Environmental Product Declaration of multiple products

In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 for:

Asphalt BIO 50 and Asphalt Reactive

based on average results

from

Potmix Products AB

Programme:	The International EPD® System, www.environdec.com
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An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com

General information

Programme information

Programme:	The International EPD® System
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
Website:	www.environdec.com
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Accountabilities for PCR, LCA and independent, third-party verification
Product Category Rules (PCR)
CEN standard EN 15804+A2 serves as the Core Product Category Rules (PCR)
Product Category Rules (PCR): 2019:14 Construction products, version 1.3.4
PCR review was conducted by: The Technical Committee of the International EPD® System. A full list of members available on www.environdec.com. The review panel may be contacted via info@environdec.com.
Life Cycle Assessment (LCA)
LCA accountability: Martina Fridl, Xylo Sweden AB
Third-party verification
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: ☒ EPD verification by individual verifier Third-party verifier: Jan Weinzettel Approved by: The International EPD® System

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

Company information

Owner of the EPD: Potmix Products AB, http://www.potmix.com

Contact: Marcus Ansala, Managing Director, marcus@potmix.com

Description of the organisation:
Potmix Products is a Swedish asphalt material manufacturer for the European construction market. Founded in 2004, Potmix Products is the leading Nordic road repair product manufacturer and distributor of asphalt maintenance machinery. Their main customers are private contractors, municipal and state road authorities, real estate maintenance companies, and wholesale and DYI store chains. They operate one production facility located in Kungsör, Sweden.

Name and location of production site:
Potmix Products AB
Kungsgatan 10
736 36 Kungsör
Sweden

Product information

Product names: Asphalt BIO 50 and Asphalt Reactive from Potmix Products AB
UN CPC code: 37940

Product description:
This EPD of multiple products covers two types of reactive, cold lay asphalt repair materials produced by Potmix®: Asphalt BIO 50 and Asphalt Reactive. The products' intended application is as cold lay road repair asphalt, used for repairs of road infrastructure. The products' specific composition differs slightly, though they contain the same materials, sourced from the same suppliers, and are produced at the same facility.

Asphalt BIO 50 is a high-performance repair asphalt material for durable and permanent repairs of asphalt surfaces. Its binder is a unique blend of bitumen and bio-oil. The product is a cold lay asphalt which cures under pressure and in contact with moisture at ambient temperatures. Watering it before compaction quickens the curing process — indicative consumption is approximately 1 L water per 10 kg material. Traffic can be let onto the repaired area immediately; the asphalted area reaches 5 kN Marshall stability in 48 hours. Asphalt Bio 50 works equally well in summer and winter and is completely VOC/solvent free. It is to be stored in dry conditions. Product density at 20 °C is 1400 kg/m^3.

Asphalt Reactive is an ultra-high-performance repair asphalt material for durable and permanent repairs of asphalt surfaces. The product is the only cold-lay asphalt material that truly matches the quality of hot mix asphalt. Its binder is a unique blend of bitumen and bio-oil. The product is a cold lay asphalt which cures under pressure and in contact with moisture at ambient temperatures. Watering it before compaction quickens the curing process — indicative consumption is approximately 1 L water per 10 kg material. Traffic can be let onto the repaired area immediately; the asphalted area reaches 5 kN Marshall stability in one hour. Asphalt Bio 50 works equally well in summer and winter and is completely VOC/solvent free. It is to be stored in dry conditions. Product density at 20 °C is 1400 kg/m^3.

LCA information

Declared unit: 1000 kg of asphalt repair material

Results have been averaged based on production volumes of Asphalt BIO 50 and Asphalt Reactive in 2023.

Time representativeness: Specific data from the manufacturer cover the production period from January 2023 to December 2023. Datapoints obtained from suppliers are not older than 5 years and the generic datapoints are not older than 10 years.

Geographical scope: Processes in A1-A2 represent material extraction and transport in the geography of Europe. Processes in A3 represent production in Sweden. Modules A5, C1-C4 and D have been modelled to represent the geography of Europe.

Database(s) and LCA software used: Ecoinvent version 3.10; SimaPro, version 9.6.

Description of system boundaries: Cradle to gate with options, modules C1–C4, module D and with an optional module A5.

Characterisation factors used: Environmental Footprint reference package, version 3.1 (JRC, 2022)

Modules declared, geographical scope, share of specific data (in GWP-GHG results) and data variation (in GWP-GHG results):

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
Module	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Modules declared	X	X	X	ND	X	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	EU	EU	SE	-	EU	-	-	-	-	-	-	-	EU	EU	EU	EU	EU
Specific data used	25%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	±13%			-	±22.5%	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	0 %			-	-	-	-	-	-	-	-	-	-	-	-	-	-

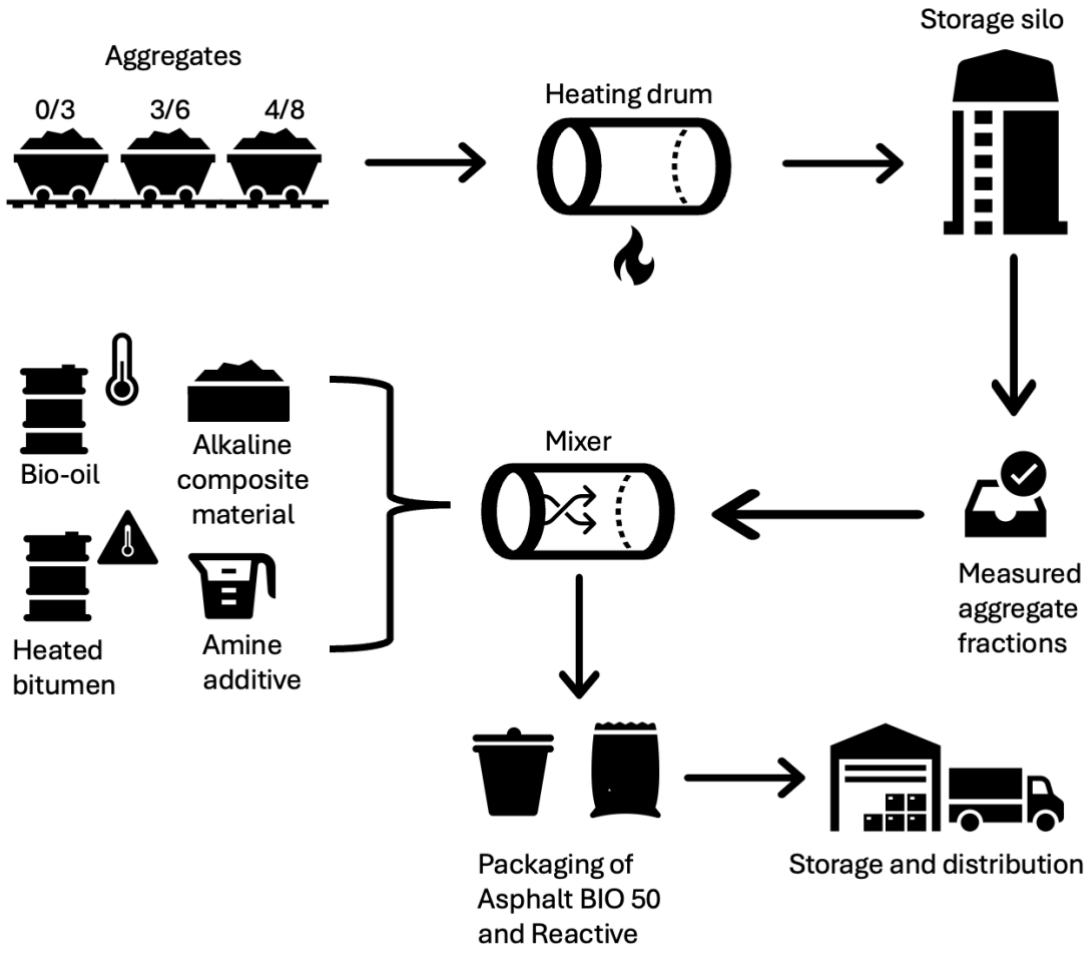
Process description

Potmix® Asphalt Bio 50 and Asphalt Reactive are produced in Kungsör, Sweden. The products' intended application is as cold lay road repair asphalt, used for repairs of road infrastructure.

The product's components are granite aggregates, bitumen, and bio-oil, with alkaline composite material and amine additives completing the product composition. Aggregates from local granite quarries are transported unbounded, sorted in different size fractions. The aggregates are dried and stored in silos until use. The fine dust generated during the drying process is collected through a ventilation system which includes filters for fine particles, and a large fraction of collected materials is mixed back into the aggregate fraction 0/3 mm. Bitumen is transported in a heated reservoir and stored in a heated tank at 150 ℃ throughout production days. Bio-oil is transported and stored at ambient temperatures.

The products are manufactured by mixing specific quantities of the abovementioned components in an electric mixer. Manufacturing is followed by packaging - for Asphalt BIO 50, paper bags with polyethylene liners and polypropylene buckets are used, whereas for Asphalt Reactive, the product is packaged into polypropylene buckets and polyethylene bags. Packaging options have different capacities.

Manufacturing process diagram:



Cut-off rules

Cut-off criteria as defined in EN15804 + A2 were observed, which allow for maximum 1% of renewable and non-renewable primary energy usage and 1% of total mass input of unit processes to be excluded. Furthermore, the total of excluded inputs must be below 5% excluded LCI data per LCA module. All excluded processes are documented below.

List of excluded processes/inputs:

1) Packaging materials of product components (97% (by weight) of all materials for product manufacturing arrive unpackaged, thus cut-off criteria were observed to exclude the remaining percentage of primary material packaging (wood pallets and paper bags). However, packaging of the packaging itself (buckets, paper bags and PE bags) was included due to high characterization factors of plastic materials).
2) Lubricant oils and water for maintenance and washing of the equipment (negligible quantities)
3) On-site vehicular transportation of material (materials mostly moved with electric equipment)
4) Pallets for packaging (reused from deliveries of primary materials)

Allocation

Allocation hierarchy from the compliance standards has been followed

1) If possible, allocation is avoided.
2) Allocation based on underlying physical properties (e.g., weight) if economic value of product and co-product(s) is similar.
3) If economic value (e.g., revenue) of product and co-product(s) is significantly different, allocation based on economic value is preferred over option 2.

This manufacturing process produces no co-products.

Facility-level data (electricity and heating consumption) have been allocated based on production volumes (kg of product), scaled up to the declared unit. This is done as the facility produces different asphalt products with similar manufacturing processes. For the product itself, the composition is fixed, so no allocation was needed. For packaging, percentage fractions of different packaging alternatives sold in 2023 were calculated and allocated based on weight.

Assumptions

Impacts from infrastructure, capital good and staffing have been excluded from the analysis.

Electricity consumption at the production facility is 100% covered by Guarantees of Origin. Thus, the specific electricity mix of electricity consumed in 2023 (through cancelled out GoO) has been modelled. Bitumen was modelled with the life cycle inventory data (excluding infrastructure) provided by the European Bitumen Association (Eurobitume, 2020). Bio-oil was modelled with product-specific LCA results in EPD format (indicators according to EN15804+A2). Amine additive used to enhance the mixture's adhesiveness was modelled using a proxy for volatile fatty acids (Santos et al, 2018).

In case if electricity consumption in module A3 represents more than 30% total energy across modules A1-A3, specific sources and their GWP-GHG need to be declared. Despite this not being the case in this study, the GWP-GHG of the electricity mix modelled was declared for transparency reasons.

Modelled electricity mix for 2023	GWP-GHG (gCO2eq per kWh)
Hydropower (57%), nuclear (29.5%), biomass (10%) and wind (3.5%)	15.8

Product life cycle

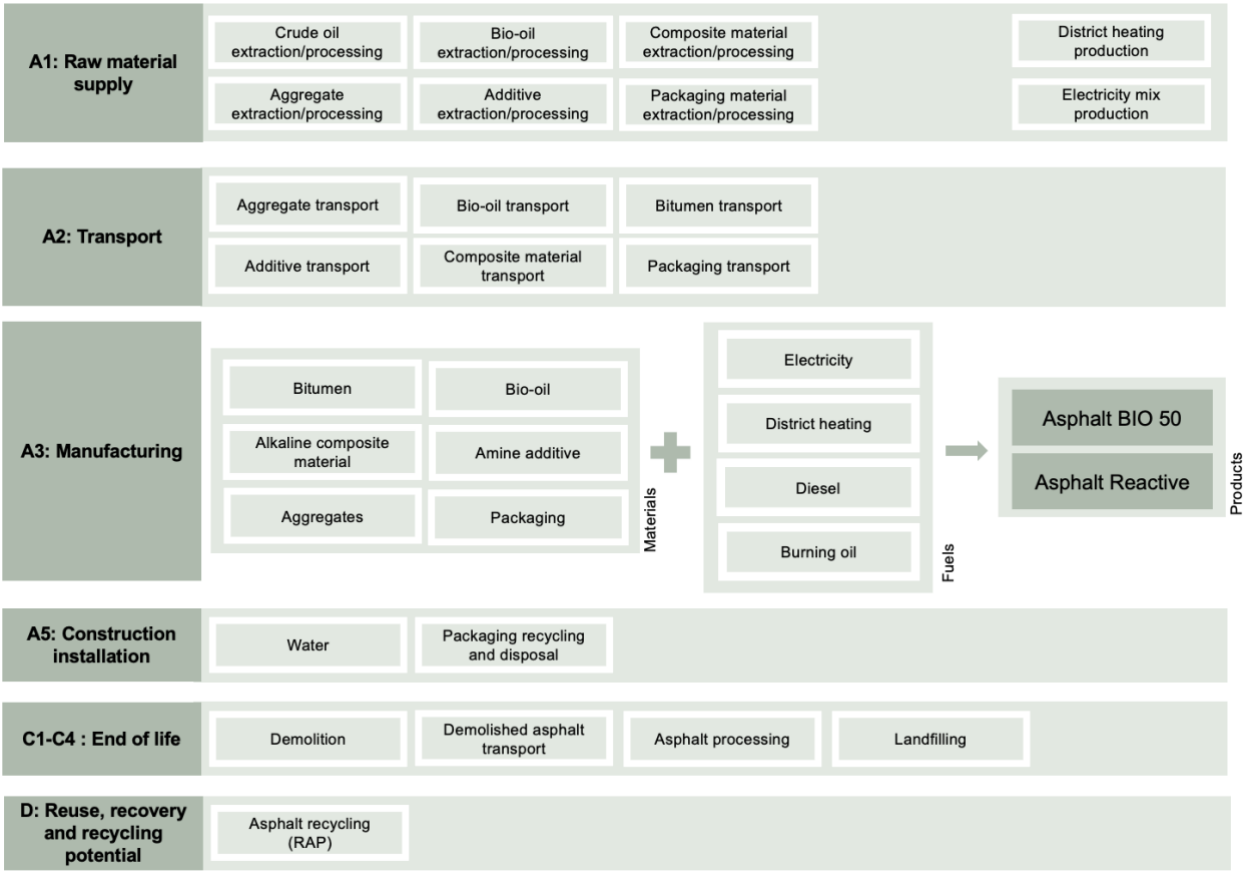
A1-A3 (Raw material extraction, transport, and manufacturing):
All major processes for extraction and manufacturing of the components used in the product and its packaging are considered in this aggregated module, including their transportation. There is no use of scrap or recycled materials in manufacturing of the product or packaging. The manufacturing process occurs no product losses. Product packaging is done semi-manually, electricity-run processes are included in the electricity consumption.

A5 (Installation):
This scenario-based module accounts for treatment and disposal of packaging at the point of utilization/installation. For paper-based packaging, virtual CO_2 emissions have been added to model biogenic carbon leaving the system. Additionally, water consumption for product installation has been model which can be used to speed up the curing process (1L water/10kg product).

C1-C4 (Product end-of-life):
These scenario-based modules assume asphalt demolition by cold-milling. Demolished asphalt is then transported to an asphalt production facility to be recycled. A conservative assumption has been made that 5% of the asphalt is taken to landfill due to unsuitability for recycling, thus additional transportation has been considered for the 5% of material. For bio-based product components, virtual CO_2 emissions have been added in C3 to model biogenic carbon leaving the system. Material processing for recycling is accounted in Module D to avoid double counting. In C4, landfilling of 50 kg of waste asphalt has been modelled. See table Scenario development for more information.

D (Benefits and burdens beyond the system boundary):
It is assumed that the recycled asphalt is crushed in Module D. Additionally, a conservative assumption has been made that the recycled asphalt as secondary raw material only replaces virgin aggregates, and not the asphalt mixture as-is due to the quality of material being affected by binder aging. This results in avoided production of 950 kg virgin aggregates.

System diagram:



Scenario development:

Module	Scenario	Assumptions
A5	Waste processing and disposal of packaging at installation	European market for waste polyethylene/polypropylene product; used to balance out biogenic carbon in packaging; water consumption for product installation at 1L water/10 kg product
C1	Demolition of asphalt with cold milling	Diesel fuel consumption at 0.2 L per 1000 kg asphalt[1]
C2	Transportation of demolished asphalt	Transportation to an asphalt production facility with a lorry (distance of 50 km for 1000 kg); transportation of asphalt unsuitable for recycling to a landfill with a lorry (distance of 100 km for 50 kg)
C3	Waste processing until the end-of-waste stage is reached	Used to balance out biogenic carbon present in the product
C4	Waste disposal of asphalt unsuitable for recycling	Landfilling of waste asphalt (50 kg)
D	Recycling of asphalt	Processing of recovered asphalt (crushing 950 kg material), resulting in avoided production of 950 kg virgin aggregates

[1] Aurangzeb et al., 2014; Pokkinen, 2012

Content declaration

The products do not contain any substances of very high concern (SVHC) according to REACH.

Product components of average composition	Weight, kg (min-max range)	Post-consumer material, weight-%	Biogenic material, weight-% and kg C/declared unit
Aggregates 0/8	893–925	0	0
Bitumen	28–29	0	0
Bio-oil	27–28	0	2.10 %; 21.0 kgC/DU
Alkaline composite material	17.7–49.7	0	0
Additive (amine)	0.3	0	0
TOTAL	**1000.0**	**0**	**2.10 %; 21.0 kgC/DU**
Packaging*	**Weight, kg (min-max range)**	**Weight-% (versus the product)**	**Weight biogenic carbon, kg C/declared unit**
Polypropylene buckets	11.0–15.1	1.23	0
Polyethylene bags	0.00-2.49	0.0782	0
Kraft paper sacks	0.00-2.21	0.152	0.598
Polyethylene liners for paper sacks	0.00-1.05	0.0723	0
TOTAL	**15.3**	**1.53**	**0.598**

*The content declaration of packaging materials has been calculated according to % production volumes of each individual product packaging material and size, scaled up to the declared unit. Asphalt BIO 50 is sold in PE-lined paper sacks and PPE buckets, whereas Asphalt Reactive is sold in PPE buckets and PE bags.

Results of the environmental performance indicators

Disclaimer: The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.

Core mandatory impact category indicators according to EN 15804

Indicator	Unit	A1-A3	A5	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq.	3.13E+01	2.71E+01	2.31E-01	8.54E+00	7.69E+01	7.53E-01	-7.65E+00
GWP-fossil	kg CO_2 eq.	1.08E+02	2.46E+01	2.31E-01	8.54E+00	0.00E+00	7.53E-01	-7.64E+00
GWP-biogenic	kg CO_2 eq.	-7.82E+01	2.45E+00	9.84E-06	3.22E-04	7.69E+01	1.69E-04	-5.52E-03
GWP-luluc	kg CO_2 eq.	1.41E+00	1.16E-04	7.88E-06	2.10E-04	0.00E+00	3.90E-05	-6.11E-03
ODP	kg CFC 11 eq.	3.04E-06	7.41E-09	3.60E-09	1.74E-07	0.00E+00	1.61E-08	-5.49E-08
AP	mol H^+ eq.	4.16E-01	4.52E-03	1.03E-03	2.13E-02	0.00E+00	3.15E-03	-4.26E-02
EP-freshwater	kg P eq.	2.21E-03	4.98E-06	2.16E-07	7.16E-06	0.00E+00	1.75E-06	-2.56E-04
EP-marine	kg N eq.	1.19E-01	2.87E-03	4.59E-04	8.15E-03	0.00E+00	1.47E-03	-1.09E-02
EP-terrestrial	mol N eq.	1.32E+00	2.23E-02	5.04E-03	8.92E-02	0.00E+00	1.42E-02	-1.19E-01
POCP	kg NMVOC eq.	5.30E-01	7.24E-03	1.63E-03	3.71E-02	0.00E+00	5.54E-03	-3.79E-02
ADP-minerals&metals*	kg Sb eq.	6.29E-05	1.92E-07	9.57E-09	2.82E-07	0.00E+00	2.11E-07	-8.57E-07
ADP-fossil*	MJ	2.19E+03	6.54E-01	3.23E-02	1.13E+00	0.00E+00	4.82E-01	-5.23E+01
WDP*	m^3	4.38E+01	3.73E+00	2.38E-03	4.79E-02	0.00E+00	-2.81E-01	-1.34E+01
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; 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; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption							

** Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.*

Additional mandatory impact category indicators

Indicator	Unit	A1-A3	A5	C1	C2	C3	C4	D
GWP-GHG[2]	kg CO_2 eq.	1.10E+02	2.56E+01	2.31E-01	8.54E+00	0.00E+00	7.53E-01	-7.65E+00
GWP-GHG variation from average for Asphalt Reactive	%	13.2	22.5	0.0	0.0	0.0	0.0	0.0
GWP-GHG variation from average for Asphalt BIO 50	%	-6.0	-10.3	0.0	0.0	0.0	0.0	0.0

Indicator	Unit	A1-A3	A5	C1	C2	C3	C4	D
Particulate matter	disease inc.	4.19E-06	3.34E-08	1.36E-08	5.61E-07	0.00E+00	7.54E-08	-6.60E-07
Ionising radiation**	kBq U-235 eq	2.80E+01	4.67E-03	2.69E-04	1.54E-02	0.00E+00	6.26E-03	-2.88E-01
Ecotoxicity-freshwater*	CTUe	5.54E+02	3.42E+01	2.08E-01	7.65E+00	0.00E+00	1.63E+00	-3.28E+01
Human toxicity, cancer*	CTUh	1.09E-07	3.27E-09	2.70E-10	1.28E-09	0.00E+00	1.04E-09	-2.46E-08
Human toxicity, non-cancer*	CTUh	1.11E-06	1.08E-07	7.82E-10	1.13E-07	0.00E+00	3.30E-09	-5.93E-08
Land use related impacts/soil quality*	Pt	1.73E+04	4.24E+00	6.39E-03	2.52E-01	0.00E+00	2.72E+01	-6.40E+01

*** Disclaimer: This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.*

Resource use indicators

Indicator	Unit	A1-A3	A5	C1	C2	C3	C4	D
PERE	MJ	1.70E+03	2.53E+01	6.64E-03	3.91E-01	0.00E+00	2.94E-01	-8.20E+00
PERM	MJ	6.83E+02	-2.52E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	2.39E+03	1.35E-01	6.64E-03	3.91E-01	0.00E+00	2.94E-01	-8.20E+00
PENRE	MJ	2.01E+03	6.03E+02	3.01E+00	1.13E+02	0.00E+00	1.11E+01	-9.47E+01
PENRM	MJ	1.74E+03	-5.98E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	3.75E+03	5.26E+00	3.01E+00	1.13E+02	0.00E+00	1.11E+01	-9.47E+01

[2] This indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such, the indicator is identical to GWP-total except that the CF for biogenic CO_2 is set to zero.

SM[3]	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	1.06E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ	2.80E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m^3	3.51E+01	1.98E-01	1.06E-02	1.81E-01	0.00E+00	1.05E+00	-2.35E+01
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh wate							

Waste indicators

Indicator	Unit	A1-A3	A5	C1	C2	C3	C4	D
Hazardous waste disposed	kg	1.02E-01	2.42E-01	2.25E-05	8.30E-04	0.00E+00	6.45E-02	-2.36E-03
Non-hazardous waste disposed	kg	4.65E+00	4.38E+00	8.61E-05	3.35E-03	0.00E+00	5.00E+01	-8.46E-02
Radioactive waste disposed	kg	4.07E-02	3.57E-06	1.54E-07	1.06E-05	0.00E+00	3.78E-06	-1.78E-04

Output flow indicators

Indicator	Unit	A1-A3	A5	C1	C2	C3	C4	D
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Material for recycling	kg	0.00E+00	0.00E+0[4]	0.00E+00	0.00E+00	9.50E+02	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+0[5]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electricity	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, thermal	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

[3] Due to uncertainty in calculations, values were left as 0.
[4] Value could be higher than 0 in case of recycling of plastic packaging, however, due to uncertainties in the calculations, value was kept as 0.
[5] Value could be higher than 0 in case of incineration of plastic packaging with energy retrieval, however, due to uncertainties in the calculations, value was kept as 0.

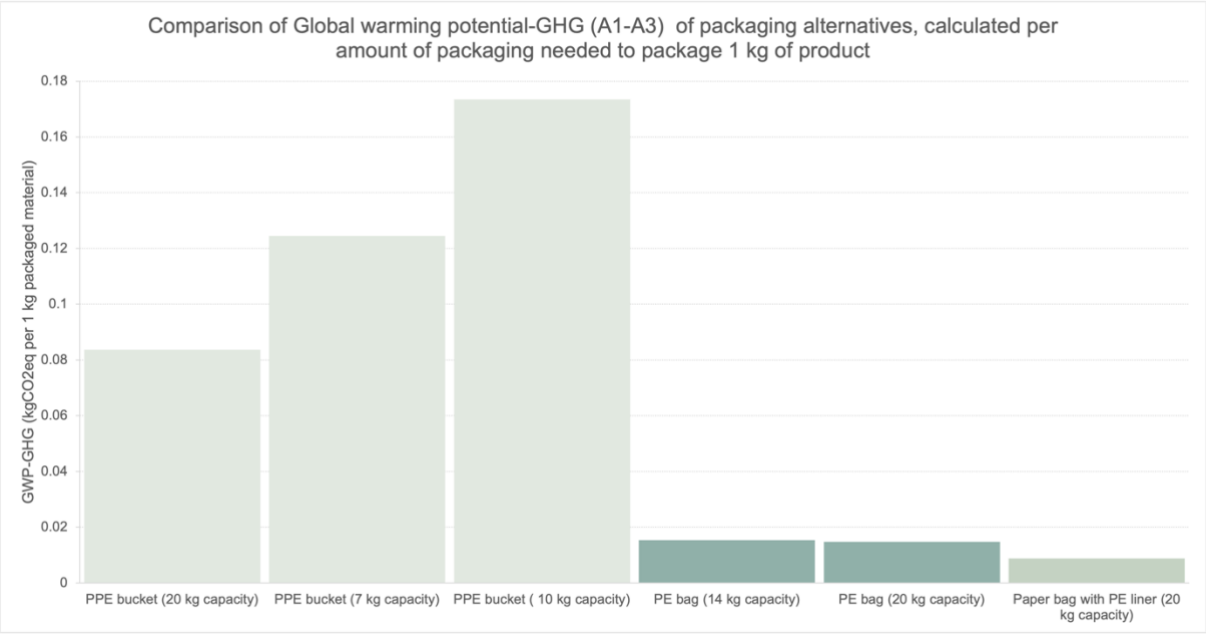
Additional information

Variation in core impact categories between Asphalt BIO 50 and Asphalt Reactive:

Variation in environmental impacts from core impact categories for the two products covered by this EPD has been calculated over the product's life cycle (A1-C4). The values show difference in Asphalt BIO 50 as compared to Asphalt Reactive, meaning that Asphalt BIO 50 has 18.9% lower impact in GWP-fossil category than Asphalt Reactive. The differences stem mainly from product packaging – particularly in category GWP-biogenic Asphalt BIO 50 has a higher impact due to packaging with biogenic carbon present. BIO 50 is packaged in paper sacks, which is not the case for Asphalt Reactive, thus large variability occurs due to material extraction and waste processing.

Core impact category	Percentage variation in agglomerated results A1-C4 (BIO 50 vs. Asphalt Reactive)
GWP-fossil	-18.9
GWP-biogenic	+1066.9
GWP-luluc	+2.04
GWP-total	-17.9
ODP	-19.3
AP	-11.0
EP-freshwater	-11.1
EP-marine	-7.63
EP-terrestrial	-8.51
POCP	-14.4
ADP-minerals&metals	-4.52
ADP-fossil*	-5.11
WDP	-16.3

Comparison of GWP-GHG of packaging alternatives:



Packaging alternative	Weight of packaging per 1 kg of packaged product, in grams	GWP-GHG in A1-A3, In kg CO2eq per kg of packaged product
PPE bucket (20 kg capacity)	25.5	0.084
PPE bucket (10 kg capacity)	53.9	0.173
PPE bucket (7kg capacity)	38.7	0.125
PE bag (20 kg capacity)	5.5	0.015
PE bag (14 kg capacity)	5.7	0.015
Paper sacks with PE liner (20 kg capacity)	5.7	0.009

References

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