ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A2*

Owner of the Declaration	Interplast Kunststoffe GmbH
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-IKG-20260040-IBC1-EN
Issue date	08.04.2026
Valid to	07.04.2031

ISO-DRAIN Dimpled sheets for foundation wall protection

Interplast Kunststoffe GmbH

Institut Bauen und Umwelt e.V.

ECO PLATFORM EPD VERIFIED

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1. General Information

Interplast Kunststoffe GmbH

Programme holder

IBU – Institut Bauen und Umwelt e.V.
Hegelplatz 1
10117 Berlin
Germany

Declaration number

EPD-IKG-20260040-IBC1-EN

This declaration is based on the product category rules:

Dimpled Sheets, 01.08.2021
(PCR checked and approved by the SVR)

Issue date

08.04.2026

Valid to

07.04.2031

Dipl.-Ing. Hans Peters
(Chairman of Institut Bauen und Umwelt e.V.)

Dr. Martina Bender
(Managing Director Institut Bauen und Umwelt e.V.)

ISO-DRAIN Dimpled sheets for foundation wall protection

Owner of the declaration

Interplast Kunststoffe GmbH
Heinrich-Schickhardt-Str. 1
72221 Haiterbach
Germany

Declared product / declared unit

1 kg dimpled sheet

Scope:

This EPD for the dimpled sheets of the **ISO-DRAIN eco /nature** series (with PE recyclate content, unlaminated) from Interplast Kunststoffe GmbH is representative of all the company's dimpled sheets for foundation wall protection. These are in particular

- ISO-DRAIN eco / nature G / P (with PE recyclate content, fleece-laminated)
- ISO-DRAIN (made from virgin material, unlaminated)
- ISO-DRAIN G / P (made from virgin material, fleece-laminated)

The dimpled sheets from the ISO-DRAIN eco/nature product series are selected as a representative product because they cover approx. 57% of the production volume in 2023 and therefore account for the highest proportion.
The dimpled sheets with recycled content are produced at the plants in Haiterbach, Germany and Krupka, Czech Republic. The dimpled sheets made from virgin material are only produced at the Haiterbach plant.
The dimpled sheets are used worldwide, with the sales focus being on Europe. This is a representative EPD based on the ISO-DRAIN eco /nature product. The specific LCA results of the other dimpled sheets are attached to this EPD as annexes.

The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

The EPD was created according to the specifications of EN 15804+A2. In the following, the standard will be simplified as *EN 15804*.

Verification

The standard EN 15804 serves as the core PCR
Independent verification of the declaration and data according to ISO 14025:2011
☐ internally ☒ externally

Manfred Russ,
(Independent verifier)

2. Product

2.1 Product description/Product definition

ISO-DRAIN dimpled sheets for foundation wall protection are single or multi-layer plastic sheets made of polyolefins with round, square or polygonal dimples. In addition to the shape and size of the studs, the model variants can also differ in terms of coloring and the type of lamination. The representative product in this study is a dimpled sheet from the **ISO-DRAIN eco /nature** product range with PE recyclate content without lamination. Other product lines covered by this EPD include:

- **ISO-DRAIN eco / nature G / P**: with PE recyclate content and fleece lamination
- **ISO-DRAIN**: made from virgin material, without lamination
- **ISO-DRAIN G / P**: made from virgin material, with fleece lamination

Product according to CPR with hEN:
Regulation (EU) No. 305/2011(CPR) applies to the placing on the market of the product in the EU/EFTA (with the exception of Switzerland). The product requires a declaration of performance in accordance with EN 13252 2016-12 'Geotextiles and geotextile-related products - Characteristics required for use in drainage systems' and EN 13967: 2017-08 'Flexible sheets for waterproofing - Plastic and elastomeric sheets for waterproofing against soil moisture and water'. The respective national regulations apply for use.

2.2 Application

The dimpled sheets are used for waterproofing, drainage, water storage, ventilation of buildings and structures or as a separating layer and horizontal drainage. They can be covered with additional layers of geotextile.

2.3 Technical Data

The dimpled sheets meet the relevant standards mentioned. In addition, the films are impermeable to water in accordance with DIN EN 1928:2000-07 and have CE certification in accordance with EN ISO 13967 or EN ISO 13252 for drainage films.

Structural data

Name	Value	Unit
EN 13252 (Geotextiles and geotextile related products)	-	-
Tensile strength EN ISO 10319 (MD)	4.7 - 23	kN/m
Grammage DIN EN 12127	400 - 1900	g/m^2
Compressive strength DIN EN ISO 25619-2	950 - 130	kPa
Resistance to water according to DIN EN 1928:2000-07	tight	-
Resistance against oxidation DIN EN ISO 13438	passed	-
Water drainage capacity EN ISO 12958	0.5 - 9.8	l/(ms)

Product according to CPR with hEN:
Performance values of the product according to the declaration of performance with regard to its essential characteristics according to EN 13252 2016-12 'Geotextiles and geotextile-related products - Characteristics required for use in drainage systems' or EN 13967: 2017-08 'Flexible sheets for waterproofing - Plastic and elastomeric sheets for waterproofing against soil moisture and water'.

2.4 Delivery status

Depending on the product variant, the dimpled sheets are supplied in rolls between 0.5 m and 4.0 m wide and between 6.0 and 40 m long. For certain products, delivery in sheet form is also possible.

2.5 Base materials/Ancillary materials

Composition of dimpled sheets ISO-DRAIN eco/nature
The compositions of the average dimpled sheets ISO-DRAIN eco/nature in mass-% in relation to the declared unit are given in the following table.

Name	Value	Unit
HDPE Recycled Granulate	89.3	%
Chalk	8.8	%
Carbon black masterbatch	1.8	%

1. The product/product/at least one part of the product contains substances on the ECHA list of Substances of Very High Concern (SVHC) (date 01.10.2025) above 0.1% by mass: **no**.
2. The product/product/at least one sub-product contains other CMR substances of category 1A or 1B that are not on the candidate list, above 0.1% by mass in at least one sub-product: **no**.
3. Biocidal products have been added to this construction product or it has been treated with biocidal products (it is therefore a treated product within the meaning of the Biocidal Products Regulation (EU) No. 528/2012): **no**.

2.6 Manufacture

The dimpled sheets are produced at Interplast in Haiterbach, Germany and at Interplast Kunststoffe s.r.o in Krupka, Czech Republic.
They are manufactured in a single production step by extrusion. The plastic is melted in an extruder and formed into a film using a slot die. While the film is still warm, it is passed over a forming roller, which embosses the dimples into the film. In the case of dimpled sheets with lamination, this is continuously welded onto the finished dimpled sheet using further rollers. The dimpled sheets are rolled up and stacked on pallets.

2.7 Environment and health during manufacturing

The legal regulations on handling exhaust air, waste water, waste and noise emissions are complied with or undercut. The health of employees is not endangered during production.Interplast Kunststoffe GmbH has energy and environmental management certifications (ISO 14001, ISO 50001). In addition, the entire potential of direct waste heat is exploited in production. Only closed cooling circuits are used.

2.8 Product processing/Installation

The dimpled sheets are installed manually. The dimpled sheets are cut to length using manual cutting tools.

2.9 Packaging

The rolled dimpled sheets are wrapped in PE film and delivered on reusable pallets.

2.10 Condition of use

No material changes occur during use, as all the plastics used are stabilized and resistant to ageing.

2.11 Environment and health during use

There are no known interactions between the dimpled sheets, the environment and health during use. The product does not contain or form any harmful substances that could be released.

2.12 Reference service life

The reference service life (RSL) in accordance with *ISO 15686* is not relevant for the LCA calculation and is therefore not determined.

2.13 Extraordinary effects

Fire

Due to the fact that the dimpled sheet is generally installed underground to drain off water, the effects in the event of fire can be assumed to be negligible.

Water

Dimpled sheets are used to drain off water in accordance with EN ISO 12958. Exposure to water therefore has no effect on the behavior of the product.

Mechanical destruction

In the event of unforeseen mechanical destruction of the dimpled sheet, the corresponding functionality in terms of sealing, drainage or water storage is no longer guaranteed. Destruction of the product has no impact on the environment.

2.14 Re-use phase

At the end of its useful life, the dimpled sheet can be removed and sent for thermal recycling at energy recovery. In principle, material recycling is also possible.

2.15 Disposal

In addition to thermal and mechanical recycling, landfilling should also be considered, depending on local conditions.

Waste code according to the European Waste Catalogue:
20 01 39 Plastics

2.16 Further information

Further information can be found in the product catalogs or on the corresponding websites:
https://interplast.de/deutsch/downloads.html

3. LCA: Calculation rules

3.1 Declared Unit

The declared unit is defined according to PCR Part-B as 1 kg of dimpled sheet leaving the factory. The product packaging is considered separately.

This representative EPD includes several product variants. A representative dimpled sheet is balanced based on the average values of annual production in 2023.

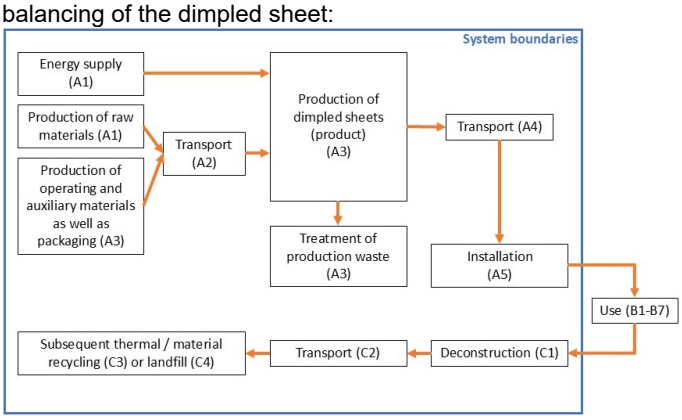
Declared unit

Name	Value	Unit
Declared unit	1	kg
Mass reference	0.4 - 1.9	kg/m^2
Bulk density (averaged)	60	kg/m³

3.2 System boundary

The project report and the EPD take into account the life cycle of the dimpled sheet from the cradle to the factory gate with options, modules C1-C4 and module D (A1-A3 + C + D and additional modules A4 and A5).

The following flow chart shows the system boundaries for the balancing of the dimpled sheet:



The following is a detailed list of the life cycle stages or process modules taken into account for the production of the dimpled sheet:

A1-A3 Production phase

- Production of raw, auxiliary and operating materials as well as preliminary products, including transportation to the respective plants
- Provision of energy for production
- Packaging of the bubble wrap
- Recycling of production waste
- Recycling of other waste incl. transportation

A4-A5 Installation

- Transportation of the product to the construction site
- Installation of the bubble wrap
- Recycling of the product packaging

C1-C4 Disposal

Three 100% disposal scenarios are assumed:
1. End-of-life (EoL) basic scenario: 100% dismantling of the dimpled sheet with subsequent energy recovery (modules C3 and D)
2. EoL scenario 1: 100% dismantling of the dimpled sheet with subsequent mechanical recycling (modules C3/1 and D/1)
3. EoL scenario 2: 100% dismantling of the dimpled sheet and disposal in a local landfill (module C4/2)

D Reuse, recovery and/or recycling potential

Reuse, recovery and/or recycling potentials are available in the disposal scenarios, as the dimpled sheets are recycled for energy or materials. The recovered energy or the recovered secondary materials can be used outside the system boundary.

The GWP of the residual electricity mix balanced in modules A1-A3 is **0.561 kg CO2 eq./kWh**. The weighted average of the electricity requirements of the production sites in Germany and the Czech Republic is used for this purpose.

3.3 Estimates and assumptions

Transport

Trucks with a total weight of more than 32 t are assumed to transport the raw materials over land. A truck with a total weight of 14 to 20 tons and a payload of 11.4 tons was assumed for transporting the product to the construction site. For reusable packaging, a return transport of the same distance was assumed in addition to the transport to the production site.

Electricity mix

The German residual mix is used for the electrical energy required to produce the bubble wrap at the Haiterbach plant and the Czech residual mix is used for production at the Krupka plant, both with the reference year 2023.

Material

The purchased recycled material and the production waste from the manufacture of the dimpled sheets are included in the calculation free of charge. As they must first be converted from

regrind into pellets for processing in an extrusion process, an electricity requirement of 0.04 kWh/kg is assumed.
Due to the difficulty in distinguishing between production quantities, PE laminates were also approximated with PP material in the calculation. This can be justified by the very similar environmental impacts of the materials.

Assembly/disassembly
The dimpled sheets are assembled manually on site without any additional energy requirement. Dismantling, on the other hand, is carried out using an excavator with an excavation of 0.6 m³, as the dimpled sheet must be exposed for dismantling.

Recycling of dimpled sheet
The recycled PE material produced in EoL scenario 1 from the dismantled dimpled sheet can be considered an advantage of reuse after appropriate processing in module D/1. The loss of quality due to recycling compared to virgin PE is taken into account by a substitution factor of 0.5.

3.4 Cut-off criteria
In this study, all significant inputs and outputs were included in the assessment. The majority of the data (> 95 % of the mass share) is site-specific primary data. Existing data gaps were filled with conservative assumptions and generic secondary data. The following processes/materials were not taken into account due to a lack of data or due to the low mass fraction or the low expected environmental impacts:

- Production of reusable packaging
- Yellow pigment for one product variant

All processes/materials not included have a mass fraction < 1% in relation to the declared unit.

3.5 Background data
The LCA model on which this EPD is based was created using Sphera's LCA for Experts software. The Managed LCA Content database (version 2025.1) from Sphera was used.

3.6 Data quality
The foreground data collected by Interplast Kunststoffe GmbH for the production year 2023 was used to model the production of the dimpled sheet. All relevant information and data for modeling the dimpled sheet are available. The data used is consistent. The inputs and outputs of the production as well as data on the packaging of the dimpled sheet come directly from the manufacturing company. The background data used comes from Sphera's Managed LCA content database (version 2025.1). Where possible, data from the year 2023 was used. No data older than five years was used.

3.7 Period under review
The production data refer to average values for 2023.

3.8 Geographic Representativeness
Land or region, in which the declared product system is manufactured, used or handled at the end of the product´s lifespan: Europe

3.9 Allocation
During the production (modules A1-A3) of the dimpled sheets, co-products are created insofar as the production waste is processed and reused in the product. The reprocessing process includes grinding the material with the corresponding electricity requirement. A reject rate of 5% is assumed here. The scrap is thermally recycled. This means that 95% of the production waste is returned to the product as secondary material without any load. Due to the use of recyclate in the product, a net flow calculation is carried out for the possible material recovery of the product at the end of its life cycle. The recycling or thermal recovery of the product and packaging materials generates benefits in the form of recovered energy or secondary materials that can be used outside the system boundaries (Module D). The secondary material can partly replace virgin material. The loss of quality is taken into account with a substitution factor of 0.5. When using secondary material or recycling, the waste to be recycled loses its waste status at the end of its life when it is processed into regrind. Up to and including regrinding, the emissions and effects are attributed to the original product. The regrind is included in the balance of the downstream product without any load. Possible further processing, such as regranulation, influences the balance of the downstream product.

3.10 Comparability
Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to *EN 15804* and the building context, respectively the product-specific characteristics of performance, are taken into account. The Managed LCA content database (version 2025.1) from Sphera was used.

4. LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon
The biogenic carbon content quantifies the amount of biogenic carbon in a building product when it leaves the factory gate. No biogenic carbon is bound in the product dimpled sheet. According to the background data set, the wooden pallet used with a mass of 0.120 kg in relation to the declared unit has approx. 43 % biogenic carbon per kg, which results in 0.052 kg biogenic carbon in relation to the declared unit.

Information on the description of the biogenic carbon content at the factory gate

Name	Value	Unit
Biogenic carbon content in product	-	kg C
Biogenic carbon content in accompanying packaging	0.052	kg C

Note: 1 kg of biogenic carbon is equivalent to 44/12 kg of CO_2.

The following technical information is the basis for the declared modules or can be used for the development of specific scenarios in the context of a building assessment if modules are not declared (MND).

Transport to construction site (A4)
A distance of 434 km with a truck with a total weight of 14 to 20 t (11.4 t payload) was assumed for the transportation of the product to the construction site.

Name	Value	Unit
Transport distance	450	km
Dimpled sheet	1	kg
Gross density of products transported (averaged)	60	kg/m³
Packaging	0.13	kg

Installation in the building (A5)
The dimpled sheets are installed manually on site without the need for additional energy. It is assumed that the installation site has already been cleared and therefore the use of heavy

equipment for earthmoving is not necessary.

Name	Value	Unit
Dimpled sheet	1	kg
Packaging PE film (for thermal recycling)	0,004	kg
Packaging wooden pallets (for re-use)	0,122	kg

End of life (C1-C4)
The dimpled sheet is removed using an excavator, as the dimpled sheet must be exposed for dismantling. It is assumed that, in relation to the declared unit, approximately 1 m² of dimpled sheet must be uncovered and 0.6 m³ of soil excavated. Transport of the removed dimpled sheet for recycling takes place via trucks with a total weight of more than 32 t and a distance of 77 km.

Module C3, C4 - Energy recovery:
Here, the waste is incinerated without prior treatment and recovered as energy.

Module C3/1, C4/1 - Recycling/material recovery:
The recycling process takes into account the treatment steps "washing" and "grinding" of the waste. As ground material, the product has an economic value and thus reaches the status of end-of-waste. Water and electrical energy are required for processing. A conservative processing rate of 95 % is assumed. The remaining 5 % is transported by 32 t truck over 77 km to a customer for energy recovery.

Module C3/2, C4/2 - Waste disposal / landfill:
For this EoL scenario, the dimpled sheet is disposed of in a landfill.

Name	Value	Unit
Energy recovery (Modul C3)	1	kg
Recycling (Modul C3/1)	1	kg
Landfilling (Modul C4/2)	1	kg

Wiederverwendungs- Rückgewinnungs- und Recyclingpotential (D), relevante Szenarioangaben
Module D comprises the benefits and loads for the incineration processes of the product packaging in A5 and the bubble wrap in C3 and C3/1 in a waste incineration plant. From the EoL scenario 1 (module C3/1), PE regrind can be produced from the dismantling of the bubble wrap, which leaves the product system. After regranulation, it can replace virgin material with an assumed factor of 0.5 (D).

Name	Value	Unit
Exported electrical energy from C3	6.68	MJ
Exported thermal energy from C3	11.9	MJ
Net flow	0,11	kg
Recyclable material from C3/1	0.052	kg
Exported electrical energy from C3/1	0.334	MJ
Exported thermal energy from C3/1	0.594	MJ
Exported electrical energy from C4/2	0	MJ
Exported thermal energy from C4/2	0	MJ

5. LCA: Results

The results of the life cycle assessment and the impact assessment for the ISO-DRAIN eco/nature dimpled sheets examined are listed in detail below. The EoL baseline scenario (100 % energy recovery) comprises modules C1, C2, C3, C4 and D, EoL scenario 1 (100 % mechanical recycling) comprises modules C1, C2, C3/1, C4/1 and D/1 and EoL scenario 2 (100 % landfill) comprises modules C1, C2, C4/2 and D/2.

The results of the other product variants can be found in the annex to this EPD.

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE OR INDICATOR NOT DECLARED; MNR = MODULE NOT RELEVANT)

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 the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	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	MND	MND	MNR	MNR	MNR	MND	MND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 kg Noppenfolie

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C3/2	C4	C4/1	C4/2	D	D/1	D/2
GWP-total	kg CO_2 eq	4.61E-01	1.47E-02	1.63E-02	6.92E-01	6.82E-03	3.13E+00	2.74E-01	0	0	0	2.9E-02	-1.43E +00	-1.6E-01	-5.29E-03
GWP-fossil	kg CO_2 eq	4.59E-01	1.42E-02	1.61E-02	7E-01	6.62E-03	3.13E+00	2.73E-01	0	0	0	2.89E-02	-1.42E +00	-1.58E-01	-5.25E-03
GWP-biogenic	kg CO_2 eq	5.6E-04	6.76E-05	2.21E-05	3.83E-06	3.15E-05	9.42E-05	7.85E-04	0	0	0	0	-7.37E-03	-1.05E-03	-2.72E-05
GWP-luluc	kg CO_2 eq	1.68E-03	3.68E-04	1.18E-04	7.15E-03	1.71E-04	2.65E-05	1.94E-05	0	0	0	8.1E-05	-1.97E-03	-1.31E-04	-7.25E-06
ODP	kg CFC11 eq	7.88E-13	4E-15	1.93E-15	8.19E-14	1.86E-15	1.75E-13	4.84E-13	0	0	0	9.8E-14	-1.34E-11	-1.04E-12	-4.95E-14
AP	mol H^+ eq	5.11E-04	3.07E-05	8.82E-06	3.47E-03	1.11E-05	3.15E-04	1.74E-04	0	0	0	1.74E-04	-1.68E-03	-2.33E-04	-6.21E-06
EP-freshwater	kg P eq	3.6E-07	2.71E-08	8.8E-09	1.87E-06	1.26E-08	2.13E-08	9.53E-07	0	0	0	1.54E-05	-1.31E-06	-1.99E-07	-4.81E-09
EP-marine	kg N eq	1.5E-04	1.34E-05	3.42E-06	1.66E-03	4.6E-06	6.77E-05	4.9E-05	0	0	0	3.81E-05	-4.87E-04	-6.05E-05	-1.79E-06
EP-terrestrial	mol N eq	1.67E-03	1.49E-04	4.07E-05	1.79E-02	5.1E-05	1.49E-03	5.32E-04	0	0	0	4.15E-04	-5.44E-03	-6.52E-04	-2E-05
POCP	kg NMVOC eq	4.32E-04	2.89E-05	7.92E-06	4.5E-03	1.04E-05	2.01E-04	1.29E-04	0	0	0	1.2E-04	-1.32E-03	-2.53E-04	-4.87E-06
ADPE	kg Sb eq	2.05E-08	1.92E-09	6.23E-10	4.61E-08	8.92E-10	1.97E-09	3.47E-09	0	0	0	1.96E-09	-1.41E-07	-1.79E-08	-5.21E-10
ADPF	MJ	1.02E+01	1.86E-01	6.1E-02	8.84E+00	8.64E-02	3.67E-01	1.45E+00	0	0	0	4.75E-01	-2.52E +01	-4.77E +00	-9.29E-02
WDP	m^3 world eq deprived	3.09E-02	5.46E-05	1.09E-03	2.78E-03	2.54E-05	2.89E-01	2.24E-02	0	0	0	3.55E-03	-1.49E-01	-8.07E-03	-5.48E-04

GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential)

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 kg Noppenfolie

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C3/2	C4	C4/1	C4/2	D	D/1	D/2
PERE	MJ	4.72E-01	1.6E-02	1.84E+00	6.51E-01	7.45E-03	1.01E-01	9.37E-02	0	0	0	7.97E-02	-8.23E +00	-6.03E-01	-3.03E-02
PERM	MJ	1.83E+00	0	-1.83E +00	0	0	0	0	0	0	0	0	0	0	0
PERT	MJ	2.3E+00	1.6E-02	5.51E-03	6.51E-01	7.45E-03	1.01E-01	9.37E-02	0	0	0	7.97E-02	-8.23E +00	-6.03E-01	-5.06E-11
PENRE	MJ	5.28E+00	1.86E-01	2.21E-01	8.84E+00	8.64E-02	5.16E+00	1.6E+00	0	0	0	4.75E-01	-2.52E +01	-4.77E +00	-9.29E-02
PENRM	MJ	4.95E+00	0	-1.6E-01	0	0	-4.79E +00	-2.92E +00	0	0	0	0	0	0	0
PENRT	MJ	1.02E+01	1.86E-01	6.1E-02	8.84E+00	8.64E-02	3.67E-01	-1.32E +00	0	0	0	4.75E-01	-2.52E +01	-4.77E +00	-9.29E-02
SM	kg	8.95E-01	0	0	0	0	0	0	0	0	0	0	0	9.93E-02	0
RSF	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FW	m^3	1.1E-03	1.14E-05	2.87E-05	3.14E-04	5.3E-06	6.76E-03	5.42E-04	0	0	0	1.04E-04	-6.41E-03	-6.64E-04	-2.36E-05

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 net fresh water

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 kg Noppenfolie

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C3/2	C4	C4/1	C4/2	D	D/1	D/2
HWD	kg	1.25E-09	9.68E-12	3.85E-12	3.2E-10	4.51E-12	2E-10	6.82E-11	0	0	0	1.06E-10	-1.59E-08	-1.29E-09	-5.88E-11
NHWD	kg	2.1E-03	2.76E-05	5.48E-05	1.16E-03	1.28E-05	1.24E-02	2.52E-03	0	0	0	9.96E-01	-1.26E-02	-1.54E-03	-4.63E-05
RWD	kg	3.06E-04	2.69E-07	1.64E-07	1.16E-05	1.25E-07	2.11E-05	7.23E-05	0	0	0	6.78E-06	-1.9E-03	-1.22E-04	-7E-06
CRU	kg	1.34E-01	0	1.22E-01	0	0	0	0	0	0	0	0	0	0	0
MFR	kg	4.6E-02	0	0	0	0	0	1E+00	0	0	0	0	0	0	0
MER	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EEE	MJ	1.73E-02	0	2.47E-02	0	0	6.68E+00	3.34E-01	0	0	0	0	0	0	0
EET	MJ	3.11E-02	0	4.4E-02	0	0	1.19E+01	5.94E-01	0	0	0	0	0	0	0

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; EEE = Exported electrical energy; EET = Exported thermal energy

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1 kg Noppenfolie

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C3/2	C4	C4/1	C4/2	D	D/1	D/2
PM	Disease incidence	6.73E-09	2.43E-10	6.89E-11	4.03E-08	9.01E-11	1.84E-09	1.56E-09	0	0	0	1.81E-09	-1.37E-08	-2.47E-09	-5.06E-11
IR	kBq U235 eq	2.91E-02	2.65E-05	2.1E-05	1.61E-03	1.23E-05	3.38E-03	6.77E-03	0	0	0	9.06E-04	-3.13E-01	-1.94E-02	-1.15E-03
ETP-fw	CTUe	2.61E+00	2.05E-01	6.65E-02	1.15E+01	9.56E-02	1.36E-01	2.92E-01	0	0	0	1.06E+00	-2.22E +00	-2.37E +00	-8.2E-03
HTP-c	CTUh	4.75E-11	2.94E-12	1.02E-12	1.54E-10	1.37E-12	1.99E-11	1.16E-11	0	0	0	1.46E-11	-2.58E-10	-5.19E-11	-9.51E-13
HTP-nc	CTUh	1.41E-09	1.14E-10	3.69E-11	8.71E-09	5.3E-11	9.2E-11	6.75E-10	0	0	0	2.64E-10	-4.26E-09	-8.66E-10	-1.57E-11
SQP	SQP	1.01E+00	9.72E-02	3.16E-02	3.92E+00	4.53E-02	1.15E-01	2.19E-02	0	0	0	7.49E-02	-4.83E +00	-3.61E-01	-1.78E-02

PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index

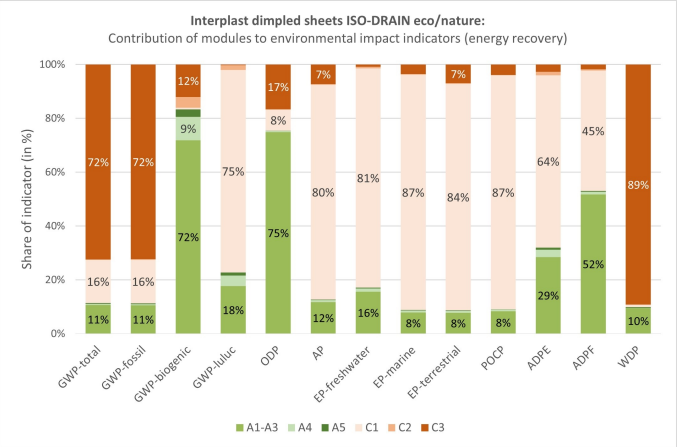
Disclaimer 1 – for the indicator “Potential Human exposure efficiency relative to U235”. This impact category deals mainly with the eventual impact of low-dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure or radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – for the indicators “abiotic depletion potential for non-fossil resources”, “abiotic depletion potential for fossil resources”, “water (user) deprivation potential, deprivation-weighted water consumption”, “potential comparative toxic unit for ecosystems”, “potential comparative toxic unit for humans – cancerogenic”, “Potential comparative toxic unit for humans - not cancerogenic”, “potential soil quality index”. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high as there is limited experience with the indicator.

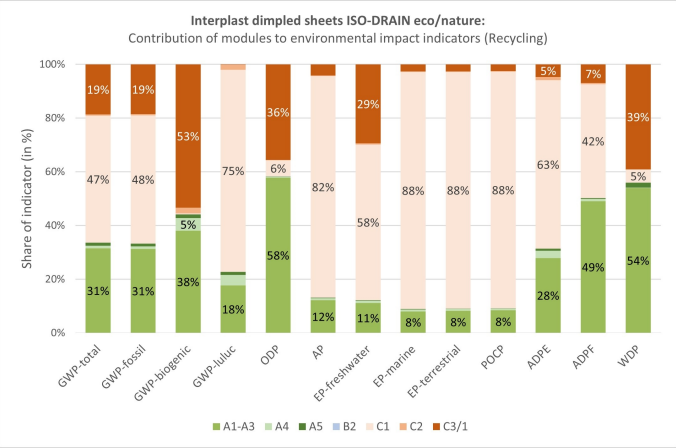
6. LCA: Interpretation

This section provides an interpretation of the life cycle assessment results for the representative product **ISO-DRAIN eco/nature**. Results for the ISO-DRAIN eco/nature G/P, ISO-DRAIN, and ISO-DRAIN G/P product series can be found in the appendices to this EPD.
The percentage shares of the modules in the core indicators for the three EoL scenarios under consideration are shown graphically.

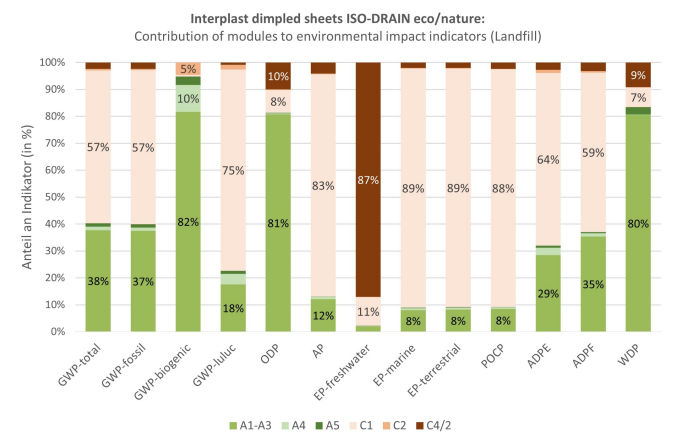
Shares of the modules in environmental impact indicators in the EoL baseline scenario (energy recovery):



Shares of the modules in environmental impact indicators in EoL scenario 1 (recycling):

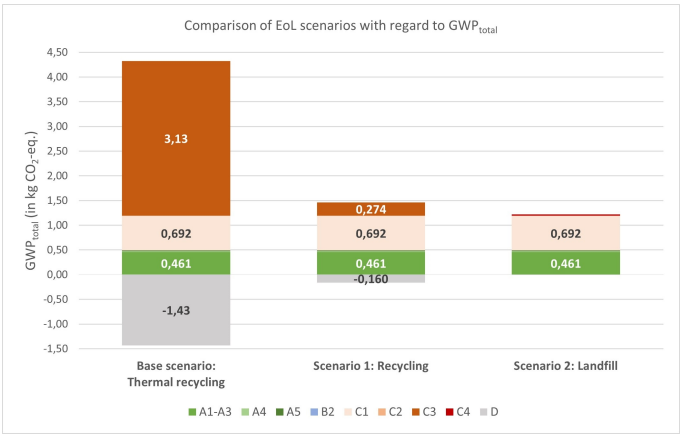


Shares of modules in environmental impact indicators in EoL scenario 2 (landfilling):



The majority of indicators on environmental impacts and resource consumption are dominated by the manufacturing phase (modules A1-A3) and dismantling (module C1).
The impacts of the production phase are made up of all categories, with plastic and additive production, transportation and energy provision having the greatest impacts.
The dismantling of the dimpled sheet is carried out using an excavator. It is assumed that 0.6 m³ of soil must be excavated for each kg of bubble wrap. This energy-intensive step with large earth movement is clearly visible and causes a considerable share of the environmental impacts.
In the baseline scenario and in scenario 1, waste treatment (module C3, C3/1) also has a significant share in the indicators.
In the baseline scenario, energy recovery (module C3) causes a significant proportion of the impacts. These are dominated in particular by the incineration process of PE. In Scenario 1, electricity generation and energy recovery from treatment waste as well as water consumption are significant.
In Scenario 2, landfilling (Module C4/2) also plays a role for some indicators.
In the baseline scenario and in Scenario 1, the impacts within the system boundaries can be partially compensated by recovery potentials outside the system boundaries (Module D, D/1).
Transportation to the construction site (Module A4), installation of the dimpled sheets (Module A5) and transportation for disposal (Module C2) play a subordinate role in all scenarios.

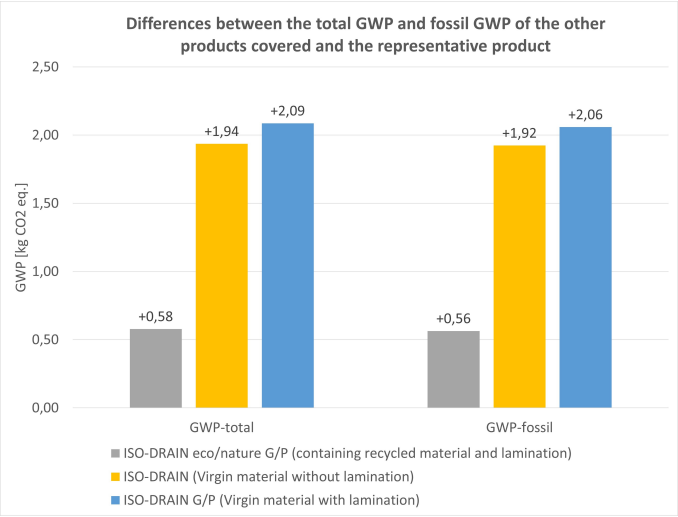
Direct comparison of the EoL scenarios with regard to the GWP_{total}:



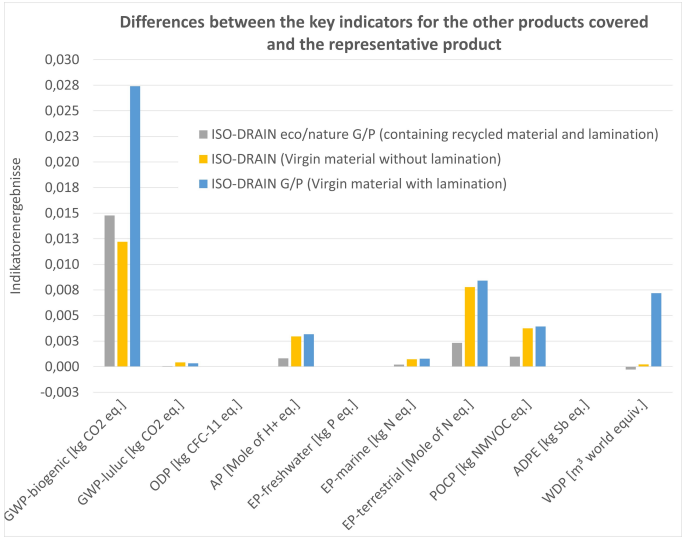
In this comparison, only the impact on climate change via the GWP_{total} is considered. The benefits and burdens outside the system boundaries for the respective scenarios are also explicitly presented.

The scenarios differ particularly in modules C and D. In the case of energy recovery, the incineration of the plastic results in high additional greenhouse gas emissions of 3.13 kg CO_2-eq. The advantages of using the energy outside the system boundaries in Module D show that these can only be offset by less than half.
Recycling results in low additional greenhouse gas emissions of 0.27 kg CO_2-eq. due to the collection and processing of the waste. In contrast, potential benefits of -0.16 kg CO_2-eq. arise outside the system boundaries (Module D) due to the possible use of the recovered recyclate instead of virgin material.
Landfilling produces the lowest emissions in Module C in terms of GWP_{total}. However, no additional benefits are gained outside the system boundaries through the disposal of the product. However, landfilling has the highest environmental impact of the EoL scenarios in the $EP_{freshwater}$ indicator, for example.

Deviations of the main indicators for the other products from the representative product
Detailed results for the other products can be found in the annexes to this EPD. The following figure shows the deviations in the $_{GWPtotal}$ and $_{GWPfossil}$ of the other products from the representative product in the EoL baseline scenario (energy recovery).



It can be clearly seen that both the GWP_{total} and the GWP_{fossil} are higher when the proportion of virgin material in the product is higher. Accordingly, the ADPF indicator (potential for depletion of abiotic resources - fossil fuels, not shown) is also significantly higher. The representative product ISO-DRAIN eco/nature is largely made from PE regranulate and the share of production in the GWP is correspondingly low. The dimpled sheet ISO-DRAIN eco/nature G/P also contains a lamination of virgin PP material. The dimpled sheet ISO-DRAIN is made entirely from virgin material and the dimpled sheet ISO-DRAIN G/P also has a lamination of virgin material. At +2.06 kg CO_2-eq./kg, the latter shows the greatest difference to the representative product.
The deviations of the other main indicators can be seen in the following figure.



7. Requisite evidence

No separate evidence is required for these EPDs.

8. References

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