DIFBU Environmental Product Declaration

according to ISO 14025

Façade Panels and Level Panels Textura / Natura, Eterplan

Eternit AG

Declaration Number
DIFBU-ETE-10907-E

DEUTSCHES INSTITUT FÜR BAUEN UND UMWELT E.V.
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DIFBU
Deutsches Institut für Bauen und Umwelt

Summary

Umweltdeklaration

Environmental Product-Declaration

Program holder

DEUTSCHES INSTITUT FÜR BAUEN UND UMWELT E.V.

www.bau-umwelt.com

Declaration holder

Eternit AG
Im Breitspiel 20
D – 69126 Heidelberg

Declaration number

DIFBU-ETE-10907-E

Declared building products

Façade panels (Textura / Natura) and level panels (Eterplan)

This declaration is an environmental product declaration according to ISO 14025 and describes the environmental performance of the construction products specified here. It intends to promote environmentally friendly and healthy construction.

This validated declaration publishes all relevant environmental data. The declaration is based on the PCR document „Fiber cement“, reference year 2005.

Validity

This validated declaration authorises the holder to bear the official stamp of the association. It only applies to the above mentioned products for three years from the date of issue. The declaration holder is liable for the information and evidence on which the declaration is based.

Content of the declaration

This **declaration** is complete and contains in detail:

- Product definition and physical data
- Information about raw materials and origin
- Specifications on manufacturing the product
- References for product processing
- Information on product in use, singular effects and end of life
- LCA results
- Evidence and verifications

Date of issuance

03rd September 2007

Signatures

Prof. Dr.-Ing. Horst J. Bossenmayer (Chairman of the DIFBU)

Verification of the declaration

This declaration, and the rules which it is based on, have been verified by the Independent Advisory Board (SVA) according to ISO 14025.

Signatures

Prof. Dr.-Ing. Hans-Wolf Reinhardt (Chairman of the SVA)

Dr. Frank Werner (Verifier appointed by the SVA)

Summary

Environmental Product-Declaration

Product description

The named products are level panels made of naturally hardened fiber cement. All Textura (formerly Peli-color)/Natura panels and Eterplan level panels are being declared. Textura is a coated façade panel with a slightly grainy surface. Natura is a laminated façade panel with a translucent surface structure. Eterplan is an uncoated fiber cement panel.

Range of application

Uses of the declared large-format fiber cement panels:
Textura and Natura are used as cladding material for suspended, back-ventilated façades and for decorative interior finish.
Eterplan is a construction panel for various uses, e.g., in container construction, as foundation bases, canal covers, permanent framework and rotating panels in composite elements.
Eterplan is also the base panel for the façade panels Textura and Natura.

Scope of the Life Cycle Assessment

The **life cycle assessment** was implemented pursuant to DIN 14040 ff. According to the DIFBU guideline for type III declarations, specific data for the examined products and data from the GaBi 4 database was used as the data sources. The life cycle assessment includes raw material and energy production, the actual manufacturing phase, and the use phase of the fiber cement panels.

Results of the Life Cycle Assessment

Façade Panels and Level Panels (Raw Materials and Manufacture)

Parameter	Unit per ton	Eterplan	Textura / Natura
Primary energy, non-renewable	[MJ]	9784	14323
Primary energy, renewable	[MJ]	3887	3890
Global warming potential (GWP 100)	[kg CO_2-eq.]	734	929
Ozone depletion potential (ODP)	[kg R11-eq.]	$88.9 \cdot 10^{-6}$	$89.8 \cdot 10^{-6}$
Acidification potential (AP)	[kg SO_2-eq.]	2.63	4.73
Eutrophication potential (EP)	[kg phosphate-eq.]	0.24	0.34
Summer smog potential (POCP)	[kg ethane-eq.]	0.32	0.52

Created by: Eternit AG, Heidelberg
in cooperation with PE INTERNATIONAL, Leinfelden-Echterdingen

Evidence and verifications

In addition, the following **evidence and verifications** are also described in the Environmental Product Declaration:

- Combustion gas analysis
  according to DIN 53436
- Eluate analysis
  according to Class 1 of the *Settlement Waste* TA

Scope of validity This DIFBU Environmental Product Declaration applies to large-format fiber cement panels produced in Germany.

0 Product definition

Product definition The named products are level panels made of fiber cement. The façade panels Textura/ Natura and the level panel Eterplan are being declared.

Range of application Natura, Tectura: façade panels for assembly on a wood or metal substructure.

Eterplan: construction panels for dry walling, canal covers, foundation bases, container construction, permanent frameworks etc.

Product standard / approval

- DIN EN 12467, fiber cement panels / product specification and test procedure
- General construction supervisory permit No. Z-31.1-34 of the German Institute for Construction Technology (DIBt) for Eternit façade panels

Quality control

- CE conformity declaration according to the regulations of Appendix ZA of DIN EN 12467
- Third party monitoring of the products with a general building supervisory permit by the Materials Testing Office of the State of Brandenburg/Berlin or the Federal Office for Testing Materials and Research (BAM)

Presentation, properties

Table 1: Civil engineering data

Property	Value
Bulk density	≥ 1,650 to 1,800 kg/m³
Strength pursuant to DIN EN 12467: Compression strength E-module Bending tensile strength	 50 N/mm² 15.000 N/mm² 17 N/mm² 24 N/mm²
Coefficient of vapor diffusion resistance μ according to DIN 4108-4	350 / 140
Equilibrium moisture content at 23°C, 80% rel. humidity	approx. 10 M.-%
Linear expansion coefficient	a_t = 0.01 mm/(mK)
Moisture expansion (air dry to water-saturated)	1 mm/(mK)
Chemical resistance	Similar to concrete C 35/45
Aging resistance	Similar to concrete C 35/45
Permanent temperature resistance	Given to 80° C
Heat conductivity λ_R	approx. 0,60 W/(mK)

Table 2: Delivery formats and product properties

	max. format in mm	Thickness in mm	Surface	Color
Eterplan	3100 x 1500	6; 8; 10; 12; 15; 20	smooth	uncoated
Textura	3100 x 1500	8; 12	granular	Various colors
Natura	3100 x 1250	8; 12	smooth	
Textura (balcony panel)	3100 x 1500	10	granular	

Sound-proofing

With a 200 mm thick porous concrete wall with $R_{w,R}$ = 44 dB and a suspended, back-ventilated façade with 80 mm insulation material and cladding with 8 mm fiber cement, an improvement of the air-borne sound insulation from 9 to 11 dB can be achieved (according to DIN 52210).

Fire protection

Building material class A2 according to DIN 4102, i.e., "non-combustible"

Building material classification according to DIN EN 13501 A2,s1-d0, i.e., according to the construction rule list part A, "non-combustible".

1 Raw materials

Raw materials, prime products

Fiber cement: (basic materials in % by mass, dry mass)

- Portland cement according to DIN EN 197-1 (CEM I 32.5 R and 42.5 R) (as a binder) 84%
- Trass (as a filler) 9 %
- Cellulose (as filter fibers) 3 %
- Polyethylene fibrides (as filter fibers) 2 %
- Polyvinyl alcohol fibers (as reinforcing fibers) 2 %

As well as mixing water for the cement: 0.24 m³/t fiber cement

Auxiliary substances / additives

Coating:

	Textura	**Natura**
Back side sealing:		
Water	60.0 %	60.0 %
Additive (cementing delaying agent)	0.3 %	0.3 %
PVDC butyl acrylate (binding agent)	35.7 %	35.7 %
Paraffin wax (binding agent)	4.0 %	4.0 %
Application quantity in g/m²	60 – 80	60 – 80

Coating of the front side:

	Textura		Natura
	Bottom coat	Top coat	
Water	41 %	52 %	56 %
Solvents (glycols)	4 %	4 %	4 %
Additive (cementing delaying agent)	2 %	2 %	2 %
Inorganic pigments*	28 %	9 %	14 %
Pure acrylates (binding agent)	24 %	31 %	24 %
Polyethylene wax	1 %	1 %	-
Preservatives	0,6 %	-	-
Application quantity in g/m²	220-240	140-160	200-240

*using Structura coating including silicate hollow spheres for surface structure formation

Material explanation

- **Portland cement:** produced according to DIN EN 197-1. It is obtained from a mixture of limestone marl, a mixture of limestone and clay. The raw material is broken, dried, burned and ground up to cement. Precise manufacturing data is available from cement makers.
- **Trass:** Trass consists of volcanic tuff. It is used as filler for optimizing product qualities (improvement of material binding, deformation properties and reduction of a tendency towards efflorescence).
- **Cellulose (sulfate cellulose):** Cellulose fibers as they are also used in paper production serve as process fibers (fiber length 0.5 to 4 mm, fiber diameter 8 – 30 µm, i.e., cannot pass into the lung). During manufacture, the cellulose as a filter fiber prevents cement particles from being washed out by the excess water.
- **Polyethylene fibrides:** Synthetic organic fibers with an average fiber diameter of 6µm and a fiber length of about 200 – 500 µm (i.e., cannot pass into the lung) are also used as filter fibers.
- **Polyvinyl alcohol fibers:** Synthetic organic fibers with a fiber length of 4 – 6 mm and a fiber diameter of 12 µm (i.e., cannot pass into the lung). They are used for reinforcing the cement and ensure the required bending tensile strength.
- **Water:** Water from the company well is exclusively used in production. 0.6 m^3 of water are used per ton of fiber cement, of which 0.36 are again released in the manufacturing process and after mechanical clarification on the company property are returned to the production process.
- **Preservatives:** A fungicide-containing cleaning agent is used during the use phase.

Raw material extraction and origin

The majority of the stated raw materials are obtained from domestic sources. All basic materials are purchased. The average transport distance from the location of raw material production/recovery to the Eternit plant: 20 km.

Local and general availability of raw materials

Fiber cement mostly consists of mineral materials for which there is no resource shortage according to current knowledge.

2 Manufacturing the building product

Manufacturing the building product

The production of large-format panels made of fiber cement follows a largely automated wrapping method: The raw materials are formed into a homogeneous mixture. Rotating sieved cylinders that drain internally are immersed into the liquid cement. The sieve surface is covered by a thin fiber cement mesh that is transferred to a continuous conveyor band. From there it is taken to the making roll, which is gradually covered with a thickening layer of fiber cement. When the desired thickness has been achieved, the still moist and moldable fiber cement (fiber cement fleece) is separated and taken off the making roll. The fiber cement fleece is cut to size with the residues being returned to the production process so that no waste arises. The cut fleece is stacked and compacted under high pressure. The panels are then taken away for binding, are later stacked and kept in a curing storage for further hardening. The binding period is about 4 weeks long.

A colorless seal is partially applied to the back sides. The visible sides (both sides of the Textura balcony panel) receive a coating for which pure acrylates are doubly applied in a brush and pour process and applied as a hot film. The color surface either is smooth or has a slate-like structure. In Textura products, hollow silicate balls (micro-glass balls) are introduced for achieving the fine-grained surface and a preservative is added.

Packaging

PE shrink foils, wood pallets and steel bands are used in packaging.

Health protection production

During the entire manufacturing process, no health protection measures extending beyond the mandatory occupational safety measures for commercial operations are required.

Environmental protection production

- Air: Arising dust is captured by a filter system and partially reused. The emissions are clearly below the limits in the *Air* TA.
- Water/soil: Water accumulating during manufacturing and system cleaning are mechanically clarified in wastewater treatment systems on the property and returned to the production process.
- Noise: The noise emissions of the production systems to the surroundings are within the admissible limit values.

3 Working with the building product

Processing recommendations

Special low-dust equipment such as slow-running , hard-metal-fitted separating saws and milling cutters as well as manual tools such as bursters, punch pliers etc. are available for processing. Drilling is carried out with normal HSS drills. Structurally required ancillary products for the installation of said products are wood and aluminum substructures including the required anchoring and connecting means (rivets, screws and nails) and joint tape made of EPDM or aluminum. The assessment of these ancillary products is not part of this document. In the selection of structurally required ancillary products care must be taken that they do not negatively affect the described environmentally compatible properties of the stated construction products.

On request, the large format panels are also delivered ready for installation so that only a few cuts for fitting are required on the construction sites.

Job safety environmental protection

The rules of the professional associations apply.
During the installation of the following products, the usual occupational safety measures must be complied with according to the manufacturer’s information. Care must be taken that the dust accruing during processing can react alkaline (pH value about 12). The general dust limit value according to TRG 900 of ≤ 6 mg/m^3 can be safely adhered with by employing the processing methods recommended by Eternit AG (see, e.g., the pamphlet *Planning and Application, Façade Panels Made of Fiber cement*).

Based on current knowledge, hazards to water, air and soil will not arise from installing fiber cement according to the regulations.

Residual materials Panel sections and packaging accruing on the construction site must be collected separately. For disposal the regulations of the local disposal authority and the notes in *Item 6: End of life phase* must be observed.

4 Building product in use

Constituents

Fiber cement:

Through settling (hydration) of the cement/water mixture, a cement stone (calcium silicate hydrates) with embedded fibers and filler as well as minute pores is formed.
During the use period, the free calcium in the cement reacts with carbon dioxide in the air to form calcium carbonate (carbonization).

Fiber cement contains about 12% water (equalization moisture) and about 30% air by volume (contained in the micropores).

The **coating materials** are bound as a solid due to hot film formation. The water has evaporated.

Environment – health effects

Environmental aspects:

Hazards to water, soil and air cannot arise from the described products according to current knowledge if used according to the regulations (See *Item 8: Evidence*).

Health aspects:

During normal use according to the construction materials' purpose, no health impairment is known due to the basic materials employed and their behavior (see also *Item 8: Evidence*). The algicidal additive contained in the Textura coating is bound in the binding agent (pure acrylate) and cannot be released in measurable quantities through leaching/washing out so that health hazards cannot result (see *Item 8: Evidence: Eluate Analysis*). The weathering rate of the pure acrylate coating is very low (not measurable) even after many years of use so that health hazards cannot result.

Long term durability Fiber cement products can be used with almost no limits after the settling of the cement binding agent if used according to the regulations.

5 Singular effects

Fire

- **Smoke production/smoke concentration:** The smoke development caused by burning of the named products (coating) is very minor ($30 m^2/s^2$).
- **Toxicity of the fumes:** See the test result regarding the toxicity of the combustion gases in *Item 8: Evidence*.
- **Change of state (burning drip down/drop-out):**
During a fire of surrounding construction materials, the polyvinyl alcohol fibers bound into the concrete gradually lose their solidity: This behavior will not result in an explosion and no danger will result from the fiber cement during a fire. The fiber cement or its paint coating will not drip down/fall off while burning.

Floods No contents that are hazardous to water will be washed out (see also *Item 8: Evidence: Eluate Analysis*). The pH value is alkaline ($pH \geq 12$).

6 End of life phase

Disassembly

The façade and level panels can be removed without destruction through unscrewing or drilling the rivets, depending on the fastening system.

Circulation

In their undamaged form, the dismantled products can be reused according to their original purpose or as foundation wall protection.

With a pure separation by type, the named coated and uncoated fiber cement products can be ground up and reused as an additive in the production of fiber cement (materials recycling).

With a pure separation by type, the named coated and uncoated materials are also suitable for continued use as filler and aggregate in civil engineering, road construction or, e.g., noise barrier walls.

Disposal

Fiber cement: Remains of the named fiber cement products accruing on the construction site or from demolition can be stored without problems due to their mostly mineral content in garbage landfills of landfill class I. Waste key: 170101 (concrete) according to the European Waste Catalogue.

Packaging: If they are collected in pure form, the recyclable polyethylene foils are disposed by INTERSEROH: if less than 20 m^3 of foil accrue, they can be returned without cost to the building supplies store, which will look after disposal by INTERSEROH. With more than 20 m^3 of foil accruing, free pick-up by INTERSERH can be organized. The reusable pallets are accepted by the building supplies store and the deposit is returned. It will then be returned to Eternit.

7 Life cycle assessment

7.1 Production of fiber cement panels

Declared unit

The declaration relates to the production of average fiber cement panels.
The bulk density of fiber cement panels is 1,650 kg/m^3.

A scenario for the use phase assumes 100 m^2 of used area.

System boundaries

The selected system limits include the manufacture of the products from including the raw material production to the finished packaged product at the factory gate (cradle to gate).

The GaBi/ GaBi 2006/ database was used for producing energy and transport. The framework of observation specifically includes:

- Manufacture of all materials employed (precursor products)
- Transport and packaging of the raw materials and precursory products
- Manufacturing costs (energy, waste, emissions), including the precursor products and energy preparation from the resources
- Packaging

All products that are examined were manufactured at the Neubeckum plant.

A scenario for cleaning the panels is considered with regard to the products examined for the use phase. In this declaration, a consideration of end-of-life scenarios was waived.

Cut-off criteria

On the input side, all material flows that enter the system and make up more than 1% of the total mass or more than 1% of the primary energy consumption are considered. On the output side all material flows are recorded that leave the system and whose environmental effects are larger than 1% of the total effect of the considered effect category. The non-modeled processes have been omitted due to their low quantities and their low primary energy consumption relevance.

Transports

The transports of the raw and auxiliary materials used has been included.

Period under consideration

The data for manufacturing the examined products refer to 2005. The life cycle assessments were established for Germany as the reference area. As a result, the relevant precursors such as making available power and energy carriers for Germany were used along with production processes in this context.

Background data

The GaBi 4 software system was used for modeling the life cycle for the manufacture of Textura/Natura fiber cement and Eterplan. For most part, the data (processes) was supplied as aggregated process data by Ecobilan.

The manufacture of one ton of Textura/Natura and Eterplan was calculated as far as possible with specific data from Eternit, alternatively average data sets are used.

Assumptions

The results of this life cycle assessment study are based on the following assumptions. The transportation of all raw and auxiliary materials is summarized in one transportation process. The specific diesel consumption of individual materials is not known.

Cleaning the fiber cement product is assumed during the use phase. The cleaning occurs every decade. Information on the consumption of cleaning agent relates to 100 m^2.

Data quality

The age of the data employed is less than 5 years.
The data for the studied fiber cement product was recorded directly in the plant. Most data for the precursor chain is derived from industrial sources that were collected under consistent chronological and methodological framework conditions. The process data and the used background data are consistent. The completeness of recording environmentally relevant material budget data on the input and output sides was strongly emphasized. The data (processes) was collected by Ecobilan. For the most part, the data (process) was supplied as aggregate process data and, therefore, a detailed analysis of these processes was not possible.

The supplied data (processes) were checked for plausibility. Therefore, the data quality can be described as good.

Allocation

Allocation means the assignment of the input and output flows of a life cycle assessment module to the examined production system/ ISO 14040/.

Relevant allocations (i.e., the assignment of environmental loads of a process to several products) did not have to be undertaken in the life cycle assessment for the foreground data of the examined products. Where relevant, the background data, such as power mix allocations, were used. In this study a German power mix is used.

Indication to use phase

The useful life of construction materials depends on the respective construction, the use situation, the user, maintenance and service.
The calculation of the use phase for the Textura and Natura façade panels in this declaration is based on cleaning with a fungicide every 10 years. Fungicide consumption is based on 100 m^2 of the fiber cement production.

Cleaning is not budgeted for the uncoated Eterplan panels.

7.2 Results of the assessment

Life cycle inventory (LCI)

In the following chapters, the life cycle inventory analysis is interpreted in terms of primary energy consumption and waste.

Primary energy use

Table 3 shows the primary energy consumption (renewable and non-renewable) divided according to manufacture, raw material production, coating, transportation, and packaging of one ton of Textura/ Natura.
46% of non-renewable primary energy demand is due to making the raw materials available and 32% due to the coating (Textura F baryt and Textura TC baryt). Among the raw materials, the cement (20%), polyvinyl alcohol fibers Textura (20%) and cellulose (5%) exhibit the largest amounts.

The share of sustainable energy in the overall energy demand lies at about 21%. About 29% of the total of 3890 MJ of renewable primary energy consumption is due to raw materials production (cellulose) and about 67% to the production of packaging (wood pallets). This is the amount of solar energy stored in the wood during the trees' growth.

Table 3: Energy input for manufacturing the Textura/Natura fiber cement product

Eternit fiber cement product Textura / Natura						
Parameter	Unit per t	Raw materials	Coating	Production	Transport	Packaging
Primary energy (non-renewable)	[MJ]	6619	4539	1695	56	1414
Primary energy (renewable)	[MJ]	1215	3	48	0	2624

A detailed analysis of the energy requirement for producing a ton of Eternit Textura/Natura that oil (34%) and renewable energy resources (21%) are used as the principal energy carriers, followed by natural gas (18%), bituminous coal (11%), uranium (10%) and lignite coal (6%).

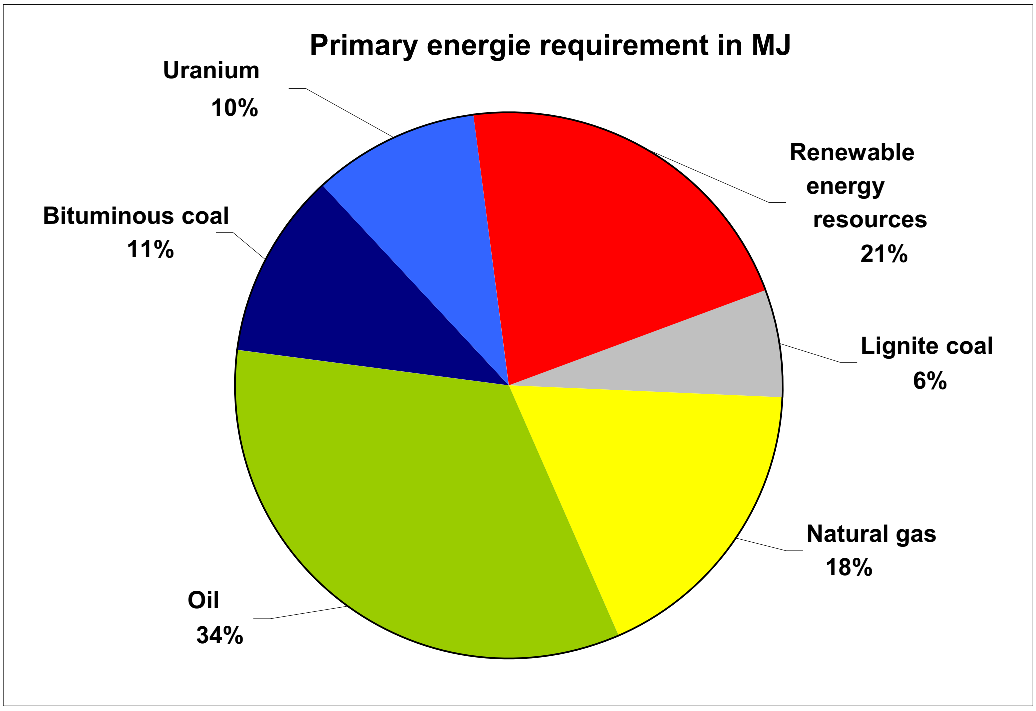

Figure 1: Distribution of energy consumption in the manufacture of 1 t Textura/ Natura

Table 4 shows the primary energy consumption (renewable and non-renewable) divided according to manufacture, raw material production, coating, transportation, and packaging of one ton of Eterplan. Since only the coating has been omitted, all other values are identical and analogous to the Textura/Natura values.

Table 4: Energy input for manufacturing the Eterplan fiber cement product

Eternit fiber cement product Eterplan					
Parameter	Unit per t	Raw materials	Production	Transport	Packaging
Primary energy (non-renewable)	[MJ]	6619	1695	56	1414
Primary energy (renewable)	[MJ]	1215	48	0	2624

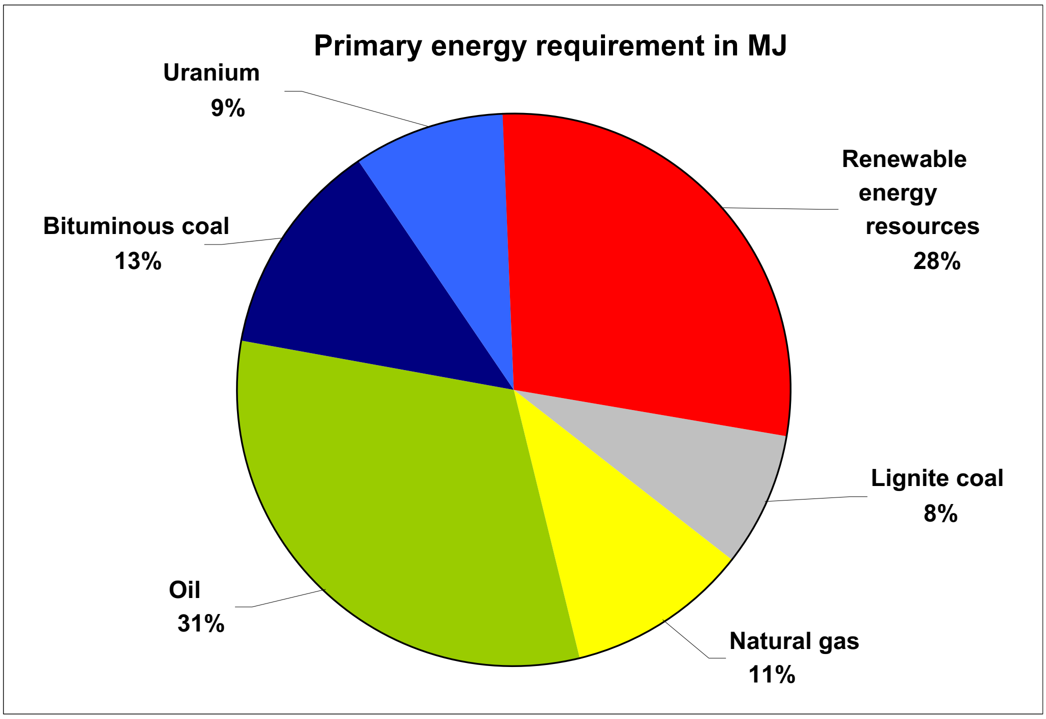

Figure 2: Distribution of energy consumption in the manufacture of 1 t of Eterplan

Waste

The analysis of the accrual of waste in the manufacture of 1 t of Textura/Natura or Eterplan is represented separately for the spoils/slag (including ore preparation residues), settlement waste (this includes domestic and commercial garbage) and toxic waste including radioactive waste (Tables 5 and 6).

Table 5: Waste in the manufacture of the fiber cement product Textura/Natura

Eternit fiber cement production Textura/Natura	
Parameter	Manufacture [kg / t]
Spoils / slag	1,768
Commercial waste similar domestic garbage	1.96
Toxic waste (including radioactive waste)	3.28

Table 6: Waste in the manufacture of the fiber cement product Eterplan

Eternit fiber cement production Eterplan	
Parameter	Manufacture [kg / t]
Spoils / slag	1,748
Commercial waste similar domestic garbage	1.32
Toxic waste (including radioactive waste)	2.68

Among **slag, spoils** constitute the largest amount, followed by preparation residues and ore preparation residues. Spoils particularly accrue in the precursor chain of power production (coal production). Preparation residues accrue during cement manufacture and ore preparation residues through the production and processing of ore concentrates.
The most significant active variables of the segment **settlement waste** are unspecified waste. All other components only play a very subordinate role.

Toxic waste essentially comprises waste that accrues in the production of cement, roof tile dispersion and wooden pallet production. The radioactive waste is exclusively due to power consumption (nuclear power).

Impact assessment

The following illustration shows the contributions of manufacture, raw material production, coating, transportation and packaging to a ton of Textura/Natura or Eterplan in the effect categories of global warming potential (GWP), ozone depletion potential (ODP), acidification potential (AP), eutrophication potential (EP) and POCP.

The share of raw material production lies between 43 and 90% in the effect categories examined. The coating processes only play a negligible role in the ozone depletion category. In all other categories the share is in excess of 20%. The production (including power and thermal energy) of one ton of Textura/Natura has an effect of 4 – 12% in the categories considered. The transportation processes follow with a small share. The contribution of packaging processes is relevant to ozone depletion (26%, manufacture of the PE foil). In the POCP environmental effect category, the packaging processes make a contribution of 14% but provide a 23% credit in the GWP effect category.

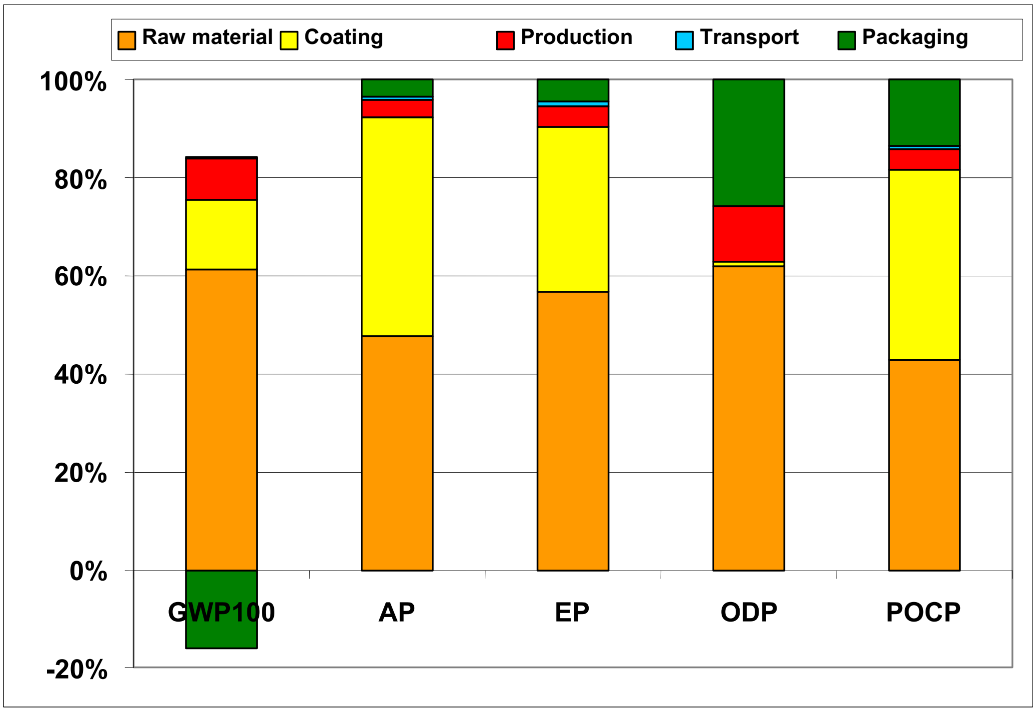

Figure 3: Relative contribution in individual categories relating to the environmental effects of manufacturing the fiber cement products Textura/Natura

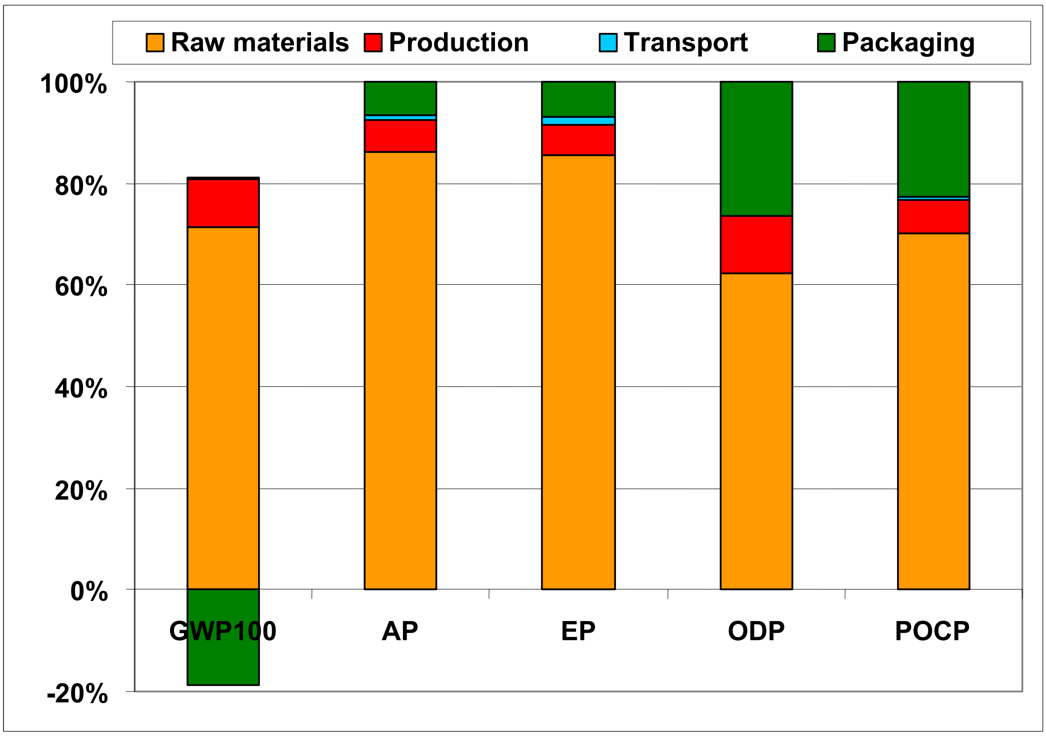

Figure 4: Relative contribution in individual categories relating to the environmental effects of manufacturing the fiber cement product Eterplan

Table 7 shows the absolute contribution of the Eternit fiber cement product Textura/Natura to individual environmental effects, divided into the areas of production, raw materials, coating, transportation and packaging.

Table 7: Absolute amounts of the fiber cement product Textura/Natura per ton

	Unit	Raw materials	Coating	Production	Transport	Packaging
Global warming potential (GWP 100 years)	kg CO_2-eq.	847	195	103	4	-220
Ozone depletion potential (ODP)	kg R11-eq.	$56.0 \cdot 10^{-6}$	$0.86 \cdot 10^{-6}$	$9.9 \cdot 10^{-6}$	$6.6 \cdot 10^{-9}$	$23.0 \cdot 10^{-6}$
Acidfication potential (AP)	kg SO_2-eq.	2.2	2.1	0.2	$26.0 * 10^{-3}$	0.2
Eutrofication potential (EP)	kg phosphate-eq.	0.2	0.1	$14.0 \cdot 10^{-3}$	$4.5 \cdot 10^{-3}$	$17.0 \cdot 10^{-3}$
Photochemical Ozone Creation Potential (POCP)	kg ethene-eq.	0.2	0.2	$21.8 \cdot 10^{-3}$	$2.2 \cdot 10^{-3}$	$71.0 \cdot 10^{-3}$

It is evident from the analysis of the **global warming potential** that almost 46% of the 1,343 kg CO_2 equivalent (gross) per ton of Textura/Natura is due to cement manufacture, 17% to cellulose production and 9% to the production of polyvinyl alcohol fibers. The net sum in kg CO^2 equivalents is 938. The credits derive from the processes cellulose, wood and kraftliner. The coating materials Textura F baryt and Textura TC baryt each have a share in the gross sum of about 7%. The share in electrical energy and thermal energy is about 4%.

About 11% of the **ozone depletion potential** is due to power production. The raw material production for the cement contributes almost 16%, the polyvinyl alcohol fibers and cellulose lie at about 21% each. The production of packaging materials produces a contribution of 24% (PE foil production).

For the **acidification potential** , raw material production (about 47%) and coating with 45% are decisive. The production of cement (24%), cellulose (15%) and polyvinyl alcohol fibers (9%) mainly contribute to these values. For the coating, the production of the back side seal (7%) and the production of the Textura F baryt and Textura TC baryt are relevant with 19% each.

The **eutrophication potential** is characterized by raw material production with 57% and the coating of the Textura/Natura product with 33%. Among the raw materials, production of cement (39%) as well as cellulose and polyvinyl alcohol fibers (8% each) and coating with Textura F baryt and Textura TC baryt (13% each) make the main contributions to the eutrophication potential.

The analysis of the **photochemical oxidant creation potential (POCP)** shows that here as well raw material production and the coating have a significant effect on this effect category. Raw materials production has a share of 43% and coating of about 39%. Particularly noticeable are the raw materials cement (17%), polyvinyl alcohol fibers (13%) and cellulose (12%). The production of the back side seal contributes 6% to POCP and of Textura F baryt and Textura TC baryt 17% each. Packaging contributes another 14% while the effects of the production processes and transportation are negligible.

Table 8: Absolute amounts of the fiber cement product Eterplan per ton

	Unit	Raw materials	Production	Transport	Packaging
Global warming potential (GWP 100 years)	kg CO_2-eq.	847	103	4	-220
Ozone depletion potential (ODP)	kg R11-eq.	$56.0 \cdot 10^{-6}$	$9.9 \cdot 10^{-6}$	$6.6 \cdot 10^{-9}$	$23.0 \cdot 10^{-6}$
Acidfication potential (AP)	kg SO_2-eq.	2.2	0.2	$26.0*10^{-3}$	0.2
Eutrofication potential (EP)	kg phosphate-eq.	0.2	$14.0 \cdot 10^{-3}$	$4.5 \cdot 10^{-3}$	$17.0 \cdot 10^{-3}$
Photochemical Ozone Creation Potential (POCP)	kg ethene-eq.	0.2	$21.0 \cdot 10^{-3}$	$2.2 \cdot 10^{-3}$	$71.0 \cdot 10^{-3}$

The analysis of the product Eterplan is analogous to that of the product Textura/Natura. Only the effect of the coating does not apply.

Use phase

The base is a cleaning of the fiber cement products every 10 years. In the process, 13.3 kg of cleaning agent are used for 100 m^2. Table 9 shows the results for the examined environmental effect categories per 100 m^2 for one year.

Table 9: Results by effect category for the use (cleaning) of 100 m^2 of Textura/Natura

	Unit	Cleaning per 100 m² per year
Primary energy, non-renewable	MJ	0.891
Primary energy, renewable	MJ	0.014
Global warming potential (GWP 100 years)	kg CO_2-eq.	$54.1 \cdot 10^{-3}$
Ozone depletion potential (ODP)	kg R11-eq.	$10.8 \cdot 10^{-9}$
Acidfication potential (AP)	kg SO_2-eq.	$0.17 \cdot 10^{-3}$
Eutrofication potential (EP)	kg phosphate-eq.	$17.6 \cdot 10^{-6}$
Photochemical oxidation creation potential (POCP)	kg ethene-eq.	$17.3 \cdot 10^{-6}$

8 Evidence

Eluate analysis

Measurement site/protocol/date: Hygiene Institute of the Ruhr District, Gelsenkirchen; No. A 1027 S/00/Lo dated 15 March 2000

Result: The analysis results for leaching from the examined plates pursuant to Din 38414 Part 4 show that both the limit and guideline values determined in the Potable Water Regulation as well as the attribution values fixed in the TA *Settlement Waste for Landfill Category 1* have been complied with. There are no concerns regarding water hygiene aspects relating to the use of the stated product in construction.

Toxicity of the combustion gases

Measurement pursuant to DIN 53436
Measurement site/date: Prof. Dr. Lechner, Institute for Chemistry, University of Osnabrück; 19 November 1997
Result: The results according to testing pursuant to DIN 53436 show that gaseous emissions due to fire stress on the examined plates are free of sulfur compounds and chlorine compounds. The concentration of hydrogen cyanide lies in the normal range.

The construction materials classification according to Din EN 13501-1 is A2-s1,d0. “s1” stands for the lowest smoke density SMOGRA ≤ 30 m^2/s^2.

9 PCR-Document and verification

This declaration is based on the PCR document Fiber cement.

Review of the PCR document by the SVA. Chairman: Prof. Dr.-Ing. Hans-Wolf Reinhardt (University of Stuttgart, IWB)
Independent verification of the declaration according to ISO 14025: ☐ intern ☒ extern
Validation of the declaration: Dr. Frank Werner

10 Literature

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Weitere Literatur siehe PCR Dokument

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In a case of doubt is the original EPD „AUB-ETE-10907-D“ applicable.