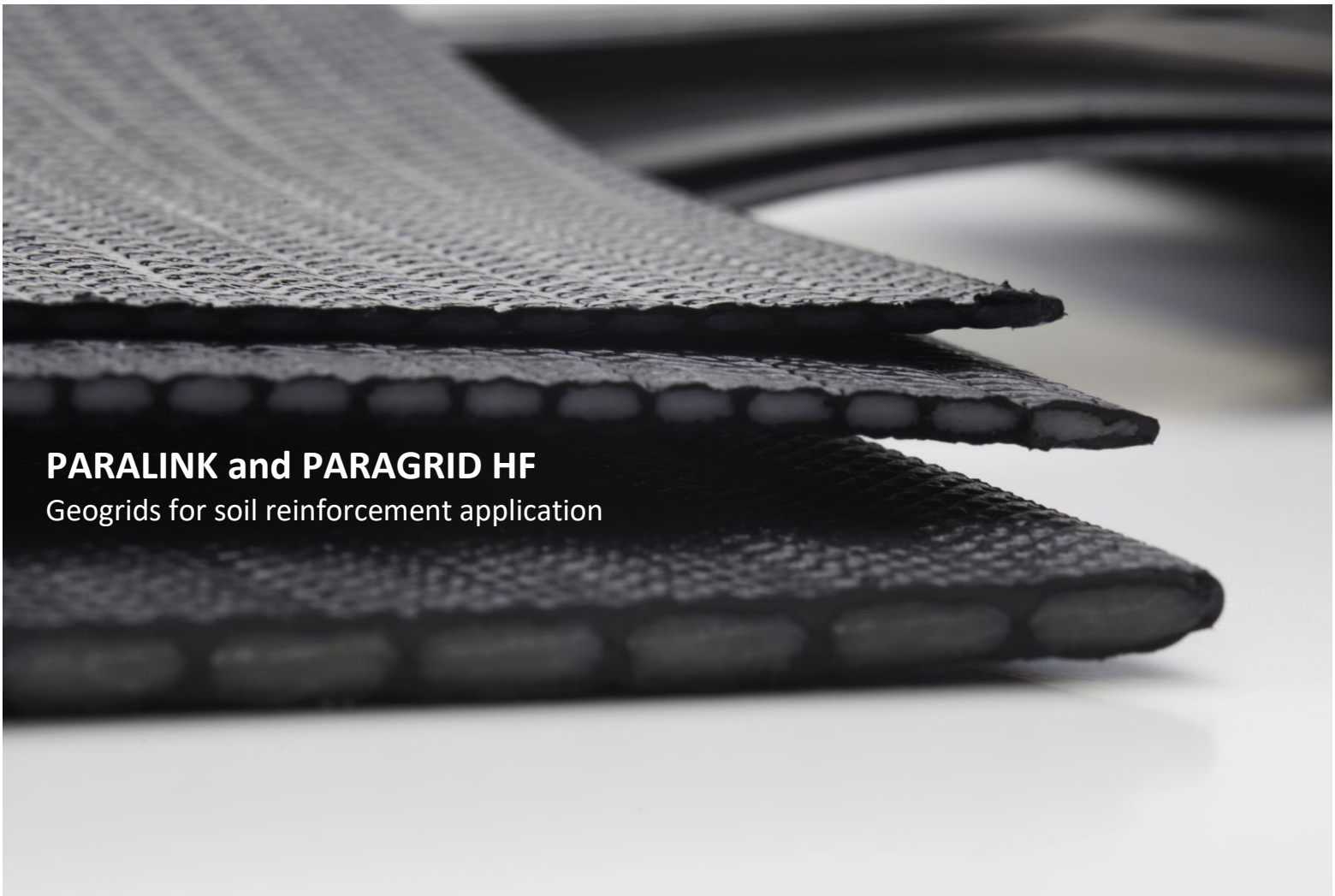

PARALINK and PARAGRID HF

Geogrids for soil reinforcement application

1. General information

Officine Maccaferri S.p.A.

Programme operator
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Registration number
EPD-Kiwa-EE-000373-EN

This declaration is based on the Product Category Rules
PCR B: Product Category Rules for geosynthetic products Edition 2022-02-08
PCR A: EPD program Version 2.1, 2022-02-14

Issue date
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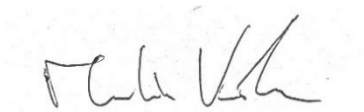
Valid to
22.05.2029

Raoul Mancke
(Head of programme operations, Kiwa-Ecobility Experts)



Martin Koehrer
(Verification body, Kiwa-Ecobility Experts)

PARALINK and PARAGRID HF

Owner of the declaration
Officine Maccaferri S.p.A.
Via del Faggiolo, 1/12 D
40132 Bologna (BO) - Italia

Declared product / declared unit
1 m^2 of PARALINK geogrid including distribution packaging

Scope
The EPD is based on the composition of PARALINK 300 (unit weight 789 g/m^2). The LCA results are also representative of the others PARALINK and PARAGRID HF products applying the scaling function reported in section 7.

Kiwa-Ecobility Experts assumes no liability for manufacturer's information, LCA 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: 2010.

☐internal ☒external

Dr.-Ing. Morteza Nikravan
(External verifier of Kiwa GmbH)

2. Product

2.1 Product description

PARALINK and PARAGRID HF geogrids are a planar structure consisting of a monoaxial array of composite geosynthetics strips.

Each single longitudinal strip has a core of high tenacity polyester yarns tendons encased in a polyethylene sheath; the single strips are connected by cross-laid polyethylene strips to form a grid configuration to the composite.

2.2 Application

PARALINK and PARAGRID HF are widely used in civil engineering for soil reinforcement application including reinforced soil walls and slopes and basal reinforcement applications.

PARALINK and PARAGRID HF provide the high performance and reassurance also in the most demanding applications such as embankment over piles or soils subjected to voids.

2.3 Technical data

Characteristic	Unit	Value
Unit weight (EN ISO 9864)	314 – 4443	g/m^2
T_{char} (kN per meter width) (EN ISO 10319) MD	90 – 1800	kN/m
T_{char} (kN per me meter tre width) (EN ISO 10319) CMD	5 - 100	kN/m
Nominal strain at T_{char} load (%)(EN ISO 10319) MD	9.5	%
Nominal strain at T_{char} load (%)(EN ISO 10319) CMD	3	%
Durability (EN 13249ff, Appendix B)	Predicted to be durable for more than 120 years in natural soils with 4≤pH≤11 and soil temperatures <30 °C.	

The characteristic short-term tensile strength (T_{char}) values MD can be taken from the name of the respective product
The characteristic short-term tensile strength (T_{char}) are the mean short-term tensile strength minus 1 x the tolerance value, in accordance with BS EN 13251 : 2016.

2.4 Placing on the market/ Application rules

PARALINK and PARAGRID HF geogrids are CE certified for reinforcement applications according to EN 13249:2016, EN 13250:2016, EN 13251:2016, EN 13253:2016, EN 13254:2016, EN 13255:2016, EN 13257:2016, EN 13265:2016 and BBA HAPAS certified.

2.5 Base materials / Ancillary materials

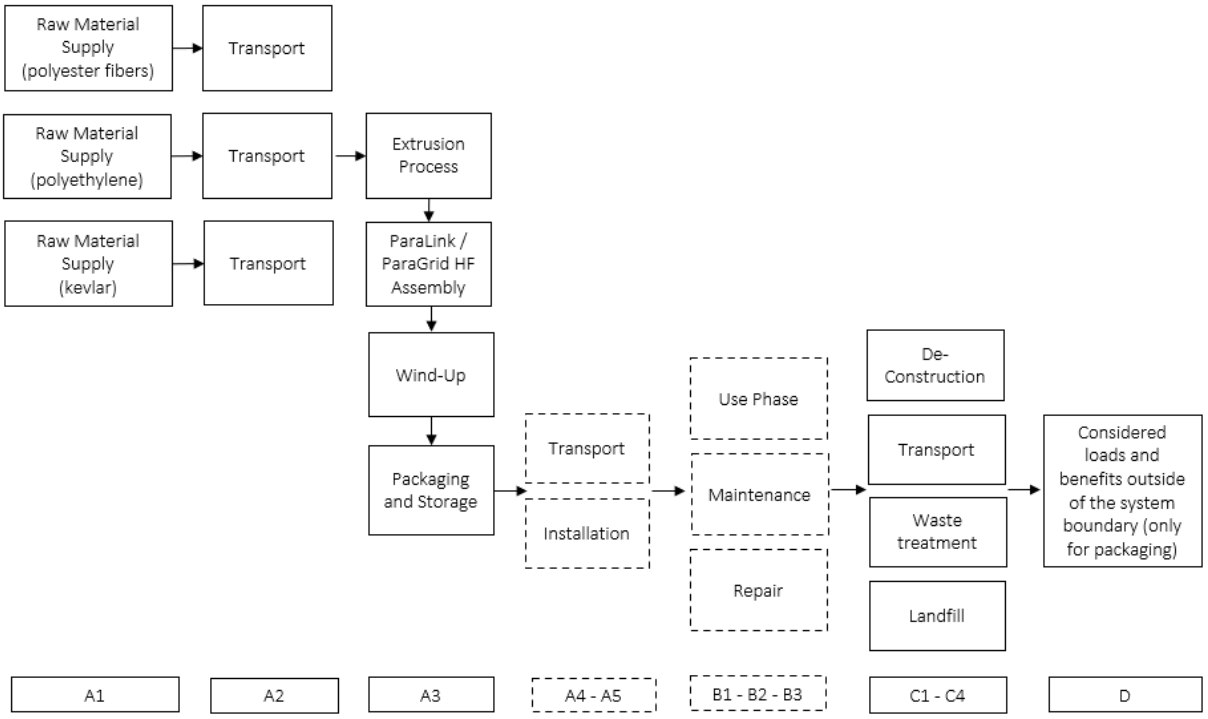
The composition of the reference product for 1 m^2 is reported in its weight in table below.

Raw material	Unit	Value
Polyester fibers	kg	0.493
LLDPE – Linear Low-density polyethylene	kg	0.36
Kevlar	kg	0.001

The content of SVHC does not exceed 0.1 % of its weight.

2.6 Manufacturing

The manufacturing is managed in the West Yorkshire site (United Kingdom) by Linear Composites Ltd and in Pune plant (India) by Maccaferri Environmental Solution Pvt Ltd, both subsidiaries of Officine Maccaferri S.p.A.
The Production process includes the extrusion of the polyethylene to coat a core made in high tenacity polyester in order to obtain composite geosynthetic strips and the assembly through cross-laid poly-ethylene strips (reinforced by PA – Kevlar – yarns) to form a grid configuration to the composite.
Below is a diagram of the product system and the modules considered.



2.7 Packaging

Packaging is carried out by rolling the products onto steel tubes and then wrapping them in LDPE film. The table below shows the quantities per declared unit.

Packed material/component	Packaging type	Packaging amount per kg of finished product
PARALINK and PARAGRID HF	Steel tubes	0.115 kg
	Polytarp (LDPE)	0.008 kg

2.8 Reference Service Life (RSL)

The typical service life for reinforced soil structures is between 60 years to 120 years. The typical Design life is up to 120 years.

According to EN 13249ff, Appendix B, the durability shall be evaluated by testing according to EN12447. PARALINK and PARAGRID HF are predictable to be durable for more than 120 years as per test result according to EN12447 and as reported in the DOP of the products.

2.9 Other Information

For further information on this product please visit the webpage under the following link:
www.maccaferri.com

3. LCA: Calculation rules

3.1 Declared unit

In accordance with the PCR B, 1 m^2 of PARALINK geogrid is chosen as the declared unit.

Product	Unit weight (g/m2)	Conversion factor for 1 kg
PARALINK 300	789	1.267

3.2 System boundary

This a cradle to gate with modules C1-C4 and module D. More precisely, the following processes were accounted for each module:

A1 - Production of raw materials used in the products, as well as the production of energy carriers used in the production process.

A2 - Transport of raw materials to the manufacturing site and internal handling

A3 - Manufacturing of the Officine Maccaferri PARALINK and PARAGRID HF which includes the manufacturing steps reported in section 2.6 as well as the production of the distribution packaging and of the ancillary material. In addition, the treatment of waste generated from the manufacturing processes are accounted for.

C1 - Dismantling of the strip from the construction work.

C2 - Transport from collection point to waste processing and disposal site.

C3 - Shredding and sorting of fractions for recycling.

C4 - Landfill of material fractions not recycled.

D - Benefit and load beyond the product system.

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	Manu-facturing	Transport from manu-facturer to	Construction -installation process	Use	Main-tenance	Repair	Replacement	Refur-bishmen	Operational energy use	Operational water use	De-construction	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	MND	MND	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	X
X=Module declared | MND=Module not declared																

3.3 Estimates and assumptions

The main assumptions are related to packaging for raw materials transportation and distances of inbound transportations. A generic packaging is assumed for the transport of raw materials and auxiliaries, composed as below.

Packaging type	Packaging amount per kg of finished product	Notes
Wooden pallet	0.02 kg	Average reuse rate of 25 times
Cardboard	0.01 kg	
Plastic bag (HDPE)	0.005 kg	

3.4 Cut-off Criteria

The cut-off applied are related to the packaging of wastewater treatment chemicals in India and the packaging of steel blades used in the production process in the UK.

3.5 Period under review and Geographical reference area

All process-specific data was collected for the operating year 2022. Geographical reference area is global.

3.6 Data quality

Specific data were collected at Linear Composites Ltd site in United Kingdom and at Maccaferri Environmental Solution Pvt Ltd site in India, considering an annual average referred to 2022, whereas the most updated selected generic datasets available in the LCI databases were used for the other modules. hus, in line with PCR A requirements, manufacturer-specific data is not older than 5 years and generic data is not older than 10 years. The assessment of the potential environmental impacts of the products and components under study has been performed with the support of LCA for Expert v. 10.7.1.28 software and the 2023.2 professional Sphera DB.

3.7 Allocation

A mass allocation based on the weight of the production volumes has been applied. The relative contribution of the two manufacturing sites was calculated considering the mass-weighted average of the total production volumes of the two plants. Regarding PARALINK and PARAGRID HF product the manufacturing mix is 62.15% Indian and 37.85% UK.

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

It is assumed that 25% of the product remains in the soil while 75% is removed and sent to landfill. For the digging up from the soil it was considered only the impacts related to the removal of the geogrid from the soil.
Regarding the end of life of packaging components, the following scenarios were applied:

- The end-of-life plastic component was, conservatively, incinerated.
- End-of life of steel component was recycled.

Processes	Unit (expressed per FU or DU of components, products or materials and by type of material)	PARALINK 300
Collection process specified by type	Kg collected separately	Polymer: 0.592 kg
		Steel: 1.49E-03 kg
Recovery system specified by type	Kg for reuse	0
	Kg for recycling	Steel: 1.49E-03 kg
	Kg for energy recovery	Polymer: 9.83E-05 kg
		Steel: 0
Disposal specified by type	Kg product or material for final deposition	Landfill (Polymer): 0.592 kg
		Landfill (Steel): 0

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.

LCA results - Indicators describing environmental impacts based on the impact assessment (LCIA): 1 m^2 of PARALINK 300 (EN 15804+A2)							
Parameter	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
Core environmental impact indicators (EN 15804+A2)							
GWP-total	kg CO2 eqv.	2.13E+00	3.57E-04	5.07E-03	0.00E+00	4.04E-02	-7.41E-04
GWP-f	kg CO2 eqv.	2.08E+00	3.59E-04	5.01E-03	0.00E+00	4.09E-02	-7.41E-04
GWP-b	kg CO2 eqv.	4.76E-02	-4.91E-06	1.17E-05	0.00E+00	-5.00E-04	3.51E-07
GWP-luc	kg CO2 eqv.	1.09E-03	3.27E-06	4.72E-05	0.00E+00	3.35E-05	-2.64E-07
ODP	kg CFC 11 eqv.	5.65E-12	3.09E-17	4.46E-16	0.00E+00	6.84E-14	7.59E-16
AP	mol H+ eqv.	5.11E-03	1.81E-06	2.68E-05	0.00E+00	1.22E-04	-1.55E-06
EP-fr	kg P eqv.	6.47E-06	1.29E-09	1.86E-08	0.00E+00	7.83E-06	-2.62E-10
EP-mar	kg N eqv.	1.55E-03	8.52E-07	1.29E-05	0.00E+00	2.80E-05	-3.82E-07
EP-ter	mol N eqv.	1.69E-02	9.44E-06	1.44E-04	0.00E+00	3.07E-04	-4.13E-06
POCP	kg NMVOC eqv.	6.59E-03	2.39E-06	2.54E-05	0.00E+00	8.88E-05	-1.24E-06
ADP-e	kg Sb-eqv.	9.73E-08	2.29E-11	3.31E-10	0.00E+00	1.08E-09	-1.60E-11
ADP-f	MJ	6.40E+01	4.80E-03	6.93E-02	0.00E+00	6.08E-01	-7.03E-03
WU	m3 world eqv.	3.96E-01	4.07E-06	5.87E-05	0.00E+00	-5.46E-04	-2.13E-05
Additional environmental impact indicators (EN 15804+A2)							
PM	disease incidence	5.25E-08	2.04E-11	1.25E-10	0.00E+00	1.18E-09	-2.17E-11
IR	kBq U235 eqv.	1.44E-01	8.99E-07	1.30E-05	0.00E+00	1.06E-03	-2.24E-05
ETP-fw	CTUe	3.19E+01	3.38E-03	4.88E-02	0.00E+00	5.19E-01	-1.04E-03
HTP-c	CTUh	2.51E-09	6.82E-14	9.85E-13	0.00E+00	2.66E-11	-9.75E-13
HTP-nc	CTUh	2.31E-07	3.02E-12	4.35E-11	0.00E+00	2.13E-09	5.24E-14
SQP	Pt	7.24E+00	2.00E-03	2.89E-02	0.00E+00	5.26E-02	-4.18E-05

ADP-e= Abiotic depletion potential for non-fossil resources | **ADP-f**=Abiotic depletion for fossil resources potential | **AP**= Acidification potential, Accumulated Exceedance | **EP-fr** = Eutrophication potential, fraction of nutrients reaching freshwater end compartment | **EP-mar**= Eutrophication potential, fraction of nutrients reaching marine end compartment| **EP-ter**= Eutrophication potential, Accumulated Exceedance | **GWP-b**=Global Warming Potential biogenic | **GWP-f**=Global Warming Potential fossil fuels | **GWP-luc**=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 | **WU**=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

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.

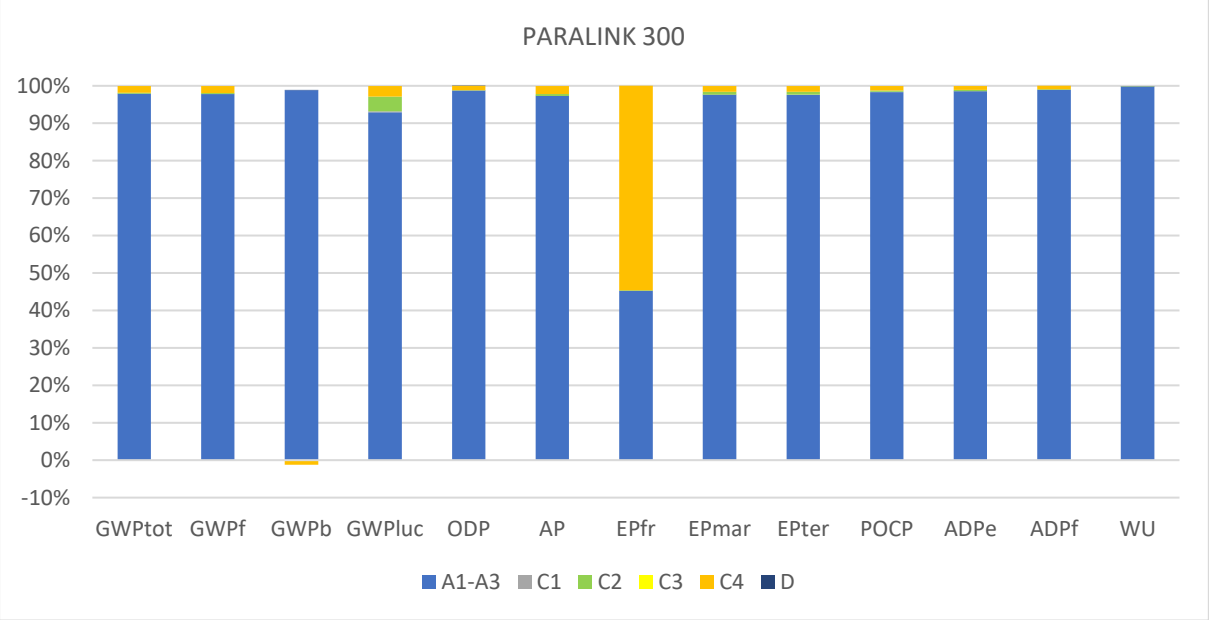
Disclaimer on IR: This impact category mainly addresses the potential effect of low dose ionizing radiation on human health in the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents and occupational exposures, nor does it consider radioactive waste disposal in underground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

LCA results - Indicators describing resource use and environmental information derived from life cycle inventory (LCI): 1 m² of PARALINK 300 (EN 15804+A2)							
Parameter	Unit	A1-A3	C1	C2	C3	C4	D
PERE	MJ	4.41E+00	3.40E-04	4.90E-03	0.00E+00	5.48E-02	4.39E-05
PERM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	4.41E+00	3.40E-04	4.90E-03	0.00E+00	5.48E-02	4.39E-05
PENRE	MJ	3.79E+01	4.82E-03	6.94E-02	0.00E+00	6.08E-01	-7.09E-03
PENRM	MJ	2.63E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	6.41E+01	4.82E-03	6.94E-02	0.00E+00	6.08E-01	-7.09E-03
SM	Kg	0.00E+00	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
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	M3	1.14E-02	3.75E-07	5.40E-06	0.00E+00	6.66E-06	-9.68E-07
HWD	Kg	4.85E-09	1.78E-14	2.57E-13	0.00E+00	5.12E-11	-1.49E-13
NHWD	Kg	5.97E-02	6.94E-07	1.00E-05	0.00E+00	5.89E-01	-1.04E-05
RWD	Kg	9.20E-04	6.23E-09	8.98E-08	0.00E+00	7.20E-06	-1.08E-07
CRU	Kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	Kg	9.93E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.49E-03
MER	Kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EET	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.57E-04
EEE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.17E-03
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 | EET=Exported energy, thermical | EE=Exported energy, electrical							

LCA results - information on biogenic carbon content at the factory gate: 1 m² of PARALINK 300 (EN 15804+A2)		
Parameter	**Unit**	**Value**
biogenic carbon content in product	kg C	0
biogenic carbon content in accompanying packaging	kg C	0
NOTE 1 kg biogenic carbon is equivalent to 44/12 kg CO2		

6. Interpretation

The analysis of the contribution of each module to the impacts of PARALINK 300 is shown in the graph below. It can be observed that the impacts are driven by modules A1-A3, while the contribution of the other modules is about 3 % for all impact categories analyzed, except for EPfr whose impacts are driven by the disposal of the geogrid in landfill. The contribution of module D is negligible (<1%) compared to modules A1-A3.



7. Scaling

The environmental impacts for the production phase (Module A1-A3) of specific grades of **PARALINK and PARAGRID HF** products, defined by nominal unit weight, are shown in the following tables. For other grades the scaling function in the last column can be used, where 'x' represents the nominal unit weight in kg/m^2.

		HF 150	200	300	400	500	600	1500	Scaling Function
Nominal Unit weight	**(g/m²)**	**408**	**590**	**789**	**1014**	**1219**	**1507**	**3785**	**(x*1000)**
Nominal Unit weight	**(kg/m²)**	**0.408**	**0.590**	**0.789**	**1.014**	**1.219**	**1.507**	**3.785**	**X**
Core environmental impact indicators (EN 15804+A2)									
GWP-total	kg CO_2 eqv.	1.06E+00	1.50E+00	2.13E+00	2.66E+00	3.31E+00	4.08E+00	1.08E+01	2.89E+00x-1.97E-01
GWP-f	kg CO_2 eqv.	1.04E+00	1.46E+00	2.08E+00	2.60E+00	3.23E+00	3.99E+00	1.05E+01	2.82E+00x-1.92E-01
GWP-b	kg CO_2 eqv.	2.39E-02	3.40E-02	4.76E-02	5.89E-02	7.32E-02	9.06E-02	2.40E-01	6.42E-02x-4.29E-03
GWP-luc	kg CO_2 eqv.	5.38E-04	7.52E-04	1.09E-03	1.39E-03	1.73E-03	2.12E-03	5.56E-03	1.49E-03x-1.06E-04
ODP	kg CFC 11 eqv.	2.82E-12	3.89E-12	5.65E-12	7.17E-12	8.91E-12	1.09E-11	2.87E-11	7.70E-12x-5.24E-13
AP	mol H+ eqv.	2.58E-03	3.68E-03	5.11E-03	6.30E-03	7.82E-03	9.70E-03	2.57E-02	6.87E-03x-4.48E-04
EP-fr	kg P eqv.	3.17E-06	4.36E-06	6.47E-06	8.33E-06	1.04E-05	1.26E-05	3.31E-05	8.90E-06x-6.36E-07
EP-mar	kg N eqv.	7.81E-04	1.12E-03	1.55E-03	1.91E-03	2.38E-03	2.95E-03	7.81E-03	2.09E-03x-1.38E-04
EP-ter	mol N eqv.	8.51E-03	1.21E-02	1.69E-02	2.09E-02	2.59E-02	3.21E-02	8.51E-02	2.28E-02x-1.50E-03
POCP	kg NMVOC eqv.	3.29E-03	4.67E-03	6.59E-03	8.19E-03	1.02E-02	1.26E-02	3.32E-02	8.90E-03x-5.98E-04
ADP-e	kg Sb-eqv.	4.88E-08	6.83E-08	9.73E-08	1.22E-07	1.51E-07	1.87E-07	4.92E-07	1.32E-07x-8.81E-09
ADP-f	MJ	3.21E+01	4.59E+01	6.40E+01	7.91E+01	9.82E+01	1.22E+02	3.22E+02	8.63E+01x-5.76E+00
WU	m3 world eqv.	1.96E-01	2.78E-01	3.96E-01	4.97E-01	6.17E-01	7.61E-01	2.01E+00	5.38E-01x-3.73E-02
Additional environmental impact indicators (EN 15804+A2)									
PM	disease incidence	2.67E-08	3.85E-08	5.25E-08	6.36E-08	7.89E-08	9.85E-08	2.62E-07	7.00E-08x-4.40E-09
IR	kBq U235 eqv.	7.09E-02	9.86E-02	1.44E-01	1.84E-01	2.28E-01	2.80E-01	7.33E-01	1.97E-01x-1.39E-02
ETP-fw	CTUe	1.60E+01	2.30E+01	3.19E+01	3.92E+01	4.87E+01	6.05E+01	1.60E+02	4.29E+01x-2.85E+00
HTP-c	CTUh	1.23E-09	1.68E-09	2.51E-09	3.25E-09	4.04E-09	4.93E-09	1.29E-08	3.46E-09x-2.51E-10
HTP-nc	CTUh	1.12E-07	1.52E-07	2.31E-07	3.03E-07	3.77E-07	4.57E-07	1.19E-06	3.21E-07x-2.37E-08
SQP	Pt	3.62E+00	5.11E+00	7.24E+00	9.04E+00	1.12E+01	1.39E+01	3.66E+01	9.81E+00x-6.61E-01

		HF 150	200	300	400	500	600	1500	Scaling Function
Nominal Unit weight	**(g/m^2)**	**408**	**590**	**789**	**1014**	**1219**	**1507**	**3785**	**(x*1000)**
Nominal Unit weight	**(kg/m^2)**	**0.408**	**0.590**	**0.789**	**1.014**	**1.219**	**1.507**	**3.785**	**X**
Indicators describing resource use and environmental information derived from life cycle inventory (LCI)									
PERE	MJ	2.20E+00	3.06E+00	4.41E+00	5.58E+00	6.94E+00	8.52E+00	2.24E+01	6.01E+00x-4.12E-01
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+00x+0.00E+00
PERT	MJ	2.20E+00	3.06E+00	4.41E+00	5.58E+00	6.94E+00	8.52E+00	2.24E+01	6.01E+00x-4.12E-01
PENRE	MJ	1.88E+01	2.64E+01	3.79E+01	4.78E+01	5.93E+01	7.30E+01	1.92E+02	5.16E+01x-3.58E+00
PENRM	MJ	1.34E+01	1.96E+01	2.63E+01	3.15E+01	3.90E+01	4.89E+01	1.31E+02	3.49E+01x-2.20E+00
PENRT	MJ	3.21E+01	4.59E+01	6.41E+01	7.92E+01	9.84E+01	1.22E+02	3.23E+02	8.64E+01x-5.77E+00
SM	Kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00x+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+00x+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+00x+0.00E+00
FW	M3	5.66E-03	7.97E-03	1.14E-02	1.43E-02	1.78E-02	2.19E-02	5.77E-02	1.55E-02x-1.06E-03
HWD	Kg	2.44E-09	3.50E-09	4.85E-09	5.97E-09	7.41E-09	9.19E-09	2.44E-08	6.52E-09x-4.30E-10
NHWD	Kg	2.98E-02	4.14E-02	5.97E-02	7.55E-02	9.38E-02	1.15E-01	3.03E-01	8.13E-02x-5.52E-03
RWD	Kg	4.54E-04	6.31E-04	9.20E-04	1.17E-03	1.45E-03	1.78E-03	4.68E-03	1.26E-03x-8.81E-05
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+00x+0.00E+00
MFR	Kg	4.99E-03	7.14E-03	9.93E-03	1.22E-02	1.52E-02	1.88E-02	4.99E-02	1.34E-02x-8.85E-04
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+00x+0.00E+00
EET	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00x+0.00E+00
EEE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00x+0.00E+00

The environmental impacts for the end-of-life phase (Module C1-C4) of specific grades of **PARALINK and PARAGRID HF** products, defined by nominal unit weight, are shown in the following tables. For other grades the scaling function in the last column can be used, where 'x' represents the nominal unit weight in kg/m^2.

		HF 150	200	300	400	500	600	1500	Scaling Function
Nominal Unit weight	**(g/m²)**	**408**	**590**	**789**	**1014**	**1219**	**1507**	**3785**	**(x*1000)**
Nominal Unit weight	**(kg/m²)**	**0.408**	**0.590**	**0.789**	**1.014**	**1.219**	**1.507**	**3.785**	**X**
Core environmental impact indicators (EN 15804+A2)									
GWP-total	kg CO_2 eqv.	2.81E-03	4.06E-03	5.43E-03	6.97E-03	8.39E-03	1.04E-02	2.61E-02	6.89E-03x-9.64E-06
GWP-f	kg CO_2 eqv.	2.82E-03	4.08E-03	5.46E-03	7.01E-03	8.43E-03	1.04E-02	2.62E-02	6.93E-03x-9.69E-06
GWP-b	kg CO_2 eqv.	-4.15E-05	-6.00E-05	-8.03E-05	-1.03E-04	-1.24E-04	-1.53E-04	-3.86E-04	-1.02E-04x+1.43E-07
GWP-luc	kg CO_2 eqv.	2.61E-05	3.77E-05	5.04E-05	6.48E-05	7.79E-05	9.63E-05	2.42E-04	6.40E-05x-8.96E-08
ODP	kg CFC 11 eqv.	2.46E-16	3.56E-16	4.77E-16	6.12E-16	7.37E-16	9.11E-16	2.29E-15	6.05E-16x-8.47E-19
AP	mol H+ eqv.	1.48E-05	2.13E-05	2.86E-05	3.67E-05	4.41E-05	5.46E-05	1.37E-04	3.63E-05x-5.08E-08
EP-fr	kg P eqv.	1.03E-08	1.48E-08	1.99E-08	2.55E-08	3.07E-08	3.79E-08	9.54E-08	2.52E-08x-3.53E-11
EP-mar	kg N eqv.	7.13E-06	1.03E-05	1.38E-05	1.77E-05	2.13E-05	2.63E-05	6.62E-05	1.75E-05x-2.46E-08
EP-ter	mol N eqv.	7.93E-05	1.15E-04	1.53E-04	1.97E-04	2.37E-04	2.93E-04	7.37E-04	1.95E-04x-2.74E-07
POCP	kg NMVOC eqv.	1.43E-05	2.07E-05	2.77E-05	3.56E-05	4.29E-05	5.30E-05	1.33E-04	3.52E-05x-4.82E-08
ADP-e	kg Sb-eqv.	1.83E-10	2.64E-10	3.54E-10	4.54E-10	5.46E-10	6.76E-10	1.70E-09	4.49E-10x-6.29E-13
ADP-f	MJ	3.83E-02	5.53E-02	7.41E-02	9.51E-02	1.14E-01	1.41E-01	3.56E-01	9.40E-02x-1.32E-04
WU	m3 world eqv.	3.24E-05	4.69E-05	6.28E-05	8.06E-05	9.70E-05	1.20E-04	3.01E-04	7.97E-05x-1.12E-07
Additional environmental impact indicators (EN 15804+A2)									
PM	disease inci-dence	7.53E-11	1.09E-10	1.46E-10	1.87E-10	2.25E-10	2.78E-10	6.99E-10	1.85E-10x-2.38E-13
IR	kBq U235 eqv.	7.16E-06	1.04E-05	1.39E-05	1.78E-05	2.14E-05	2.65E-05	6.65E-05	1.76E-05x-2.46E-08
ETP-fw	CTUe	2.70E-02	3.90E-02	5.22E-02	6.70E-02	8.06E-02	9.96E-02	2.50E-01	6.62E-02x-9.27E-05
HTP-c	CTUh	5.44E-13	7.87E-13	1.05E-12	1.35E-12	1.63E-12	2.01E-12	5.06E-12	1.34E-12x-1.87E-15
HTP-nc	CTUh	2.40E-11	3.47E-11	4.65E-11	5.97E-11	7.18E-11	8.87E-11	2.23E-10	5.90E-11x-8.26E-14
SQP	Pt	1.60E-02	2.31E-02	3.09E-02	3.97E-02	4.77E-02	5.90E-02	1.48E-01	3.92E-02x-5.49E-05

		HF 150	200	300	400	500	600	1500	Scaling Function
Nominal Unit weight	**(g/m^2)**	**408**	**590**	**789**	**1014**	**1219**	**1507**	**3785**	**(x*1000)**
Nominal Unit weight	**(kg/m^2)**	**0.408**	**0.590**	**0.789**	**1.014**	**1.219**	**1.507**	**3.785**	**X**
Indicators describing resource use and environmental information derived from life cycle inventory (LCI)									
PERE	MJ	2.71E-03	3.92E-03	5.24E-03	6.73E-03	8.10E-03	1.00E-02	2.52E-02	6.65E-03x-9.31E-06
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+00x+0.00E+00
PERT	MJ	2.71E-03	3.92E-03	5.24E-03	6.73E-03	8.10E-03	1.00E-02	2.52E-02	6.65E-03x-9.31E-06
PENRE	MJ	3.84E-02	5.55E-02	7.43E-02	9.54E-02	1.15E-01	1.42E-01	3.57E-01	9.42E-02x-1.32E-04
PENRM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00x+0.00E+00
PENRT	MJ	3.84E-02	5.55E-02	7.43E-02	9.54E-02	1.15E-01	1.42E-01	3.57E-01	9.42E-02x-1.32E-04
SM	Kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00x+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+00x+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+00x+0.00E+00
FW	M3	2.99E-06	4.32E-06	5.78E-06	7.42E-06	8.92E-06	1.10E-05	2.77E-05	7.33E-06x-1.03E-08
HWD	Kg	1.42E-13	2.05E-13	2.75E-13	3.53E-13	4.24E-13	5.25E-13	1.32E-12	3.49E-13x-4.88E-16
NHWD	Kg	5.53E-06	8.00E-06	1.07E-05	1.37E-05	1.65E-05	2.04E-05	5.14E-05	1.36E-05x-1.90E-08
RWD	Kg	4.96E-08	7.17E-08	9.60E-08	1.23E-07	1.48E-07	1.83E-07	4.61E-07	1.22E-07x-1.71E-10
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+00x+0.00E+00
MFR	Kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00x+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+00x+0.00E+00
EET	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00x+0.00E+00
EEE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00x+0.00E+00

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