Statement of Verification

BREG EN EPD No.: 000621 Issue 01

This is to verify that the

Environmental Product Declaration

provided by:

GreenBlue Urban

BRE Global Verified EPD

is in accordance with the requirements of:

EN 15804:2012+A2:2019

and

BRE Global Scheme Document SD207

This declaration is for:

1 m² of products installed underground in tree pits over a study period

Company Address

Northpoint
Compass Park
Junction Road
Bodiam
TN32 5BS

Signed for BRE Global Ltd	Emma Baker Operator	26 July 2024 Date of this Issue
26 July 2024 Date of First Issue		25 July 2029 Expiry Date

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Environmental Product Declaration

EPD Number: **000621**

General Information

EPD Programme Operator	Applicable Product Category Rules
BRE Global Watford, Herts WD25 9XX United Kingdom	**PN 514 Rev 3.0** BRE Global Product Category Rules (PCR) For Type III EPD of Construction Products to EN 15804+A2
Commissioner of LCA study	**LCA consultant/Tool**
GreenBlue Urban Northpoint, Compass Park, Junction Road, Bodiam, TN32 5BS	**Eight Versa** 1st Floor, 46 Loman Street, London, SE1 0EH LCA tool: SimaPro 9.3.0.3
Declared/Functional Unit	**Applicability/Coverage**
1 m^2 of products installed underground in tree pits over a study period of 50 years.	Product specific – RootSpace© Product Variants included: 400 Single and 600 Single.
EPD Type	**Background database**
Cradle to Grave	Ecoinvent v3.7.1

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 Hermon
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)

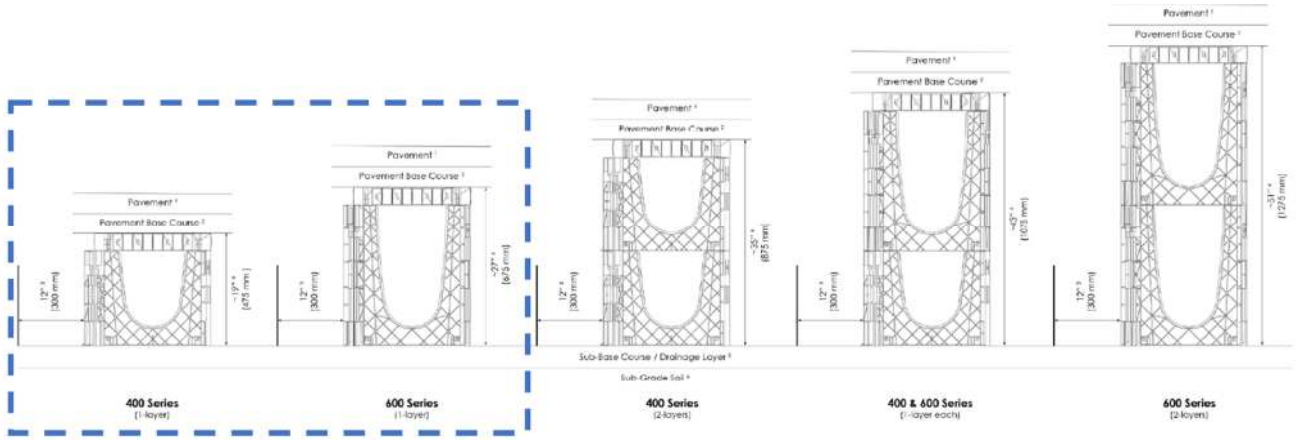
RootSpace's parts are manufactured by GreenBlue Urban's manufacturing partner, Dolphin Solutions.

Compass Park, Southpoint, Junction Rd,
Bodiam, Robertsbridge,
TN32 5BS, United Kingdom.

Construction Product:

Product Description

RootSpace © Product is one of the key components of a tree pit system. RootSpace © is a pavement support system, designed for maximum soil and rooting volume to be 'utility friendly' with economic freight and industry-leading strength characteristics. RootSpace © is an engineered load-bearing soil cell with over 95% open void space for maximum rooting volume as well as the ability to accommodate services.



This EPD covers the environmental performance for only the two highlighted variants:

- 400 Single (also known as 400 Series-1Layer)
- 600 Single (also known as 600 Series-1Layer)

Technical Information

Property	Value, Unit	Value, Unit
Configuration	400 Single	600 Single
Material	100% Recycled PP (from post-industrial scraps)	
Nominal Weight of 1 m^2 of installed products (without side panels)	24.93 kg	27.38 kg
Open Void Space / Porosity	96%	96%
Height	475 mm	675 mm
Compression strength as per EN 17150:2017	Vertical loading 317 kN/m2	Vertical loading 300 kN/m2
Short-term elastic deflection as per EN 17150:2017	Vertical loading 1 mm per 38.53 kN/m2	Vertical loading 1 mm per 26.28 kN/m2
Minimum allowable paving construction depths required to disperse a 4.5 tonne wheel load	Macadam depth 150 mm Aggregate pavement's sub-base DTp Type 1 150 mm	Macadam depth 150 mm Aggregate pavement's sub-base DTp Type 1 300 mm
Technical data reported in this EPD has been sourced from: 1. RootSpace© Pavement Support System, Product Overview 2021, issued by GreenBlue Urban 2. Product Certificate no. 20/5801 issued by BBA (British Board of Agrement)		

Main Product Contents

RootSpace © is manufactured in the UK from 100% recycled polypropylene

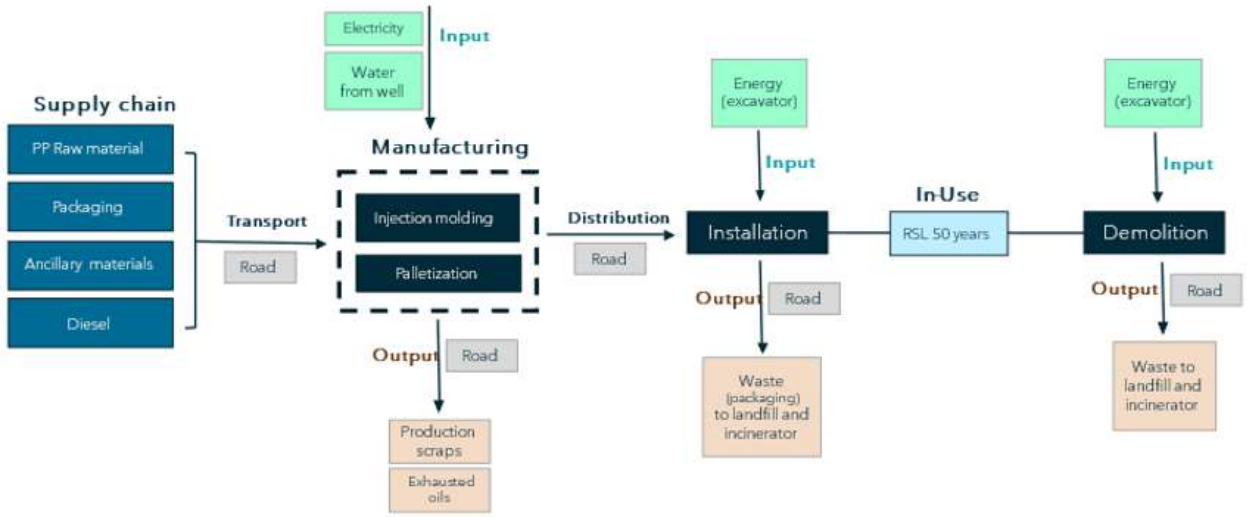
Material/Chemical Input	%
Recycled polypropylene (from post-industrial scraps)	100%
Recycled content	100% (pre-consumer)

Manufacturing Process

RootSpace parts are produced by injection moulding by GreenBlue Urban's 5 injection mould tools. One 800 t, one 395 t and one 380t injection moulding machines are utilised. The manufacturing facility uses energy from both the national grid and solar panels installed onsite.

Finished parts are stacked on pallets, secured with tensioned PP strapping, wrapped in stretch film and labelled. Coloured tape is applied to identify the specific part. No unit assembly takes place at the manufacturing site.

Process flow diagram



Construction Installation

RootSpace© is one of the key components of a more complex tree pit system. In fact, a typical tree pit system consists of several components, as listed below (from lower to upper level):

1) Sub-base course/drainage layer per engineers' specification. 100 mm minimum depth of a compactable angular aggregate, placed on a geogrid or filter fabric, based on project design requirements. Compact base course to a minimum of 95% standard proctor density.
2) RootSpace® Product
3) Planting soil
4) Irrigation system (if needed)
5) Pavement Base Course layer per engineers' specification. 100 mm minimum depth of a compactable angular aggregate, placed on top of a geogrid with an integrated geocomposite. Compact base course to a minimum of 95% standard proctor density.
6) Pavement - Per engineers' specifications

To ensure adequate performance, the system must be installed in accordance with the instructions for installation provided by GreenBlue Urban. The product being assessed does not require ancillary materials to be installed. The parts of the product are assembled by mechanical interlocking, there is no need for adhesives or other connection systems.

The other materials necessary for the construction of the tree pit system (e.g., subbase aggregates, membranes, irrigation system, planting soil, etc.) are not considered ancillary materials of the product under assessment. Likewise, the materials required for the construction of the pavement (e.g., pavement base course, pavings) are not considered ancillary materials, and their impacts are not included in this EPD.

The equipment needed to install the system are:

A) Earth-moving and/or excavation equipment (e.g., mini digger)
B) An earth-compactor is not needed. Soil has to be laid to GBU specifications in lifts of no more than 250 mm, lightly compacting each layer by manual treading to achieve 75-80% density.
C) Other equipment may be needed for the construction of the pavement, or for the installation of the irrigation systems. However, these components are not part of the product-system under assessment, and therefore are not counted.

The impacts associated with the installation of the RootSpace product are therefore attributable to the excavation (usually carried out with a diesel-powered mini digger) and the disposal of packaging materials.

Use Information

The reference service life of the product considered in this EPD is 50 years.

The product is entirely made of polypropylene, a thermoplastic material resistant to water and most oils, greases and chemical products. When installed underground, the product does not release substances into the ground and is not subject to mass loss. The product is statically installed underground, it is not subject to wear or other deterioration phenomena that require maintenance interventions during its life span.

The correct installation of the product, in accordance with the specifications provided by Green Blue Urban is a necessary condition to avoid undue maintenance / repairs.

End of Life

The product is made with a single material (100% recycled PP) and has potential to be recycled further.

This EPD includes two different end-of-life scenarios:

1. A conservative scenario aligned with the secondary data BRE PCR for plastics in construction. This dataset models the disposal mix for 1 kg of waste polypropylene in United Kingdom as the 100% municipal incineration.
2. A theoretical scenario considering a full 100% recyclability of the products at the end of their life.

Life Cycle Assessment Calculation Rules

Declared / Functional unit description

1m^2 of products installed underground in tree pits over a study period of 50 years.

Installed mass of product for 1 FU:

- 400 Single configuration – 24.93 kg
- 600 Single configuration – 27.38 kg

System boundary

Cradle to Grave

- Modules included: A1 - A2 - A3 - A4 - A5 - B1 - B2 - B3 - B4 - B5 – B6 – B7 - C1 - C2 - C3 - C4 – D

Data sources, quality and allocation

The results shown in this EPD are based on primary data for the fundamental aspects of the manufacturing process, such as: the product composition, the energy consumption, the water consumption, the disposal of waste and the consumption of ancillary materials (e.g., lubricating oils, hydraulic oils, etc.). Primary data have also been used for types and quantities of materials used for product packaging, the distances between raw material suppliers and production site, and manufacturing facility to installation site based on averages as provided by Green Blue.

Secondary data has been used for all processes not covered by primary data. The secondary data comes from the Ecoinvent database v3.7.1 published in March 2021 and available in the SimaPro 9.3.0.3. Secondary data have been assessed to determine technological, geographical and time representativeness against the method specified in EN 15804:2012+A2:2019 - Annex E - Table E.1. The datasets have been ranked as ‘very good’, ‘good’, and ‘fair’. Only two processes have been ranked as poor data quality – however their contribution to the total LCA is minimal.

The end-of-life system boundary of the product system is set where the system outputs (e.g., materials, products, or construction elements) have reached the end of waste state.

Recyclable outputs are considered inputs for the next lifecycle. Potential benefits and loads of reusable products, recyclable materials and useful energy carriers have been declared in module D.

The impacts of the production site were allocated among the products being studied on a physical basis using the allocation based on the physical quantity of products, expressed in tons, processed in the manufacturing site over the entire study period.

Cut-off criteria

No cut-off criteria were applied for the exclusion of less significant processes.

LCA Results – 400 Single

(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	6.55E+00	6.29E+00	2.59E-01	4.38E-03	4.16E-07	2.03E-02	1.15E-03
	Transport	A2	3.39E-01	3.38E-01	7.12E-04	9.49E-05	7.94E-08	1.40E-03	2.20E-05
	Manufacturing	A3	-1.27E-01	5.01E+00	-5.15E+00	1.02E-02	3.90E-07	1.88E-02	1.13E-03
	Total (Consumption grid)	A1-3	6.77E+00	1.16E+01	-4.89E+00	1.47E-02	8.85E-07	4.05E-02	2.31E-03
Construction process stage	Transport	A4	1.18E+00	1.18E+00	2.82E-03	3.97E-04	2.68E-07	4.72E-03	7.92E-05
	Construction	A5	3.17E+00	1.32E+00	1.85E+00	1.03E-04	2.51E-07	1.22E-02	4.55E-05
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
100% Recycling Scenario									
End of life	Deconstruction, demolition	C1	1.13E+00	1.13E+00	8.88E-04	8.95E-05	2.43E-07	1.17E-02	3.40E-05
	Transport	C2	2.97E-01	2.97E-01	7.10E-04	9.98E-05	6.74E-08	1.19E-03	1.99E-05
	Waste processing	C3	5.61E+00	5.05E+00	5.52E-01	7.04E-03	3.22E-07	1.62E-02	9.04E-04
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-5.80E-01	-5.49E-01	-3.07E-02	-3.99E-04	-5.86E-08	-1.12E-03	-5.27E-05
Market Based Scenario (100% incineration)									
End of life	Deconstruction, demolition	C1	1.13E+00	1.13E+00	8.88E-04	8.95E-05	2.43E-07	1.17E-02	3.40E-05
	Transport	C2	2.97E-01	2.97E-01	7.10E-04	9.98E-05	6.74E-08	1.19E-03	1.99E-05
	Waste processing	C3	6.37E+01	6.37E+01	2.43E-03	1.21E-04	5.16E-08	8.35E-03	8.27E-05
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

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
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-2.45E+01	-2.32E+01	-1.28E+00	-1.67E-02	-2.45E-06	-4.78E-02	-2.23E-03

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 – 400 Single

(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	4.68E-03	4.50E-02	1.79E-02	4.49E-05	1.40E+02	2.04E+00	1.58E-07
	Transport	A2	4.32E-04	4.72E-03	1.51E-03	8.04E-07	5.27E+00	1.73E-02	3.03E-08
	Manufacturing	A3	4.51E-03	4.88E-02	1.49E-02	3.51E-05	1.22E+02	1.05E+00	1.30E-07
	Total (Consumption grid)	A1-3	9.62E-03	9.86E-02	3.43E-02	8.08E-05	2.68E+02	3.10E+00	3.18E-07
Construction process stage	Transport	A4	1.45E-03	1.58E-02	4.82E-03	4.25E-06	1.78E+01	5.07E-02	8.17E-08
	Construction	A5	5.69E-03	5.89E-02	1.62E-02	5.90E-07	1.61E+01	2.39E-02	3.17E-07
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
100% Recycling Scenario									
End of life	Deconstruction, demolition	C1	5.21E-03	5.70E-02	1.57E-02	4.55E-07	1.55E+01	2.23E-02	3.11E-07
	Transport	C2	3.64E-04	3.97E-03	1.21E-03	1.07E-06	4.49E+00	1.28E-02	2.05E-08
	Waste processing	C3	3.71E-03	4.03E-02	9.99E-03	1.33E-05	1.30E+02	1.68E-01	6.31E-08
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-2.75E-04	-2.99E-03	-8.00E-04	-8.28E-07	-1.14E+01	-1.05E-02	-4.02E-09
Market Based Scenario (100% incineration)									
End of life	Deconstruction, demolition	C1	5.21E-03	5.70E-02	1.57E-02	4.55E-07	1.55E+01	2.23E-02	3.11E-07
	Transport	C2	3.64E-04	3.97E-03	1.21E-03	1.07E-06	4.49E+00	1.28E-02	2.05E-08
	Waste processing	C3	4.19E-03	4.27E-02	1.03E-02	1.70E-06	6.01E+00	3.89E-02	4.05E-08
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

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
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.17E-02	-1.26E-01	-3.43E-02	-3.45E-05	-4.86E+02	-6.83E-01	-1.77E-07

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 – 400 Single

(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	2.20E+00	8.17E+01	6.21E-09	4.59E-08	2.81E+01
	Transport	A2	2.70E-02	4.04E+00	1.26E-10	4.34E-09	5.98E+00
	Manufacturing	A3	3.56E+00	7.42E+01	6.87E-09	4.85E-08	4.00E+02
	Total (Consumption grid)	A1-3	5.79E+00	1.60E+02	1.32E-08	9.87E-08	4.34E+02
Construction process stage	Transport	A4	9.32E-02	1.36E+01	4.86E-10	1.38E-08	1.23E+01
	Construction	A5	7.33E-02	9.87E+00	6.19E-10	1.02E-08	2.72E+00
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
100% Recycling Scenario							
End of life	Deconstruction, demolition	C1	7.06E-02	8.83E+00	4.33E-10	6.27E-09	2.01E+00
	Transport	C2	2.34E-02	3.43E+00	1.22E-10	3.48E-09	3.09E+00
	Waste processing	C3	4.52E+00	6.11E+01	1.21E-09	3.23E-08	4.08E+01
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-2.53E-01	-3.66E+00	-9.07E-11	-2.00E-09	-2.34E+00
Market Based Scenario (100% incineration)							
End of life	Deconstruction, demolition	C1	7.06E-02	8.83E+00	4.33E-10	6.27E-09	2.01E+00
	Transport	C2	2.34E-02	3.43E+00	1.22E-10	3.48E-09	3.09E+00
	Waste processing	C3	1.25E-02	1.52E+01	2.43E-09	8.62E-08	1.95E+00

Parameters describing environmental impacts

			IRP	ETP-fw	HTP-c	HTP-nc	SQP
			kBq U^{235} eq	CTUe	CTUh	CTUh	dimensionless
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.06E+01	-1.53E+02	-3.80E-09	-8.40E-08	-9.75E+01

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 – 400 Single

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

Parameters describing resource use, primary energy								
			PERE	PERM	PERT	PENRE	PENRM	PENRT
			MJ	MJ	MJ	MJ	MJ	MJ
Product stage	Raw material supply	A1	7.42E+00	4.57E+00	1.20E+01	6.99E-04	1.40E+02	1.40E+02
	Transport	A2	4.88E-02	1.56E-02	6.45E-02	7.14E-05	5.27E+00	5.27E+00
	Manufacturing	A3	1.62E+01	7.39E+01	9.01E+01	6.48E-03	1.22E+02	1.22E+02
	Total (Consumption grid)	A1-3	2.37E+01	7.85E+01	1.02E+02	7.25E-03	2.68E+02	2.68E+02
Construction process stage	Transport	A4	1.75E-01	6.54E-02	2.40E-01	3.67E-04	1.78E+01	1.78E+01
	Construction	A5	6.88E-02	2.30E-02	9.19E-02	4.87E-05	1.61E+01	1.61E+01
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
100% Recycling Scenario								
End of life	Deconstruction, demolition	C1	6.05E-02	1.97E-02	8.02E-02	4.06E-05	1.55E+01	1.55E+01
	Transport	C2	4.40E-02	1.64E-02	6.04E-02	9.23E-05	4.49E+00	4.49E+00
	Waste processing	C3	1.05E+01	8.90E+00	1.94E+01	8.83E-04	1.30E+02	1.30E+02
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-5.89E-01	-4.95E-01	-1.08E+00	-5.36E-05	-1.14E+01	-1.14E+01
Market Based Scenario (100% incineration)								
End of life	Deconstruction, demolition	C1	6.05E-02	1.97E-02	8.02E-02	4.06E-05	1.55E+01	1.55E+01
	Transport	C2	4.40E-02	1.64E-02	6.04E-02	9.23E-05	4.49E+00	4.49E+00
	Waste processing	C3	8.97E-02	4.89E-02	1.39E-01	4.07E-05	6.01E+00	6.01E+00

Parameters describing resource use, primary energy

			PERE	PERM	PERT	PENRE	PENRM	PENRT
			MJ	MJ	MJ	MJ	MJ	MJ
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-2.46E+01	-2.07E+01	-4.53E+01	-2.23E-03	-4.86E+02	-4.86E+02

PERE = Use of renewable primary energy excluding renewable primary energy 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 resource

LCA Results – 400 Single

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

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	0.00E+00	0.00E+00	0.00E+00	5.92E-02
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	6.11E-04
	Manufacturing	A3	0.00E+00	0.00E+00	0.00E+00	6.25E-02
	Total (Consumption grid)	A1-3	0.00E+00	0.00E+00	0.00E+00	1.22E-01
Construction process stage	Transport	A4	0.00E+00	0.00E+00	0.00E+00	1.93E-03
	Construction	A5	0.00E+00	0.00E+00	0.00E+00	1.03E-03
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00
100% Recycling Scenario						
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	8.61E-04
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	4.85E-04
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	2.35E-02
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	-1.40E-03
Market Based Scenario (100% incineration)						
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	8.61E-04
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	4.85E-04
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	4.16E-03

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
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	-6.18E-02

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 – 400 Single

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

Other environmental information describing waste categories					
			HWD	NHWD	RWD
			kg	kg	kg
Product stage	Raw material supply	A1	7.44E-05	1.31E+00	5.74E-04
	Transport	A2	1.27E-05	4.54E-01	3.61E-05
	Manufacturing	A3	1.78E-04	5.02E-01	9.18E-04
	Total (Consumption grid)	A1-3	2.65E-04	2.27E+00	1.53E-03
Construction process stage	Transport	A4	4.65E-05	8.55E-01	1.22E-04
	Construction	A5	4.31E-05	7.48E-01	1.11E-04
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00
100% Recycling Scenario					
End of life	Deconstruction, demolition	C1	4.17E-05	1.90E-02	1.08E-04
	Transport	C2	1.17E-05	2.15E-01	3.07E-05
	Waste processing	C3	5.30E-05	3.22E-01	1.12E-03
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-8.68E-06	-1.97E-02	-6.48E-05
Market Based Scenario (100% incineration)					
End of life	Deconstruction, demolition	C1	4.17E-05	1.90E-02	1.08E-04
	Transport	C2	1.17E-05	2.15E-01	3.07E-05
	Waste processing	C3	6.38E-05	1.09E+00	9.98E-06

Other environmental information describing waste categories					
			HWD	NHWD	RWD
			kg	kg	kg
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-3.62E-04	-8.22E-01	-2.70E-03

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

LCA Results – 400 Single

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

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	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A	N/A
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A	N/A
	Manufacturing	A3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A	N/A
	Total (Consumption grid)	A1-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A	N/A
Construction process stage	Transport	A4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A	N/A
	Construction	A5	0.00E+00	0.00E+00	1.96E+00	8.38E+00	N/A	N/A
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A	N/A
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A	N/A
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A	N/A
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A	N/A
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A	N/A
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A	N/A
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A	N/A
100% Recycling Scenario								
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A	N/A
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A	N/A
	Waste processing	C3	0.00E+00	2.49E+01	0.00E+00	0.00E+00	N/A	N/A
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A	N/A
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A	N/A
Market Based Scenario (100% incineration)								
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A	N/A
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A	N/A
	Waste processing	C3	0.00E+00	0.00E+00	2.49E+01	3.40E+02	N/A	N/A

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
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A	N/A
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A	N/A

CRU = Components for reuse;
MFR = Materials for recycling

MER = Materials for energy recovery;
EE = Exported Energy

LCA Results – 600 Single

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	7.20E+00	6.91E+00	2.84E-01	4.81E-03	4.56E-07	2.23E-02	1.26E-03
	Transport	A2	3.72E-01	3.71E-01	7.81E-04	1.04E-04	8.70E-08	1.53E-03	2.41E-05
	Manufacturing	A3	3.06E-01	5.41E+00	-5.11E+00	1.07E-02	4.17E-07	2.01E-02	1.21E-03
	Total (Consumption grid)	A1-3	7.88E+00	1.27E+01	-4.83E+00	1.57E-02	9.61E-07	4.39E-02	2.50E-03
Construction process stage	Transport	A4	1.29E+00	1.29E+00	3.08E-03	4.33E-04	2.92E-07	5.15E-03	8.65E-05
	Construction	A5	3.65E+00	1.79E+00	1.85E+00	1.41E-04	3.53E-07	1.71E-02	5.99E-05
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
100% Recycling Scenario									
End of life	Deconstruction, demolition	C1	1.60E+00	1.60E+00	1.26E-03	1.27E-04	3.45E-07	1.67E-02	4.83E-05
	Transport	C2	3.27E-01	3.26E-01	7.80E-04	1.10E-04	7.40E-08	1.30E-03	2.19E-05
	Waste processing	C3	6.16E+00	5.54E+00	6.06E-01	7.73E-03	3.54E-07	1.78E-02	9.93E-04
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-5.79E-01	-5.48E-01	-3.07E-02	-3.99E-04	-5.87E-08	-1.12E-03	-5.26E-05
Market Based Scenario (100% incineration)									
End of life	Deconstruction, demolition	C1	1.60E+00	1.60E+00	1.26E-03	1.27E-04	3.45E-07	1.67E-02	4.83E-05
	Transport	C2	3.27E-01	3.26E-01	7.80E-04	1.10E-04	7.40E-08	1.30E-03	2.19E-05
	Waste processing	C3	7.00E+01	7.00E+01	2.67E-03	1.33E-04	5.67E-08	9.17E-03	9.09E-05
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

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
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-2.68E+01	-2.54E+01	-1.41E+00	-1.83E-02	-2.68E-06	-5.24E-02	-2.44E-03

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 – 600 Single

(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	5.14E-03	4.94E-02	1.96E-02	4.93E-05	1.54E+02	2.24E+00	1.73E-07
	Transport	A2	4.73E-04	5.17E-03	1.66E-03	8.80E-07	5.78E+00	1.90E-02	3.32E-08
	Manufacturing	A3	4.81E-03	5.20E-02	1.58E-02	3.78E-05	1.32E+02	1.08E+00	1.36E-07
	Total (Consumption grid)	A1-3	1.04E-02	1.07E-01	3.71E-02	8.79E-05	2.92E+02	3.34E+00	3.42E-07
Construction process stage	Transport	A4	1.58E-03	1.72E-02	5.26E-03	4.64E-06	1.95E+01	5.54E-02	8.91E-08
	Construction	A5	7.89E-03	8.29E-02	2.28E-02	7.82E-07	2.26E+01	3.33E-02	4.48E-07
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
100% Recycling Scenario									
End of life	Deconstruction, demolition	C1	7.40E-03	8.11E-02	2.23E-02	6.47E-07	2.20E+01	3.18E-02	4.42E-07
	Transport	C2	3.99E-04	4.36E-03	1.33E-03	1.17E-06	4.93E+00	1.40E-02	2.26E-08
	Waste processing	C3	4.07E-03	4.42E-02	1.10E-02	1.46E-05	1.43E+02	1.85E-01	6.93E-08
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-2.75E-04	-2.98E-03	-7.98E-04	-8.28E-07	-1.13E+01	-9.92E-03	-4.00E-09
Market Based Scenario (100% incineration)									
End of life	Deconstruction, demolition	C1	7.40E-03	8.11E-02	2.23E-02	6.47E-07	2.20E+01	3.18E-02	4.42E-07
	Transport	C2	3.99E-04	4.36E-03	1.33E-03	1.17E-06	4.93E+00	1.40E-02	2.26E-08
	Waste processing	C3	4.60E-03	4.69E-02	1.13E-02	1.87E-06	6.60E+00	4.27E-02	4.45E-08
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

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
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.28E-02	-1.39E-01	-3.76E-02	-3.78E-05	-5.33E+02	-7.49E-01	-1.94E-07

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 – 600 Single

(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	2.41E+00	8.97E+01	6.82E-09	5.04E-08	3.09E+01
	Transport	A2	2.96E-02	4.43E+00	1.38E-10	4.76E-09	6.56E+00
	Manufacturing	A3	3.90E+00	7.96E+01	6.99E-09	5.16E-08	4.03E+02
	Total (Consumption grid)	A1-3	6.35E+00	1.74E+02	1.39E-08	1.07E-07	4.41E+02
Construction process stage	Transport	A4	1.02E-01	1.49E+01	5.30E-10	1.51E-08	1.34E+01
	Construction	A5	1.03E-01	1.36E+01	8.02E-10	1.29E-08	3.57E+00
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
100% Recycling Scenario							
End of life	Deconstruction, demolition	C1	1.00E-01	1.25E+01	6.15E-10	8.91E-09	2.85E+00
	Transport	C2	2.57E-02	3.77E+00	1.34E-10	3.82E-09	3.39E+00
	Waste processing	C3	4.97E+00	6.71E+01	1.33E-09	3.55E-08	4.48E+01
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-2.53E-01	-3.66E+00	-9.07E-11	-1.99E-09	-2.34E+00
Market Based Scenario (100% incineration)							
End of life	Deconstruction, demolition	C1	1.00E-01	1.25E+01	6.15E-10	8.91E-09	2.85E+00
	Transport	C2	2.57E-02	3.77E+00	1.34E-10	3.82E-09	3.39E+00
	Waste processing	C3	4.97E+00	6.71E+01	1.33E-09	3.55E-08	4.48E+01

Parameters describing environmental impacts

			IRP	ETP-fw	HTP-c	HTP-nc	SQP
			kBq U^{235} eq	CTUe	CTUh	CTUh	dimensionless
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-2.53E-01	-3.66E+00	-9.07E-11	-1.99E-09	-2.34E+00

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 - 600 Single

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

Parameters describing resource use, primary energy								
			PERE	PERM	PERT	PENRE	PENRM	PENRT
			MJ	MJ	MJ	MJ	MJ	MJ
Product stage	Raw material supply	A1	8.15E+00	5.02E+00	1.32E+01	7.68E-04	1.54E+02	1.54E+02
	Transport	A2	5.35E-02	1.71E-02	7.07E-02	7.82E-05	5.78E+00	5.78E+00
	Manufacturing	A3	1.78E+01	7.47E+01	9.24E+01	6.56E-03	1.32E+02	1.32E+02
	Total (Consumption grid)	A1-3	2.60E+01	7.97E+01	1.06E+02	7.40E-03	2.92E+02	2.92E+02
Construction process stage	Transport	A4	1.91E-01	7.13E-02	2.62E-01	4.01E-04	1.95E+01	1.95E+01
	Construction	A5	9.43E-02	3.13E-02	1.26E-01	6.58E-05	2.26E+01	2.26E+01
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
100% Recycling Scenario								
End of life	Deconstruction, demolition	C1	8.59E-02	2.80E-02	1.14E-01	5.77E-05	2.20E+01	2.20E+01
	Transport	C2	4.83E-02	1.81E-02	6.64E-02	1.01E-04	4.93E+00	4.93E+00
	Waste processing	C3	1.15E+01	9.78E+00	2.13E+01	9.69E-04	1.43E+02	1.43E+02
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-5.89E-01	-4.95E-01	-1.08E+00	-5.36E-05	-1.13E+01	-1.13E+01
Market Based Scenario (100% incineration)								
End of life	Deconstruction, demolition	C1	8.59E-02	2.80E-02	1.14E-01	5.77E-05	2.20E+01	2.20E+01
	Transport	C2	4.83E-02	1.81E-02	6.64E-02	1.01E-04	4.93E+00	4.93E+00
	Waste processing	C3	9.85E-02	5.37E-02	1.52E-01	4.47E-05	6.60E+00	6.60E+00

Parameters describing resource use, primary energy

			PERE	PERM	PERT	PENRE	PENRM	PENRT
			MJ	MJ	MJ	MJ	MJ	MJ
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-2.70E+01	-2.26E+01	-4.96E+01	-2.45E-03	-5.33E+02	-5.33E+02

PERE = Use of renewable primary energy excluding renewable primary energy 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 resource

LCA Results - 600 Single

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

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	0.00E+00	0.00E+00	0.00E+00	6.51E-02
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	6.69E-04
	Manufacturing	A3	0.00E+00	0.00E+00	0.00E+00	6.67E-02
	Total (Consumption grid)	A1-3	0.00E+00	0.00E+00	0.00E+00	1.32E-01
Construction process stage	Transport	A4	0.00E+00	0.00E+00	0.00E+00	2.10E-03
	Construction	A5	0.00E+00	0.00E+00	0.00E+00	1.40E-03
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00
100% Recycling Scenario						
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	1.22E-03
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	5.33E-04
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	2.58E-02
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	-1.39E-03
Market Based Scenario (100% incineration)						
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	1.22E-03
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	5.33E-04
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	4.57E-03

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
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	-6.77E-02

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 - 600 Single

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

Other environmental information describing waste categories					
			HWD	NHWD	RWD
			kg	kg	kg
Product stage	Raw material supply	A1	8.17E-05	1.44E+00	6.30E-04
	Transport	A2	1.39E-05	4.98E-01	3.96E-05
	Manufacturing	A3	5.19E-03	5.65E-01	1.00E-03
	Total (Consumption grid)	A1-3	5.29E-03	2.50E+00	1.67E-03
Construction process stage	Transport	A4	5.07E-05	9.33E-01	1.33E-04
	Construction	A5	6.07E-05	7.57E-01	1.56E-04
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00
100% Recycling Scenario					
End of life	Deconstruction, demolition	C1	5.93E-05	2.70E-02	1.53E-04
	Transport	C2	1.28E-05	2.36E-01	3.37E-05
	Waste processing	C3	5.82E-05	3.53E-01	1.23E-03
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-8.68E-06	-1.96E-02	-6.48E-05
Market Based Scenario (100% incineration)					
End of life	Deconstruction, demolition	C1	5.93E-05	2.70E-02	1.53E-04
	Transport	C2	1.28E-05	2.36E-01	3.37E-05
	Waste processing	C3	7.01E-05	1.19E+00	1.10E-05

Other environmental information describing waste categories

			HWD	NHWD	RWD
			kg	kg	kg
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-3.97E-04	-9.01E-01	-2.96E-03

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

LCA Results - 600 Single

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

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	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A	N/A
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A	N/A
	Manufacturing	A3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A	N/A
	Total (Consumption grid)	A1-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A	N/A
Construction process stage	Transport	A4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A	N/A
	Construction	A5	0.00E+00	0.00E+00	1.97E+00	8.38E+00	N/A	N/A
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A	N/A
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A	N/A
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A	N/A
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A	N/A
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A	N/A
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A	N/A
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A	N/A
100% Recycling Scenario								
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A	N/A
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A	N/A
	Waste processing	C3	0.00E+00	2.74E+01	0.00E+00	0.00E+00	N/A	N/A
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A	N/A
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A	N/A
Market Based Scenario (100% incineration)								
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A	N/A
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A	N/A
	Waste processing	C3	0.00E+00	0.00E+00	2.74E+01	3.74E+02	N/A	N/A

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
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A	N/A
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A	N/A

CRU = Components for reuse;
MFR = Materials for recycling

MER = Materials for energy recovery;
EE = Exported Energy

Scenarios and additional technical information

Scenarios and additional technical information			
Scenario	Parameter	Units	Results
A4 – Transport to the building site	The results shown in this EPD considered a distribution scenario limited to the UK, assuming that 100% of the product is delivered throughout the UK by transport pallet networks. The transport distances have been calculated to cover the whole national territory based on primary data. These calculations are based on Green Blue's sales volume and distance from the manufacturing site to their client sites based on delivery postcodes. The postcodes have been grouped into eleven areas in the UK and average distances have been calculated from this.		
	Fuel type / Vehicle type	Vehicle type	Lorry Euro 5
	Distance:	km	264 by lorry
	Capacity utilisation (incl. empty returns)	%	According to Ecoinvent default assumptions
	Bulk density of transported products	kg/m^3	N/A
A5 – Installation in the building	See page 5 of this document		
B2 – Maintenance	Not required		
B3 – Repair	Not required		
B4 – Replacement	Not required		
B5 – Refurbishment	Not required		
Reference service life	The reference service life of the product considered in this EPD is 50 years. Source: Agreement Certificate no. 20/5801, issued by BBA (British Board of Agreement)		
B6 – Use of energy; B7 – Use of water	Not required		
C1 to C4 End of life,	The product is made with a single material (100% recycled PP) and has potential to be recycled further. This EPD includes two different end-of-life scenarios: 1. A conservative scenario aligned with the secondary data BRE PCR for plastics in construction. This dataset models the disposal mix for 1 kg of waste polypropylene in United Kingdom as the 100% municipal incineration. 2. A theoretical scenario considering a full recyclability of the products at the end of their life.		

Scenarios and additional technical information			
Scenario	Parameter	Units	Results
Module D	Potential benefits and loads of reusable products, recyclable materials and useful energy carriers leaving the system boundaries at the end-of-waste state have been declared in module D. This module includes net benefits and loads arising from the reuse of products or the recycling or recovery of energy from end-of-waste state materials resulting from the construction stage (A4 – A5), the use stage (B) and the end-of-life stage (C). <u>Potential loads and benefits of net flows leaving the system boundaries in modules A5</u> The results presented in this EPD assume that a share of the packaging materials is disposed of in municipal incinerators with energy recovery (including both electricity and heating). The energy recovered can be used in subsequent product-systems, avoiding the production of the same amount of energy through other technologies. This avoided production represents a benefit beyond the system boundaries and has been included in module D. <u>Potential loads and benefits of net flows leaving the system boundaries in modules C1-C4</u> The first end-of-life scenario reported in this EPD assumes that a 100% of the product at their end of life is disposed of in municipal incinerators with energy recovery (including both electricity and heating). The energy recovered can be used in subsequent product-systems, avoiding the production of the same amount of energy through other technologies. This avoided production represents a benefit beyond the system boundaries and has been included in module D. The second end-of-life scenario reported in this EPD considers a full recyclability of the products at the end of their life. The amount of material exiting the system that will be recycled in a subsequent system is lower than the amount of recycled material recovered from a previous system; this implies that the products in subsequent systems will need an additional amount of virgin material to compensate this loss. This therefore can be classified as a load on the system and has been accounted for in Module D of this scenario.		

Summary, comments and additional information

Interpretation

The environmental impacts of the two configurations “400 Single” and “600 Single”, in relative terms (e.g., trend, distribution, contribution, etc), are very similar as they are made with the same material and manufactured with the same production processes. Moreover, both the configurations share the same installation procedure and the same disposal routes.

The life cycle modules with the highest impact vary depending on the impact category analysed, and therefore, in principle, it is not possible to identify a single module that contributes the most. However, it is possible to identify some phases that have a higher impact than others, and which should be analysed more in detail.

The modules of the life cycle that have the highest impacts are:
A1 – Raw material supply
A3 – Manufacturing
A5 – Installation
C3 – Waste Processing

The raw material supply (A1) has a considerable impact, greater than 30% of the overall impact of the life cycle analysed in over 7 impact categories. The impact categories most affected by the production of the raw material (recycled PP) are " Water (user) deprivation potential" and "Resource use, minerals and metals;", in both categories this module impacts more than 50% of the overall result.

It should be noted that the effects are associated with the production of the raw material (recycling process, from waste to product) were modelled with the secondary data "Plastic granulate, unspecified, recycled {IN}| plastic granulate production, unspecified, recycled, formal sector | Cut-off, U - Adapted to United Kingdom” available in the Ecoinvent v3.7.1 database. This data, originally created for a production plant located in India, has been readjusted to the geographical context of the United Kingdom.

Another module that brings important contributions to the impacts of the analysed life cycle is the manufacturing and packaging impacts of the products. The energy consumption of the production site and the amount of packaging used for each product are the most relevant factors in determining the environmental impacts associated with this module. Revisiting the packaging strategies – i.e., increasing the packaging density, reviewing the materials used and increasing the reuse of the packaging items can reduce the impacts.

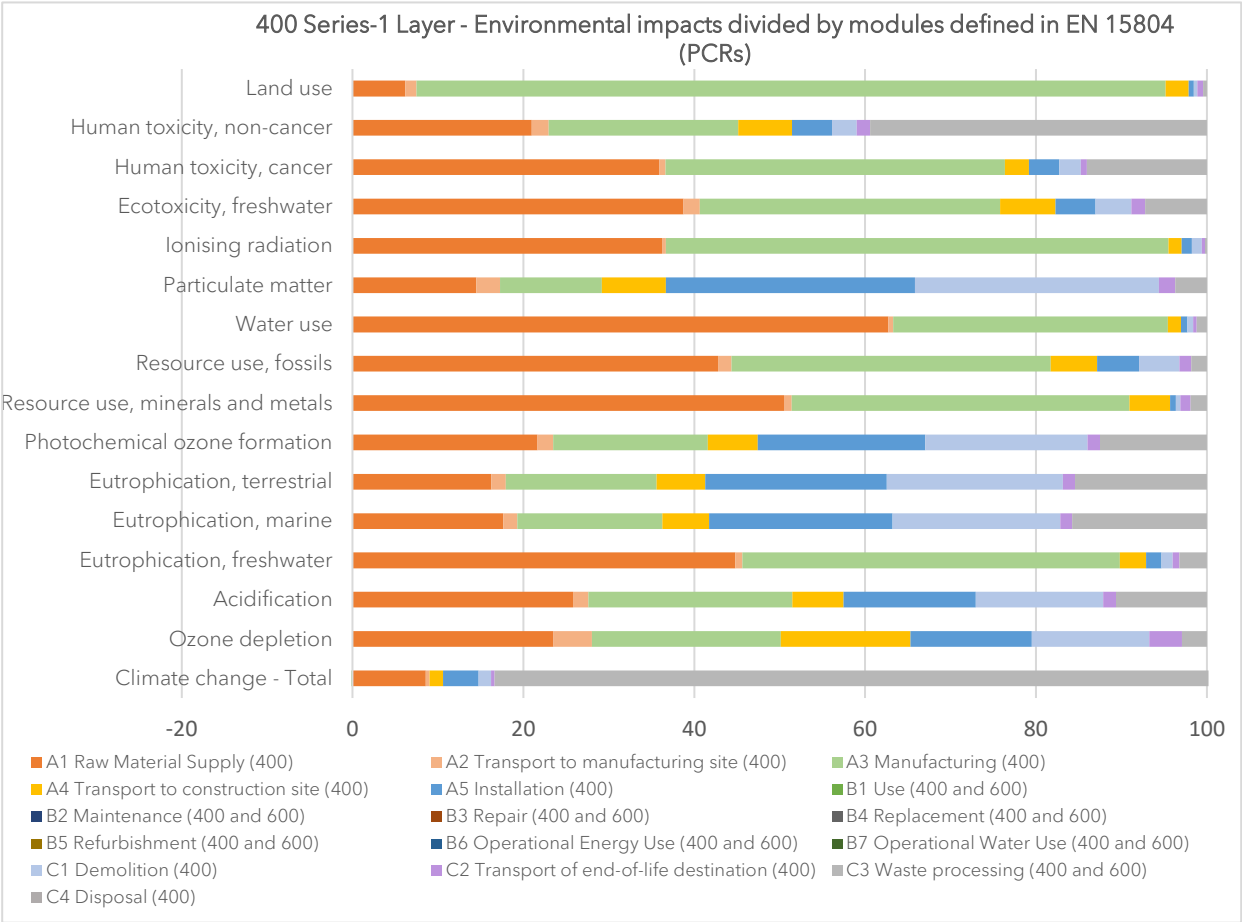
The installation of products at the construction sites (A5) has impacts on the life cycle analysed. This module contributes more than 15% of the overall impact of the life cycle analysed in 5 impact categories. The impact categories most affected by this are "particulate matter” and "eutrophication potential" and, respectively 29% and 21% of the overall lifecycle impacts. Most of these impacts are driven up the use of diesel in the excavation machinery. The demolition phase (C1) contributes to the impacts similarly to A5 – this is resultant of using the same process for both the installation and demolition phases. It is important to note that this stage has predominantly been modelled based on available secondary resources.

Finally, another module with significant impacts on the life cycle of the products analysed is the waste processing phase (C3), which contributes more than 83% of the total global warming.

It should be noted that there is considerable uncertainty regarding the treatment of the products under assessment at the end of their life. The product is made with a single material (100% recycled PP) and has potential to be recycled further.

This EPD includes two different end-of-life scenarios:

1. A conservative scenario aligned with the secondary data BRE PCR for plastics in construction. This dataset models the disposal mix for 1 kg of waste polypropylene in the United Kingdom into 100% municipal incineration systems.
2. A theoretical scenario considering a full 100% recyclability of the products at the end of their life.



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