Type III Environmental Product Declaration No. 847/2025

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Geogrids POLGRID

Owner of the EPD:

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ITB is the verified member of The European Platform for EPD program operators and LCA practitioner www.eco-platform.org

Basic information

This declaration is the Type III Environmental Product Declaration (EPD) based on EN 15804+A2 and verified according to ISO 14025 by an external auditor. It contains the information on the impacts of the declared construction materials on the environment and their aspects verified by the independent body according to ISO 14025. Basically, comparison or evaluation of EPD data is possible only if all the compared data were created according to EN 15804+A2.

Life cycle analysis (LCA): A1-A5, C1-C4 and D modules in accordance with EN 15804+A2 (Cradle-to-Gate with options)
The year of preparing the EPD: 2025
Product standard: ISO 10318-1:2015, ISO 10318-2:2015
Service Life: Over 100 years for standard product
PCR: ITB-PCR A (PCR based on EN 15804+A2)
Declared unit: 1 kg
Reasons for performing LCA: B2B
Representativeness: Polish, European, Global, 2024

MANUFACTURER

Fig. 1. Pietrucha International Sp. z o.o. in Błaszki, Poland

Pietrucha International Sp. z o.o. is a manufacturer of **PolGrid geogrids**, specialized geosynthetics used in civil engineering projects for soil stabilization, subgrade reinforcement, and separation of materials with different grain sizes. Geogrids are applied in transport infrastructure construction as well as various geotechnical projects—wherever ground stabilization is required. Easy and quick to install, geogrids help reduce material consumption, which translates into lower costs and shorter project timelines.

PRODUCTS DESCRIPTION AND APPLICATION

The wide range of PolGrid geogrids allows for optimal product selection tailored to the needs of individual projects and structures. Depending on the intended application and specific requirements, a geosynthetic with the appropriate composition and form is selected.

Biaxial geogrids

Geogrids with rigid structure with stiff, integral junctions. They are manufactured through an extrusion and stretching process, resulting in a monolithic material with no joints or connections. Characterized by square rib cross-sections, they provide improved interlocking of aggregate particles within the apertures, leading to excellent load-bearing performance.

PolGrid BX biaxial geogrid:

- Reinforcement of road and railway substructures
- Construction of temporary and technological roads
- Construction of forest roads
- Construction of access roads to wind-farms
- Construction of working platforms and parking areas

- Reinforcement of building foundations
- Reinforcement of substructures under technical floors and mass storage areas

PolGrid BX MAX biaxial geogrid with enlarged mesh openings

- Reinforcement of railway track substructure
- Reinforcement of road foundations
- Construction of temporary and technological roads
- Construction of forest roads

Geocomposites: PolGrid FSR BX

The PolGrid FSR BX geocomposite is a geogrid (PolGrid BX or PolGrid BX MAX) thermally bonded with a geotextile. Geocomposites combine the advantages of a geogrids and non-woven geofabric for even higher reinforcement, filtration and separation. Geocomposites are used on soft or unstable subgrades or in combination with finer-grained materials. The type of biaxial geogrid and the kind of geotextile are selected individually depending on the project requirements.

Biogeocomposites: PolGrid Bio

PolGrid Bio biogeocomposite is a combination of a stiff-jointed geogrid and a biodegradable geotextile embedded with grass seeds. It provides a practical and convenient solution for turfing, greening, and also protecting slopes along roads and highways, railway embankments, flood levees, and industrial sites. It allows for rapid coverage and stabilization of slope surfaces, protecting them against erosion and shallow surface landslides.

Applications

- Roads and highways – protection, stabilization, and greening of excavation slopes, embankments, and ditches
- Steep slopes and inclined areas – protection against soil slippage and erosion caused by water and wind
- Railway subgrades – protection, stabilization, and greening of excavation slopes, embankments, and ditches
- Flood levees – protection against surface slippage, water and wind erosion
- Sand dunes – protection against erosion and landslides
- Sports and recreational areas – greening and turfing on inclined surfaces

LIFE CYCLE ASSESSMENT (LCA) – General rules applied

Declared unit

The declared unit is 1 kg of product: PolGrid geogrids. Conversion factors for environmental impacts from 1 kg to square meter are provided in Table 2 for specific products based on a specific mass per m^2.

Allocation

The allocation rules used for this EPD are based on general ITB PCR A. Production of plastic geogrids is a line process executed by ietrucha International Sp. z o.o. at the plant located in Błaszki (Poland). Allocation was performed based on product mass. All environmental impacts related to raw material extraction and processing are allocated to module A1 of the life cycle assessment (LCA). The impacts from the entire production process of Pietrucha International Sp. z o.o. were inventoried and allocated to geogrids. Water and energy consumption, associated emissions, and generated waste are allocated to module A3. Packaging materials were also taken into consideration.

System limits

At the processing plant, at least 99.0% of the input materials and 100% of the energy consumption were inventoried and included in the calculations. The assessment considered all available production data, i.e., all raw materials/components used in the formulation process, the thermal energy used for heating, and the electricity consumption. Therefore, material and energy flows with a mass or energy share of more than 99% were included. It can be assumed that the sum of omitted processes does not exceed 1% of the energy and mass consumption for modules A or D. Machinery and equipment necessary for the production process were omitted. Packaging products (film, paper, cardboard, etc.) were also included.

Modules A1 and A2: *Raw materials supply and transport*

The product consists of plastics (polypropylene), colorants, processing additives, and packaging materials, sourced mainly from foreign and local suppliers. The means of transport are trucks. Average fuel consumption data for Poland and Europe were used for calculations.

Module A3: *Production*

The production process begins with mixing polypropylene and colorant, which are then fed into the extruder. In the extruder, the mixture undergoes a melting process, after which it passes through the plate extrusion module. The extruded plate is then levelled to ensure uniform surface and thickness, and holes are embossed into the material.
Subsequently, the plate with holes is stretched first in the longitudinal direction (machine direction) using a dedicated tensioning system, and then in the transverse direction. The resulting geogrid is rolled into coils, followed by labelling, marking, and packaging. The finished products are then transferred to the warehouse. Quality control is carried out at individual stages of the production process. A diagram of the production process is shown in Fig. 2.

Module A4: transport to consumer and A5 installation

Vehicle transport at distance 100 km is considered (emission standard: Euro 5) with 100% load capacity. The installation is carried out using mechanical and electrical devices, the estimated energy consumption is 3 kWh per tonne of product.

Modules C1-C4 and D: *End-of-life (EoL)*

Polypropylene geogrids are a long-lasting product, designed to remain in the ground. The current construction waste management system is not designed for their effective recovery. Efforts are

underway to increase material recycling, but this remains a niche, not widespread practice. It is assumed that the geogrids used are not recycled (Table 1). Packaging materials, which represent less than 1% of total system flows, were not taken into consideration.

*Table 1. End-of-life scenario for **POLGRID geogrids***

Material	Waste processing		Landfilling
	Material recovery (reuse, recycling)	**Energy recovery** (incineration)	
PP	0%	0 %	100 %

Data quality and databases

The data selected for LCA originate from ITB-LCI questionnaires completed by Pietrucha International Sp. z o.o. and verified during data audit. No data collected is older than five years and no generic datasets used are older than ten years. The representativeness, completeness, reliability, and consistency is judged as good. The data for the processes come from the following databases: Ecoinvent v.3.11, specific EPDs, ITB-Database. Specific data quality analysis was a part of external ISO 14001 audit.

Data collection period

The data for manufacture of the declared products refer to period between 01.01.2024 – 31.12.2024 (1 year). The life cycle assessments were prepared for Poland and Europe as reference area.

Assumptions and estimates

The impacts of the representative products were aggregated using weighted average.

Calculation rules

LCA was performed using xls tool developed in accordance with EN15804+A2 and E.F. 3.1. Factors. No mass balance approach were used. Biogenic carbon in life cycle was balanced.

Additional information

Polish electricity (Ecoinvent v 3.11 supplemented by actual national KOBiZE data) emission factor used is 0.597 kg CO_2/kWh (National for 2024). As a general rule, no particular environmental or health protection measures other than those specified by law are necessary.

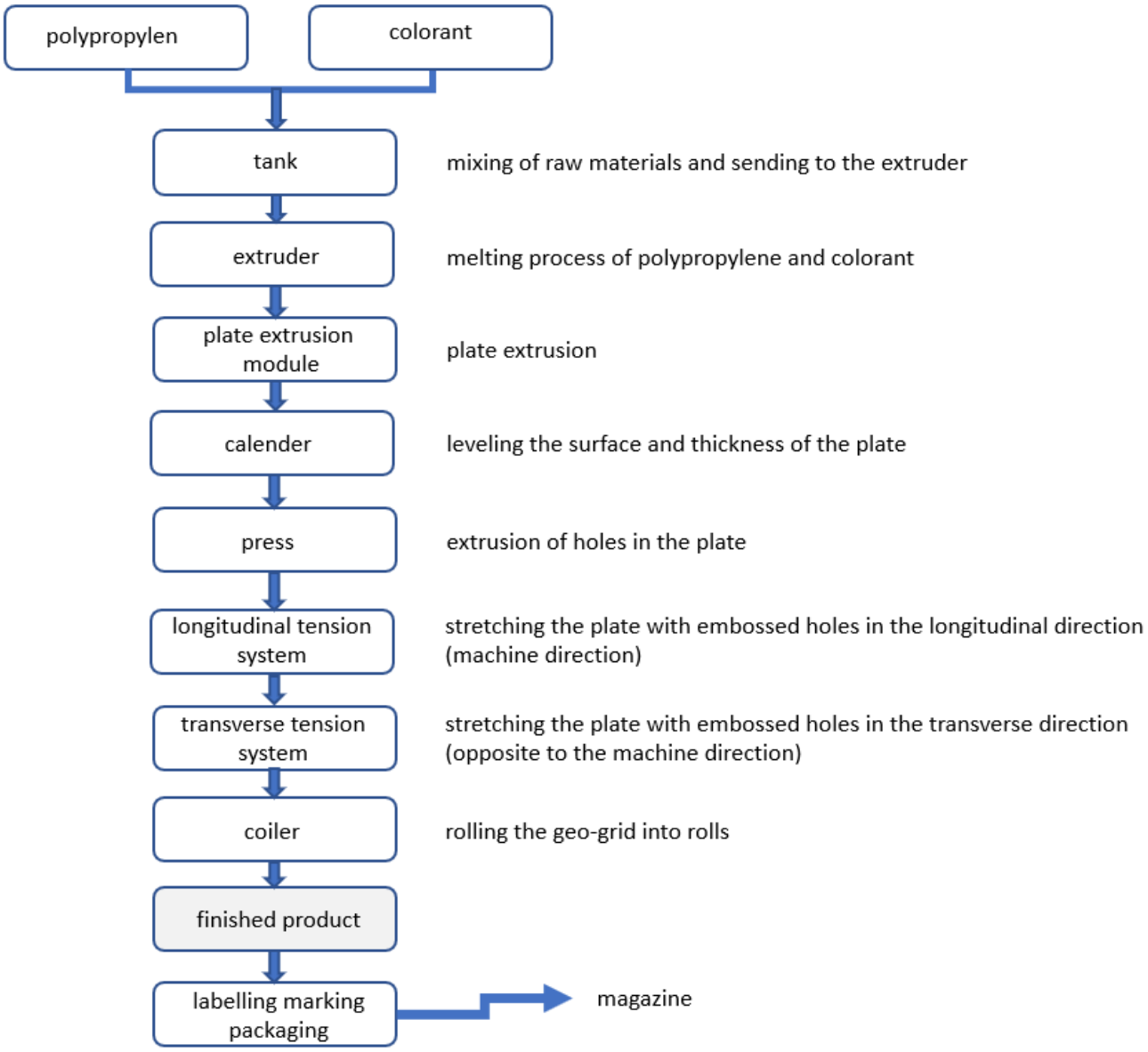

Fig. 2. The scheme of production by Pietrucha International Sp. z o.o.in Błaszki

LIFE CYCLE ASSESSMENT (LCA) – Results

Declared unit

The declaration refers to declared unit (DU) – 1 kg of geogrids produced by Pietrucha International Sp. z o. o. in Błaszki.
To convert the environmental impact value from 1 kg to 1 m^2, the values from Table 4 to Table 7 should be multiplied by the values of the coefficients from Table 2, which determines the conversion factors for individual type of geogrid.

Table 2.The conversion factors for individual types of geogrids are determined

Name	**Type**	**Conversion factors** [kg/m^2]
BIO 15/15	BIO-015	0.180
BIO 20/20	BIO-020	0.526
BIO 25/25	BIO-025	0.510
FSR BX 20/20 100PP	FSR-020/100	0.300
FSR BX 20/20 120PP	FSR-020/120	0.340
FSR BX 20/20 150PP	FSR-020/150	0.370
FSR BX 20/20 170PP	FSR-020/170	0.390
FSR BX 25/25 120PP	FSR-025/120	0.390
FSR BX 30/30 100PP	FSR-030/100	0.400
FSR BX 30/30 120PP	FSR-030/120	0.440
FSR BX 30/30 150PP	FSR-030/150	0.470
FSR BX 30/30 170PP	FSR-030/170	0.490
FSR BX 40/40 100PP	FSR-040/100	0.600
FSR BX 40/40 120PP	FSR-040/120	0.620
FSR BX 40/40 150PP	FSR-040/150	0.650
FSR BX 40/40 170PP	FSR-040/170	0.670
FSR BX 20/20 MAX 120PP	FSR-M20/120	0.320
FSR BX 20/20 MAX 150PP	FSR-M20/150	0.370
FSR BX 30/30 MAX 100PP	FSR-M30/100	0.400
FSR BX 30/30 MAX 120PP	FSR-M30/120	0.420
FSR BX 30/30 MAX 150PP	FSR-M30/150	0.450
FSR BX 30/30 MAX 170PP	FSR-M30/170	0.490
FSR BX 40/40 MAX 170PP	FSR-M40/170	0.670
BX 10/10	SBX-010	0.130
BX 15/15	SBX-015	0.180
BX 20/20	SBX-020	0.234
BX 25/25	SBX-025	0.270
BX 30/30	SBX-030	0.320
BX 40/40	SBX-040	0.500
BX 45/45	SBX-045	0.560
BXB 30/30	SBX-B30	0.282
BXB 40/40	SBX-B40	0.360
BX MAX 15/15	SBX-M15	0.180
BX MAX 20/20	SBX-M20	0.220
BX MAX30/30	SBX-M30	0.325
BX MAX40/40	SBX-M40	0.500

Table 3. System boundaries for the environmental characteristic of the product.

Environmental assessment information (MD – Module Declared, MND – Module Not Declared, INA – Indicator Not Assessed)																
Product stage			Construction process		Use stage							End of life				Benefits and loads beyond the system boundary
Raw material supply	Transport	Manufacturing	Transport to construction site	Construction-installation process	Use	Maintenance	Repair	Replacement	Refurbishment	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**
MD	**MD**	**MD**	**MD**	**MD**	**MND**	**MND**	**MND**	**MND**	**MND**	**MND**	**MND**	**MD**	**MD**	**MD**	**MD**	**MD**

Table 4. Life cycle assessment (LCA) results for specific product – environmental impacts (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO_2	2.99E+00	1.49E-01	1.04E+00	4.28E+00	8.34E-02	1.37E-03	0.00E+00	0.00E+00	2.66E-02	6.52E-01	-6.95E-03
Greenhouse potential - fossil	eq. kg CO_2	3.02E+00	1.49E-01	1.04E+00	4.31E+00	8.31E-02	1.37E-03	0.00E+00	0.00E+00	0.00E+00	6.52E-01	-5.78E-03
Greenhouse potential - biogenic	eq. kg CO_2	-2.66E-02	9.53E-05	6.75E-05	-2.63E-02	2.84E-04	3.69E-06	0.00E+00	0.00E+00	2.66E-02	1.36E-04	-1.17E-03
Global warming potential - land use and land use change	eq. kg CO_2	1.30E-03	4.95E-05	1.40E-04	1.47E-03	3.26E-05	2.14E-07	0.00E+00	0.00E+00	0.00E+00	1.03E-04	-1.07E-05
Stratospheric ozone depletion potential	eq. kg CFC 11	8.65E-08	3.25E-09	1.16E-08	1.00E-07	1.92E-08	7.53E-12	0.00E+00	0.00E+00	0.00E+00	7.96E+00	-1.07E-10
Soil and water acidification potential	eq. mol H+	9.78E-03	4.79E-04	1.07E-02	2.22E-02	3.37E-04	1.45E-05	0.00E+00	0.00E+00	0.00E+00	5.43E-03	-2.96E-05
Eutrophication potential - freshwater	eq. kg P	5.94E-04	1.02E-05	1.27E-03	2.07E-03	5.59E-06	2.36E-06	0.00E+00	0.00E+00	0.00E+00	4.41E-06	-3.32E-06
Eutrophication potential - seawater	eq. kg N	2.06E-03	1.61E-04	1.47E-03	3.84E-03	1.02E-04	2.05E-06	0.00E+00	0.00E+00	0.00E+00	1.85E-02	-7.65E-06
Eutrophication potential - terrestrial	eq. mol N	2.16E-02	1.75E-03	1.36E-02	3.82E-02	1.11E-03	1.79E-05	0.00E+00	0.00E+00	0.00E+00	3.49E-02	-6.80E-05
Potential for photochemical ozone synthesis	eq. kg NMVOC	1.36E-02	7.26E-04	3.94E-03	1.86E-02	3.40E-04	5.15E-06	0.00E+00	0.00E+00	0.00E+00	7.61E-03	-1.07E-10
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	1.56E-05	5.14E-07	1.57E-06	1.65E-05	2.95E-07	5.16E-10	0.00E+00	0.00E+00	0.00E+00	1.47E-07	-5.81E-08
Abiotic depletion potential - fossil fuels	MJ	7.92E+01	2.12E+00	1.46E+01	9.77E+01	1.23E+00	2.16E-02	0.00E+00	0.00E+00	0.00E+00	6.18E-01	-1.05E-01
Water deprivation potential	eq. m^3	6.09E-01	1.11E-02	2.70E-01	9.10E-01	5.70E-03	4.14E-04	0.00E+00	0.00E+00	0.00E+00	1.45E-02	-2.34E-03

Table 5. Life cycle assessment (LCA) results for specific product – additional impacts indicators (DU: 1 kg)

Indicator	Unit	A1-A3	A4-A5	C1-C4	D
Particulate matter	disease incidence	INA	INA	INA	INA
Potential human exposure efficiency relative to U235	eg. kBq U235	INA	INA	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	INA	INA
Potential comparative toxic unit for humans (cancer effects)	CTUh	INA	INA	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA	INA

Table 6. Life cycle assessment (LCA) results for specific product - the resource use (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	1.81E+00	3.44E-02	1.72E+00	3.57E+00	1.77E-02	1.78E-03	0.00E+00	0.00E+00	0.00E+00	1.13E-02	-2.12E-02
Consumption of renewable primary energy resources used as raw materials	MJ	2.02E-01	0.00E+00	0.00E+00	2.02E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total consumption of renewable primary energy resources	MJ	2.01E+00	3.44E-02	1.72E+00	3.77E+00	1.77E-02	1.78E-03	0.00E+00	0.00E+00	0.00E+00	1.13E-02	-2.12E-02
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	4.73E+01	2.12E+00	1.45E+01	6.39E+01	1.23E+00	2.16E-02	0.00E+00	0.00E+00	0.00E+00	-3.01E+01	-8.32E-01
Consumption of non-renewable primary energy resources used as raw materials	MJ	3.18E+01	0.00E+00	9.88E-02	3.19E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.07E+01	7.27E-01
Total consumption of non-renewable primary energy resources	MJ	7.91E+01	2.12E+00	1.46E+01	9.58E+01	1.23E+00	2.16E-02	0.00E+00	0.00E+00	0.00E+00	6.18E-01	-1.05E-01
Consumption of secondary materials	kg	1.26E-02	9.45E-04	1.45E-03	1.50E-02	4.14E-04	1.88E-06	0.00E+00	0.00E+00	0.00E+00	2.79E-04	-2.08E-02
Consumption of renew. secondary fuels	MJ	8.38E-05	1.24E-05	2.05E-05	1.17E-04	4.56E-06	9.49E-09	0.00E+00	0.00E+00	0.00E+00	3.79E-06	0.00E+00
Consumption of non-renewable secondary fuels	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	-7.19E-07
Net consumption of freshwater	m^3	1.46E-02	2.56E-04	6.65E-03	2.15E-02	1.55E-04	6.21E-05	0.00E+00	0.00E+00	0.00E+00	5.47E-04	-7.03E-05

Table 7. Life cycle assessment (LCA) results for specific product – waste categories (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Hazardous waste	kg	1.93E-01	3.03E-03	1.54E-01	3.50E-01	1.38E-03	1.68E-04	0.00E+00	0.00E+00	0.00E+00	4.44E-08	-3.10E-04
Non-hazardous waste	kg	1.20E+01	6.50E-02	6.17E+00	1.82E+01	2.46E-02	1.13E-02	0.00E+00	0.00E+00	0.00E+00	1.16E-01	-2.63E-02
Radioactive waste	kg	2.33E-05	6.22E-07	2.64E-06	2.66E-05	9.21E-08	3.25E-09	0.00E+00	0.00E+00	0.00E+00	3.30E-06	-4.17E-07
Components for re-use	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
Materials for recycling	kg	1.10E-03	2.53E-05	1.26E-02	1.37E-02	3.82E-06	1.45E-07	0.00E+00	0.00E+00	0.00E+00	4.13E-06	-1.64E-05
Materials for energy recovery	kg	2.49E-06	1.34E-07	1.64E-07	2.79E-06	3.09E-08	2.33E-10	0.00E+00	0.00E+00	0.00E+00	5.15E-08	-3.42E-09
Exported Energy	MJ	1.92E-02	9.25E-04	6.51E-03	2.67E-02	0.00E+00	6.92E-05	0.00E+00	0.00E+00	0.00E+00	6.30E-01	-3.32E-04

Verification

The process of verification of this EPD is in accordance with ISO 14025 and ISO 21930. After verification, this EPD is valid for a 5-year-period. EPD does not have to be recalculated after 5 years, if the underlying data have not changed significantly.

The basis for LCA analysis was EN 15804+A2 and ITB PCR A
Independent verification corresponding to ISO 14025 (subclause 8.1.3.) ☒ external ☐ internal
External verification of EPD: Halina Prejzner, PhD. Eng. LCI audit and verification: Filip Poznański, M.Sc. Eng. LCA, LCI audit and input data verification: Michał Piasecki, PhD., D.Sc., Eng.

Note 1: The declaration owner has the sole ownership, liability, and responsibility for the information provided and contained in EPD. Declarations of construction products may not be comparable if they do not comply with EN 15804+A2. For further information about comparability, see EN 15804+A2 and ISO 14025.

Note 2: ITB is a public Research Organization and Notified Body (EC Reg. no 1488) to the European Commission and to other Member States of the European Union designated for the tasks concerning the assessment of building products' performance. ITB acts as the independent, third-party verification organization (ISO 17025/17065/17029). ITB-EPD program is recognized and registered member of The European Platform - Association of EPD program operators and ITB-EPD declarations are registered and stored in the international ECO-PORTAL.

Normative references

- ITB PCR A General Product Category Rules for Construction Products
- ISO 10318-1:2015 – Geosynthetics - Part 1: Terms and definitions
- ISO 10318-2:2015 – Geosynthetics - Part 2: Symbols and pictograms
- EN 13249:2016; Geotextiles and geotextile-related products - Characteristics required for use in the construction of roads and other trafficked areas (excluding railways and asphalt inclusion)
- EN 13250:2016; Geotextiles and geotextile-related products - Characteristics required for use in the construction of railways
- EN 13251:2016; Geotextiles and geotextile-related products - Characteristics required for use in earthworks, foundations and retaining structures
- EN 13252:2016; Geotextiles and geotextile-related products - Characteristics required for use in drainage systems
- EN 13253:2016; Geotextiles and geotextile-related products - Characteristics required for use in erosion control works (coastal protection, bank revetments)
- EN 13254:2016; Geotextiles and geotextile-related products - Characteristics required for the use in the construction of reservoirs and dams
- EN 13255:2016; Geotextiles and geotextile-related products - Characteristics required for use in the construction of canals
- EN 13257:2016; Geotextiles and geotextile-related products - Characteristics required for use in solid waste disposals
- EN 13265:2016 ; Geotextiles and geotextile-related products - Characteristics required for use in liquid waste containment projects
- ISO 14025:2006, Environmental labels and declarations – Type III environmental declarations – Principles and procedures
- ISO 14044:2006 Environmental management – Life cycle assessment – Requirements and guidelines
- ISO 15686-1:2011 Buildings and constructed assets – Service life planning – Part 1: General principles and framework
- EN 15804:2012+A2:2019 Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products
- ISO 14067:2018 Greenhouse gases — Carbon footprint of products — Requirements and guidelines for quantification
- PN-EN 15942:2012 Sustainability of construction works – Environmental product declarations – Communication format business-to-business
- https://ecoinvent.org/

LCA, LCI audit and input data verification
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CERTIFICATE № 847/2025
of TYPE III ENVIRONMENTAL DECLARATION

Products:

Geogrids POLGRID

Manufacturer:

Pietrucha International Sp. z o.o.
ul. Przemysłowa 10, 98-235 Błaszki, Poland

confirms the correctness of the data included in the development of
Type III Environmental Declaration and accordance with the requirements of the standard

EN 15804+A2

Sustainability of construction works.
Environmental product declarations.
Core rules for the product category of construction products.

This certificate, issued on 19th September 2025 is valid for 5 years
or until amendment of mentioned Environmental Declaration

Head of the Thermal Physic, Acoustics and Environment Department
Agnieszka Winkler-Skalna, PhD

INSTYTUT TECHNIKI BUDOWLANEJ

Deputy Director for Research and Innovation
Krzysztof Kuczyński, PhD

Warsaw, September 2025