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Statement of Verification

BREG EN EPD No.: 000363 Issue: 01

This is to verify that the

Environmental Product Declaration

provided by:

AllSfär

is in accordance with the requirements of:

EN15804:2012+A2:2019

and

BRE Global Scheme Document SD207

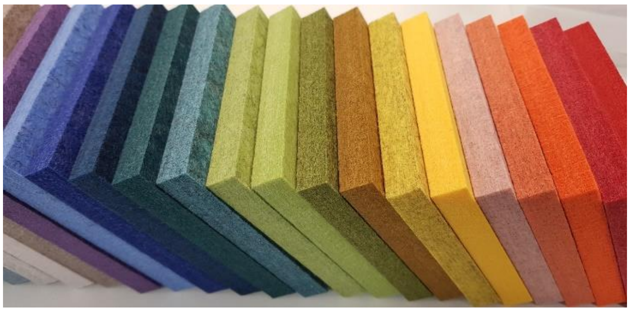
This declaration is for:

Öra Plain PET-felt Acoustic Board

BRE Global Verified EPD

Company Address

Ebury House,
Moor Lane Crossing,
Watford,
WD18 9QN,
United Kingdom



ALLSFÄR
MAKING PLACES FROM SPACES

Signed for BRE Global Ltd	Emma Baker Operator	10 June 2021 Date of this Issue
10 June 2021 Date of First Issue		09 June 2026 Expiry Date

BRE Global Verified EPD

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ECO PLATFORM EPD EN 15804 VERIFIED

Environmental Product Declaration

EPD Number: 000363

General Information

EPD Programme Operator	Applicable Product Category Rules
BRE Global Watford, Herts WD25 9XX United Kingdom	BRE Global Product Category Rules (PCR) for Type III environmental product declaration of construction products to EN 15804+A2 PN 514 Rev 3.0
Commissioner of LCA study	**LCA consultant/Tool**
AllSfär / Link Furniture Ltd	Fishwick Environmental Ltd
Declared/Functional Unit	**Applicability/Coverage**
1 m^2 of 12 mm thick PET-felt acoustic board	Product Average.
EPD Type	**Background database**
Cradle to Gate (with modules C1-C4 and module D)	Eugeos' 15804+A2_IA v4.1 extended version of ecoinvent v3.6

Demonstration of Verification
CEN standard EN 15804 serves as the core PCR [a]
Independent verification of the declaration and data according to EN ISO 14025:2010 ☐Internal ☒ External
(Where appropriate [b])Third party verifier: Pat Hermonl
a: Product category rules b: Optional for business-to-business communication; mandatory for business-to-consumer communication (see EN ISO 14025:2010, 9.4)

Comparability
Environmental product declarations from different programmes may not be comparable if not compliant with EN 15804:2012+A2:2019. Comparability is further dependent on the specific product category rules, system boundaries and allocations, and background data sources. See Clause 5.3 of EN 15804:2012+A2:2019 for further guidance.

Information modules covered

Product			Construction		Use stage							End-of-life				Benefits and loads beyond the system boundary
					Related to the building fabric					Related to the building						
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Raw materials supply	Transport	Manufacturing	Transport to site	Construction – Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction demolition	Transport	Waste processing	Disposal	Reuse, Recovery and/or Recycling potential
☑	☑	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☑	☑	☑	☑

Note: Ticks indicate the Information Modules declared.

Manufacturing site(s)

AllSfär are a manufacturing company who specialise in designing and manufacturing PET-felt acoustic screens, panels, furniture, and wall and ceiling systems. AllSfär are the study commissioner and EPD owner. They operate one production site where all Öra Plain acoustic boards are finished, located at Ebury House, Moor Lane Crossing, Watford, WD18 9QN, United Kingdom. This site is operated under a quality management system accredited to ISO 9001:2015. AllSfär also contract a manufacturer to make the precursor to Öra Plain. Morgan Doouss, Managing Director is the contact person for the EPD owner: hello@allsfar.com, +44(0)20 3889 9888, Ebury House, Moor Lane Crossing, Watford, WD18 9QN. For further information see https://allsfar.com/.

Ebury House,
Moor Lane Crossing,
Watford,
WD18 9QN,
United Kingdom

Construction Product:

Product Description

Öra Plain acoustic board is a multi-purpose solution for sound absorption and improving the aesthetics of offices, schools, public buildings etc. The board is available in a range of colours to match existing soft furnishing and can be cut to any shape or size and fitted to walls, ceilings or used as desk screens. The range of products the average product represents comprise the different colours available for Öra Plain. There is no difference in applications of different colours of the product. The average Öra Plain product was modelled using a 50:50 mix of white and black pigments, which was considered representative given the immaterial contribution of pigments to impact results.

Öra Plain is used as a “building block” for many other AllSfär products through cutting to different shapes, adding linings and printed coverings. For example, ceiling rafts and baffles (Aurora, Breeze, BreezeSense, Grid), acoustic art (Öra Mural, Öra Bespoke, Öra Pattern), screens and tiles (Arc, Lull, Orbit, Tex), acoustic trees (Grove) and light shades (Eclipse). These products are excluded from this study and the focus is on Öra Plain only.

Technical Information

Property	Value, Unit
Size	2440mm x 1220 mm
Thickness	12 mm (or 24 mm – out of scope)
Mass per area	2.2 kg / m^2
Density	185 kg / m^3
Sound absorption (Noise Reducing Co-efficient [NRC])	0.45
Fire rating (EN 13501-1:2007+a1:2009 - B, s1, d0 ASTM E84 -16)	Class A

Main Product Contents

Öra Plain PET-felt acoustic board contains approximately 60% post-industrial or post-consumer recycled material, contains 0% bio-based material and does not contain any substances hazardous to health or the environment (in particular carcinogenic, mutagenic, toxic to reproduction, allergic, PBT5 or vPvB6 substances). No substances that are listed in the "Candidate List of Substances of very high concern for authorisation" are contained in the Öra Plain acoustic board.

Öra Plain is delivered to AllSfär's customers packaged in shrink-wrap on wooden pallets. AllSfär do not specify recycled content requirements of shrink-wrap with their packaging suppliers and therefore average recycled content for the UK was used in this LCA.

Material/Chemical Input	%
Virgin PET	37%
Post-industrial and post-consumer PET	63%
Additives (pigment, flame-retardant, etc.)	<1%

Manufacturing Process

The manufacturing process for Öra Plain PET-felt board is described here and in the process flow diagram below.

1. PET granulate (virgin) production:
   This unit process comprises the extraction and refining of crude oil to produce ethylene glycol and dimethyl terephthalate and the polymerisation of these bulk chemicals to produced PET granulate.

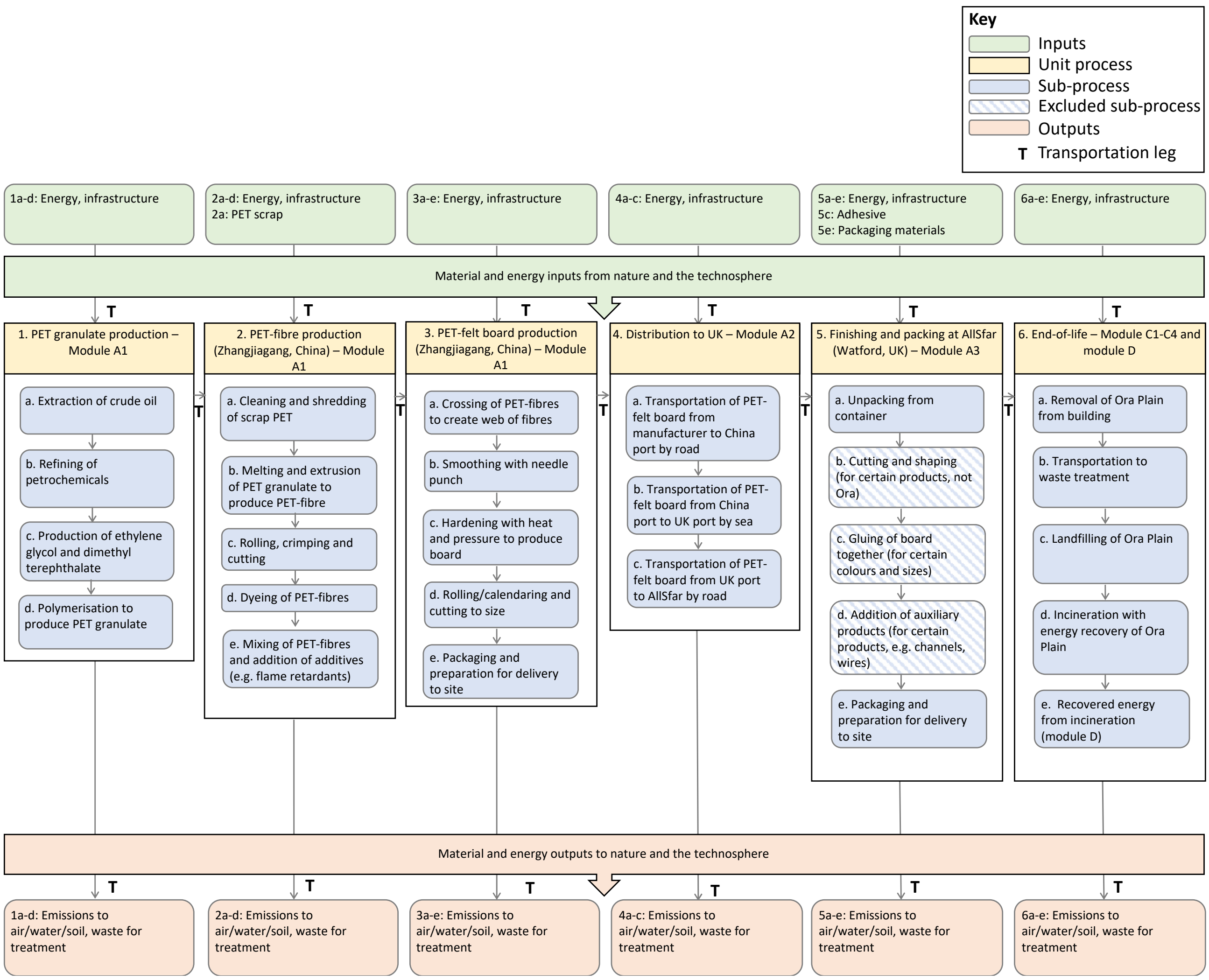
2. PET-fibre production:
   This unit process comprises the melting and extrusion of PET granulate into fibres and subsequent rolling, crimping, cutting, dyeing and addition of flame retardant etc. Alongside inputs of virgin PET granulate, post-consumer and post-industrial (on site, from adjacent PET-felt board factory and from other sites) PET is used. In the case of post-industrial PET scrap collected onsite and from the adjacent PET-felt board, it first has to be sorted, cleaned and shredded. In the case of post-consumer scrap PET and post-industrial scrap PET from other sites, these processes were carried out offsite by a supplier.

3. PET-felt board production:
This unit process comprises all production stages required to convert PET-fibres into PET-felt board. This involves the crossing of PET fibres to create a web followed by smoothing with a needle punch. Next, heat and pressure are applied to the web of fibres to produce a board, following by rolling/calendaring and cutting to size.

4. Distribution to UK:
The semi-finished PET-felt board is sent from China to the UK via container ship, with short road journeys either side from port to manufacturing site.

5. Finishing and packing at AllSär:
This unit process involves the handling, cutting and packing of PET-felt board prior to delivery to AllSfär customers.

Process flow diagram



Construction Installation

Module not declared.

Use Information

Module not declared.

End of Life

This unit process involves deconstruction and removal of the product from the building it is installed in, transportation of the product to waste treatment, waste processing (e.g. sorting, cleaning) and final disposal. It also covers the net benefits and loads arising from the recycling of materials and/or recovery of energy from the product (module D, results are reported separately from those of other modules). End-of-life scenario assumptions were taken from waste Plastics Europe, 2018[1] for average construction waste plastic in EU28. However, as recycling infrastructure in the UK for PET-felt is limited / unavailable at present, recycling was assumed to be zero and data for incineration and landfill of plastics were uplifted to 64.2% and 35.8%, respectively, to reflect this.

Life Cycle Assessment Calculation Rules

Declared / Functional unit description

BRE Global's PCR, which was followed for this EPD, prescribes the use of a declared unit rather than a functional unit for cradle-to-gate LCAs / EPDs (with modules C1-C4 and module D). The declared unit provides a reference to which material flows of the product system are normalised and serves as a basis of comparison, and is therefore an important factor. The declared unit for this study was defined as:

"1 m^2 of 12 mm thick PET-felt acoustic board"

In this study, the declared unit also served as a reference flow and their definitions are identical.

Following BRE Global's PCR, reference service life is not applicable for this product category.

System boundary

The system boundary of a product system determines the unit processes to be included in the LCA study and which data as inputs and/or outputs to/from the system can be omitted. In this LCA study and resulting EPD, the system boundary was defined as **cradle-to-gate (with modules C1-C4 and module D)**, covering extraction/cultivation of raw material, processing of raw materials, production of the finished product (including packaging), all transportation and waste stages until AllSfär's factory gate, and end-of-life of the product. This boundary comprises the following modules given in EN 15798:2011: the product stage (modules A1-A3), end-of-life stage (modules C1-C4) and benefit and loads beyond the system boundary (module D).

Data sources, quality and allocation

Specific data were sought as a preference and were collected from AllSfär's site in Watford, their contract manufacturer of PET-board in China and their contract manufacturers' supplier of PET-fibre. These specific data were collected using data collection sheets via an iterative process and represent a time period from 2020.01.01 to 2020.12.31 in the case of PET-board and PET-fibre manufactures and from 20.08.2020 to 16.02.2021 in the case of AllSfär's site in Watford. Generic data were collected for all other lifecycle stages from Eugeos' 15804+A2_IA v4.1 extended version of ecoinvent v3.6 (cut-off).

[1] https://www.plasticseurope.org/application/files/6315/5730/5565/BC_Table.pdf

For cases where there is more than one product in the system being studied, BRE Global's PCR prescribes the following procedure for the allocation of material and energy flows and environmental emissions.

- In the first instance, allocation should be avoided, by process sub-division.
- Where these methods are not applicable, the ISO 14040/44 requires that allocation reflects the physical relationships of the different products or functions. Allocation based on physical relationships such as mass or energy is a practical interpretation of this and is an approach often used in LCA.
- For some processes, allocation based on mass is not considered appropriate and, in these cases, economic allocation is used.

In this study, allocation procedures for multi-product processes followed the ISO approach above. Co-product allocation for specific data used in the LCA is described in Section 3. In terms of co-product allocation of generic data, the main database used, ecoinvent v3.6 (cut-off), defaults to an economic allocation for most processes. However, in some cases a mass-based allocation is used, where there is a direct physical relationship. The allocation approach of specific ecoinvent modules is documented on their website and method reports (see www.ecoinvent.org).

In this study a "cut-off" method (aka recycled content or 100:0 approach) was applied to all cases of end-of-life allocation, including in the case of generic data, where the ecoinvent v3.6 with a cut-off by classification end-of-life allocation method was used. In this approach, environmental burdens and benefits of recycled / reused materials and recovered energy are given to the product system consuming them, rather than the system providing them and are quantified based on recycling content of the material under investigation. The cut-off point is where an end-of-life state is reached, including any sorting, cleaning, and processing of waste prior to recycling, reuse, or energy recovery, following the "polluter pays principle". This is a common approach in LCA for materials where there is a loss in inherent properties during recycling, the supply of recycled material exceeds demand and recycled content of the product is independent of whether it is recycled downstream. It is in compliance with the ISO standards on LCA, EN 15804, EN 15978 and is prescribed in BRE Global's PCR. The exception to the use of this end-of-life allocation method was for module D, where loads and benefits beyond the system boundary, following a closed-loop approximation end-of-life allocation method, are presented separately.

Cut-off criteria

In the process of building a life cycle inventory it is typical to exclude items considered to have a negligible contribution to results. In order to do this in a consistent and robust manner there must be confidence that the exclusion is fair and reasonable. To this end, cut-off criteria were defined in this study, which allow items to be neglected if they meet the criteria. In accordance with BRE Global's PCR, exclusions could be made if they were expected to be within the below criteria:

- A process can be excluded if it contributes to <1% of the total mass or energy input of a unit process;
- A maximum of 5% of the total mass or energy of the lifecycle can be excluded; and
- The excluded process doesn't meet the following exceptions:
    - Significant effects on energy use in extraction, use or disposal;
    - Significant environmental relevance (i.e. likely to contribute to an increase/decrease in impacts of more than 1%); and
    - Are classed as hazardous waste.

Exclusions based on cut-off criteria comprised:

- Packaging of incoming raw materials and ancillary materials (immaterial [calculated to be <1% of lifecycle impact for carbon footprint, which is a good proxy for many other impact categories]);
- Module C1, which captures the deconstruction and removal of Öra Plain from a building was assumed to be negligible (<1%) as these products can be installed and removed with basic hand tools; and
- Pallets excluded as capital goods as there are usually reused.

In addition to exclusions based on cut-off criteria, the follow general exclusions from the scope of the study were made:

- Human and animal energy inputs to processes;
- Transport of employees to and from their normal place of work and business travel; and
- Environmental impacts associated with support functions (e.g. R&D, marketing, finance, management etc.).

LCA Results

The declared unit for this study was defined as: "1 m^2 of 12 mm thick PET-felt acoustic board".
(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Parameters describing environmental impacts			GWP-total	GWP-fossil	GWP-biogenic	GWP-luluc	ODP	AP	EP-freshwater
			kg CO_2 eq	kg CO_2 eq	kg CO_2 eq	kg CO_2 eq	kg CFC11 eq	mol H^+ eq	kg $(PO_4)^{3-}$ eq
Product stage	Raw material supply	A1	8.17	7.81	0.357	6.96E-03	5.24E-07	3.55E-02	4.55E-03
	Transport	A2	0.502	0.502	-2.52E-04	3.28E-04	1.02E-07	1.53E-02	6.53E-05
	Manufacturing	A3	0.143	0.129	1.42E-02	1.11E-04	4.34E-09	5.67E-04	3.94E-05
	Total (of product stage)	A1-3	8.82	8.44	0.371	7.40E-03	6.30E-07	5.13E-02	4.65E-03
Construction process stage	Transport	A4	MND	MND	MND	MND	MND	MND	MND
	Construction	A5	MND	MND	MND	MND	MND	MND	MND
Use stage	Use	B1	MND	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND	MND
End of life	Deconstruction, demolition	C1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Transport	C2	0.136	0.136	2.20E-05	1.21E-05	2.88E-08	8.18E-04	7.49E-06
	Waste processing	C3	0.166	0.166	6.03E-06	3.09E-06	1.13E-09	4.24E-05	1.06E-06
	Disposal	C4	9.00E-02	8.99E-02	7.44E-05	1.82E-06	2.46E-09	2.43E-05	7.85E-07
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	1.960	1.950	1.68E-03	-3.26E-04	-9.84E-08	-3.07E-03	-2.29E-04

GWP-total = Global warming potential, total;
GWP-fossil = Global warming potential, fossil;
GWP-biogenic = Global warming potential, biogenic;
GWP-luluc = Global warming potential, land use and land use change;
ODP = Depletion potential of the stratospheric ozone layer;
AP = Acidification potential, accumulated exceedance; and
EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment

LCA Results (continued)

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Parameters describing environmental impacts			EP-marine	EP-terrestrial	POCP	ADP-mineral&metals	ADP-fossil	WDP	PM
			kg N eq	mol N eq	kg NMVOC eq	kg Sb eq	MJ, net calorific value	m^3 world eq deprived	disease incidence
Product stage	Raw material supply	A1	8.77E-03	7.16E-02	2.53E-02	9.04E-05	142	63.8	3.82E-07
	Transport	A2	3.70E-03	4.08E-02	1.09E-02	4.19E-06	6.47	1.62	1.76E-08
	Manufacturing	A3	1.22E-04	1.16E-03	5.01E-04	1.37E-06	3.57	340	4.67E-09
	Total (of product stage)	A1-3	1.26E-02	1.14E-01	3.67E-02	9.60E-05	152	406.0	4.04E-07
Construction process stage	Transport	A4	MND	MND	MND	MND	MND	MND	MND
	Construction	A5	MND	MND	MND	MND	MND	MND	MND
Use stage	Use	B1	MND	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND	MND
End of life	Deconstruction, demolition	C1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Transport	C2	3.50E-04	3.84E-03	1.34E-03	8.13E-07	1.76	1.07	1.85E-08
	Waste processing	C3	2.12E-05	1.89E-04	4.73E-05	6.24E-08	0.04	0	2.85E-10
	Disposal	C4	1.66E-03	4.11E-05	4.02E-05	6.01E-08	1.72E-01	1.52	1.15E-09
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-3.66E-04	-4.23E-03	-1.19E-03	-8.79E-07	-20.0	-51	-4.54E-09

EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment;
EP-terrestrial = Eutrophication potential, accumulated exceedance;
POCP = Formation potential of tropospheric ozone;
ADP-mineral&metals = Abiotic depletion potential for non-fossil resources;
ADP-fossil = Depletion potential of the stratospheric ozone layer;
WDP = Water (user) deprivation potential, deprivation-weighted water consumption; and
PM = Particulate matter.

LCA Results (continued)

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Parameters describing environmental impacts							
			IRP	ETP-fw	HTP-c	HTP-nc	SQP
			kBq U^{235} eq	CTUe	CTUh	CTUh	dimensionless
Product stage	Raw material supply	A1	3.31E-01	1.47	3.17E-09	2.96E-07	8.06
	Transport	A2	3.01E-02	0.0898	2.60E-10	4.30E-09	0.977
	Manufacturing	A3	1.19E-02	0.0191	4.38E-11	4.33E-09	0.0680
	Total (of product stage)	A1-3	3.73E-01	1.58	3.48E-09	3.04E-07	9.10
Construction process stage	Transport	A4	MND	MND	MND	MND	MND
	Construction	A5	MND	MND	MND	MND	MND
Use stage	Use	B1	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND
End of life	Deconstruction, demolition	C1	0.00	0.00	0.00	0.00	0.00
	Transport	C2	8.27E-03	9.15E-03	1.39E-11	5.37E-10	1.74E-02
	Waste processing	C3	2.70E-04	0.0011	2.68E-11	1.74E-09	0.0015
	Disposal	C4	1.24E-03	8.51E-03	4.45E-12	2.14E-10	-0.132
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-9.74E-01	-2.56E-02	3.31E-10	-1.82E-08	-0.046

IRP = Potential human exposure efficiency relative to U235;
ETP-fw = Potential comparative toxic unit for ecosystems;
HTP-c = Potential comparative toxic unit for humans;
HTP-nc = Potential comparative toxic unit for humans; and
SQP = Potential soil quality index.

LCA Results (continued)

Parameters describing resource use, primary energy			PERE	PERM	PERT	PENRE	PENRM	PENRT
			MJ	MJ	MJ	MJ	MJ	MJ
Product stage	Raw material supply	A1	4.96	1.12	5.41	69.9	92.1	148
	Transport	A2	0.048	0.00	0.0476	6.51	0.00	6.51
	Manufacturing	A3	1.700	0.00	1.700	2.39	1.43	3.83
	Total (of product stage)	A1-3	6.71	1.12	7.15	78.8	93.6	158
Construction process stage	Transport	A4	MND	MND	MND	MND	MND	MND
	Construction	A5	MND	MND	MND	MND	MND	MND
Use stage	Use	B1	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND
End of life	Deconstruction, demolition	C1	0.00	0.00	0.00	0.00	0.00	0.00
	Transport	C2	9.19E-03	0.00	9.19E-03	1.77	0.00	1.77
	Waste processing	C3	0.003	0.00	0.003	0.04	0.00	0.04
	Disposal	C4	8.36E-03	0.00	8.36E-03	0.182	0.00	1.82E-01
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.060	0.00	-1.06	-32.5	0.00	-32.5

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 (primary energy and primary energy resources used as raw materials);
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; and
PENRT = Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials).

LCA Results (continued)

Parameters describing resource use, secondary materials and fuels, use of water			SM	RSF	NRSF	FW
			kg	MJ net calorific value	MJ net calorific value	m^3
Product stage	Raw material supply	A1	2.24	6.09E-02	-5.27E-02	3.18E-02
	Transport	A2	2.82E-03	1.23E-03	-1.47E-02	2.15E-04
	Manufacturing	A3	1.01E-03	1.74E-02	3.61E-04	7.74E-03
	Total (of product stage)	A1-3	2.25	7.96E-02	-6.70E-02	3.98E-02
Construction process stage	Transport	A4	MND	MND	MND	MND
	Construction	A5	MND	MND	MND	MND
Use stage	Use	B1	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND
End of life	Deconstruction, demolition	C1	0.00	0.00	0.00	0.00
	Transport	C2	2.26E-04	1.75E-04	-1.09E-03	1.90E-04
	Waste processing	C3	3.81E-05	7.27E-05	-1.17E-04	6.14E-05
	Disposal	C4	8.66E-05	1.73E-04	-2.84E-04	2.21E-04
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.34E-03	-9.66E-03	-1.89E-02	-4.02E-03

SM = Use of secondary material;
RSF = Use of renewable secondary fuels;
NRSF = Use of non-renewable secondary fuels;
FW = Net use of fresh water

LCA Results (continued)

Other environmental information describing waste categories			HWD	NHWD	RWD
			kg	kg	kg
Product stage	Raw material supply	A1	0.541	10.2	1.76E-04
	Transport	A2	7.50E-03	0.153	4.58E-05
	Manufacturing	A3	6.47E-03	0.201	3.78E-06
	Total (of product stage)	A1-3	0.555	10.6	2.26E-04
Construction process stage	Transport	A4	MND	MND	MND
	Construction	A5	MND	MND	MND
Use stage	Use	B1	MND	MND	MND
	Maintenance	B2	MND	MND	MND
	Repair	B3	MND	MND	MND
	Replacement	B4	MND	MND	MND
	Refurbishment	B5	MND	MND	MND
	Operational energy use	B6	MND	MND	MND
	Operational water use	B7	MND	MND	MND
End of life	Deconstruction, demolition	C1	0.00	0.00	0.00
	Transport	C2	6.16E-04	1.92E-02	1.32E-05
	Waste processing	C3	1.24E-03	0.077	1.07E-07
	Disposal	C4	2.36E-04	0.792	1.20E-06
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-6.04E-02	0.264	-2.43E-04

HWD = Hazardous waste disposed;
NHWD = Non-hazardous waste disposed;
RWD = Radioactive waste disposed

LCA Results (continued)

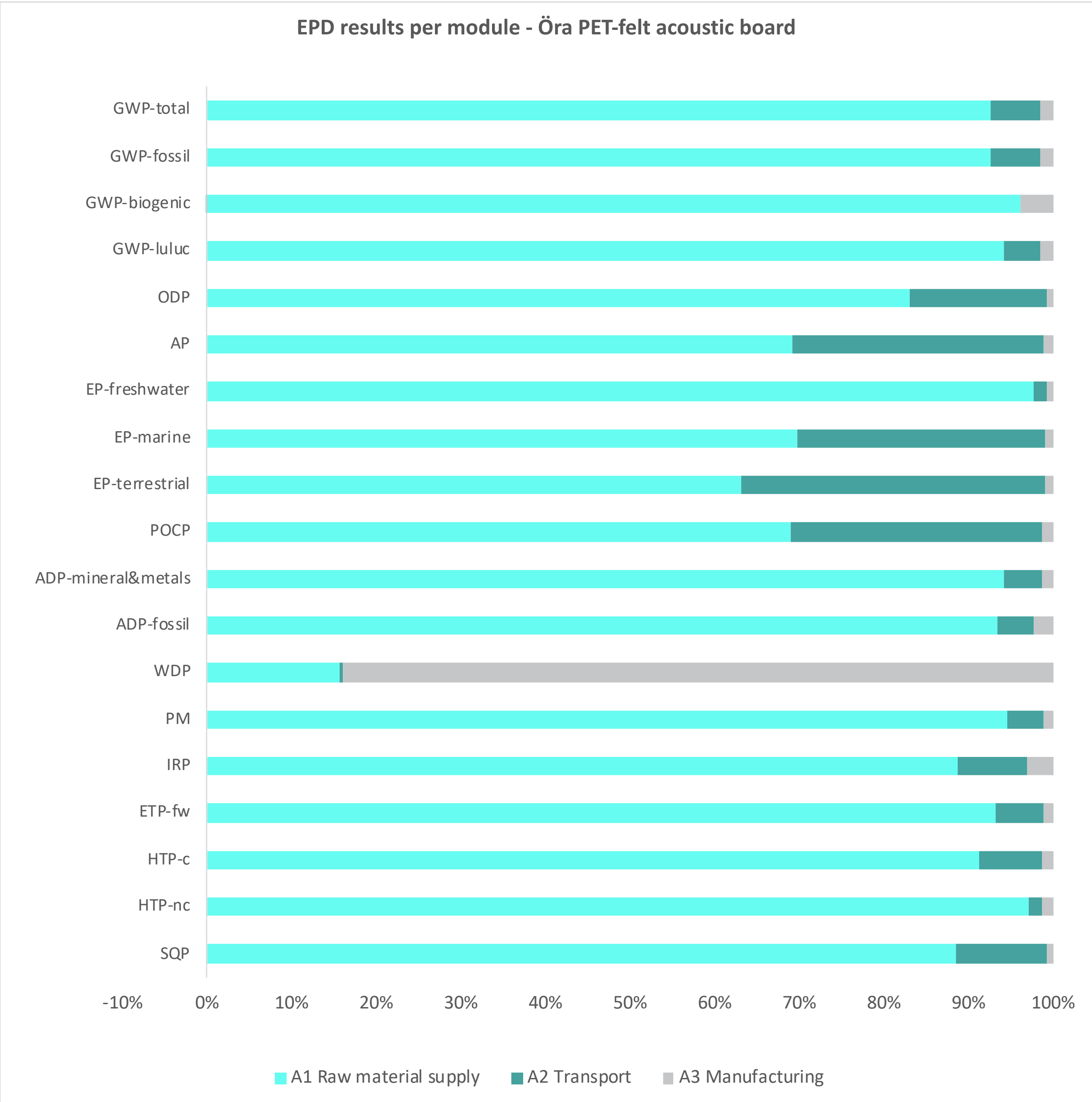
Other environmental information describing output flows – at end of life			CRU	MFR	MER	EE	Biogenic carbon (product)	Biogenic carbon (packaging)
			kg	kg	kg	MJ per energy carrier	kg C	kg C
Product stage	Raw material supply	A1	0.00	7.02E-02	7.49E-04	0.00	0.00	3.64E-02
	Transport	A2	0.00	3.39E-03	1.36E-05	0.00	0.00	0.00
	Manufacturing	A3	0.00	3.45E-04	1.86E-04	0.00	0.00	0.00
	Total (of product stage)	A1-3	0.00	7.39E-02	9.48E-04	0.00	0.00	3.64E-02
Construction process stage	Transport	A4	MND	MND	MND	MND	MND	MND
	Construction	A5	MND	MND	MND	MND	MND	MND
Use stage	Use	B1	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND
End of life	Deconstruction, demolition	C1	0.00	0.00	0.00	0.00	0.00	0.00
	Transport	C2	0.00	1.98E-04	1.97E-06	0.00	0.00	0.00
	Waste processing	C3	0.00	3.39E-05	7.52E-07	0.00	0.00	0.00
	Disposal	C4	0.00	7.06E-05	1.73E-06	0.00	0.00	0.00
Potential benefits and loads beyond	Reuse, recovery, recycling potential	D	0.00	-7.02E-04	-1.05E-04	0.00	0.00	0.00

CRU = Components for reuse;
MFR = Materials for recycling
MER = Materials for energy recovery;
EE = Exported Energy

Summary, comments and additional information

Cradle-to-gate hotspots

The figure below shows the breakdown of each parameter describing environmental impacts, as a percentage in a 100% stacked bar chart, for cradle-to-gate lifecycle stages of 1 m^2 of Öra Plain PET-felt acoustic board, based on characterised mid-point results. These environmental hotspot results show which processes contribute most (and least) to the cradle-to-gate system boundary.



The following points are evident:

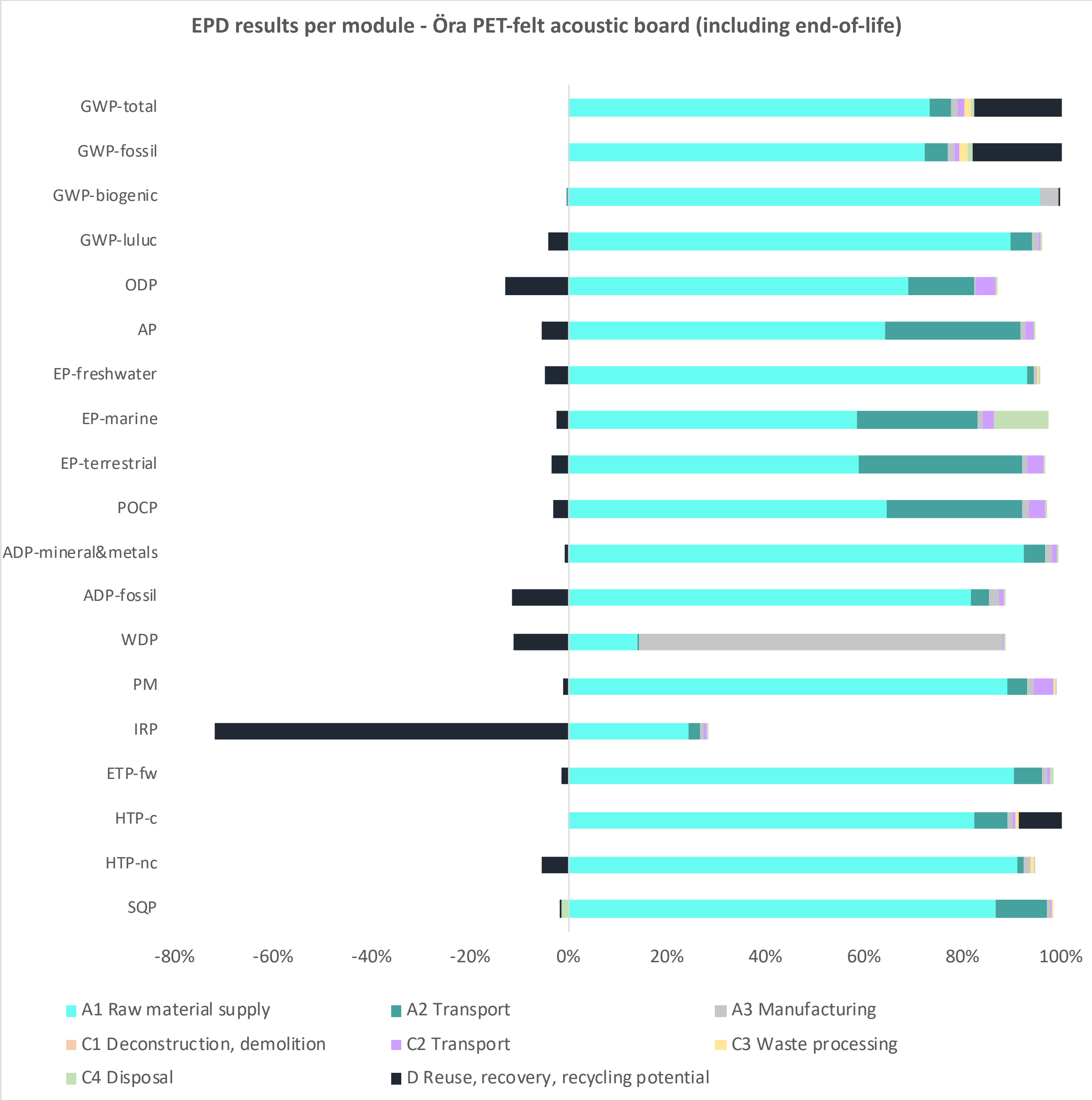
- Raw material supply (A1) dominates almost all impact categories, with the exception of ODP, AP, EP, and POCP, where it is still substantial;
- Transport (A2) has a minor to immaterial contribution for all impact categories, with the exception of ODP, AP, EP, and POCP, where it has a moderate contribution to cradle-to-gate impacts;
- In the case of ODP, AP, EP, and POCP for A2, impurities in fuel (e.g. nitrogen, sulphates) used for sea freight are the main contributor;
- Manufacturing (A3) has a minor to immaterial contribution for all impact categories, with the exception of WDP and IRP, where it has a moderate contribution to cradle-to-gate impacts; and
- In the case of WDP and IRP for A3, the production of nuclear energy used in the fuel mix of UK grid electricity is the main contributor.

Cradle-to-gate (with modules C1-C4 and module D) hotspots

The figure below shows the breakdown of each parameter describing environmental impacts, as a percentage in a 100% stacked bar chart, for cradle-to-gate (with modules C1-C4 and module D) lifecycle stages of 1 m^2 of Öra Plain PET-felt acoustic board, based on characterised mid-point results. These environmental hotspot results show which processes contribute most (and least) to the cradle-to-gate (plus end-of-life) system boundary.

The following points are evident:

- Deconstruction and demolition (C1) were assumed to be negligible and therefore do not appear in results;
- Transport to waste treatment (C2) is immaterial across all impact categories, due to the relatively short distances to waste treatment assumed (50 km);
- Waste processing (C3) does not appear in results, as the end-of-life allocation method used apportions these impacts to recovered materials and energy and it is not relevant in the case of landfill;
- Disposal (C4) is immaterial for all impact categories apart from EP-marine, where it is minor, which is due to the low degradability of PET-felt in landfill;
- Module D, which shows the net benefits of recovered energy from incinerated PET-felt waste, is negative for many impact categories where the positive impact of incineration is outweighed by the negative impact of the displaced electricity; and
- There are a few of impact categories for module D where the impact of incineration is not outweighed by the impact of the displaced electricity and these show as net positive impacts (e.g. GWP-total, GWP-fossil, GWP-biogenic and HTP-c).


EPD results per module - Öra PET-felt acoustic board (including end-of-life)
GWP-total
GWP-fossil
GWP-biogenic
GWP-luluc
ODP
AP
EP-freshwater
EP-marine
EP-terrestrial
POCP
ADP-mineral&metals
ADP-fossil
WDP
PM
IRP
ETP-fw
HTP-c
HTP-nc
SQP
-80%
-60%
-40%
-20%
0%
20%
40%
60%
80%
100%
A1 Raw material supply
A2 Transport
A3 Manufacturing
C1 Deconstruction, demolition
C2 Transport
C3 Waste processing
C4 Disposal
D Reuse, recovery, recycling potential

Conclusions

The LCA study generated an environmental profile of Öra Plain PET-felt acoustic board to better understand the associated lifecycle environmental impacts and to allow a Type III EPD to be generated and made public via BRE Global's GreenBook Live. The declared unit for this study was defined "1 m^2 of 12 mm thick PET-felt acoustic board", the system boundary was set at cradle-to-gate (with modules C1-C4 and module D), the underlying LCIA method used for parameters describing environmental impacts was are prescribed by BRE Global's PCR and the LCA model was constructed in openLCA (version 1.10.3) and Microsoft Excel.

The following conclusions can be drawn from this study:

- Raw material supply (A1) dominates almost all impact categories;
- Breaking raw material supply down further, PET-fibre and ultimately PET-granulate dominate impacts, with electricity use at both PET-felt board and PET-fibre production sites making a notable contribution too;
- Virgin PET granulate has a higher impact than recycled PET granulate;
- Transport (A2) and manufacturing (A3) had a minor to immaterial contribution for most impact categories;
- End-of-life modules (C1-C4) generally make an immaterial contribution to impacts; and
- Module D is negative for many impact categories where the positive impact of incineration is outweighed by the negative impact of the displaced electricity.

In should be noted that results presented here represent an average product, which covers the range of colours available for Öra Plain. The average Öra Plain product was modelled using a 50:50 mix of white and black pigments, which was considered representative given the immaterial contribution of pigments to impact results.

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