ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH EN 15804+A2 & ISO 14025

AC 12.5 RC and Other Bituminous Mixtures for Road Construction – Koropi Plant - Athens Greece
ELLINIKI TECHNIKI A.T.E.V.E.

EPD HUB, HUB-5631

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Life Cycle Assessment study has been performed in accordance with the requirements of EN 15804, EPD Hub PCR version 1.2 (24 Mar 2025) and JRC characterization factors EF 3.1.

Created with One Click LCA

GENERAL INFORMATION

MANUFACTURER

Manufacturer	ELLINIKI TECHNIKI A.T.E.V.E.
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Website	www.elltech.gr/

EPD STANDARDS, SCOPE AND VERIFICATION

Program operator	EPD Hub, hub@epdhub.com
Reference standard	EN 15804:2012+A2:2019/AC:2021 and ISO 14025
PCR	EPD Hub Core PCR Version 1.2, 24 Mar 2025
Sector	Construction product
Category of EPD	Third party verified EPD
Parent EPD number	-
Scope of the EPD	Cradle to gate with options, A4, and modules C1-C4, D
EPD author	Harry Kantarelis -KX Consulting Engineers- www.kxconsulting.com
EPD verification	Independent verification of this EPD and data, according to ISO 14025: ☐ Internal verification ☐ External verification
EPD verifier	Imane Uald Lamkaddam as an authorized verifier for EPD Hub

This EPD is intended for business-to-business and/or business-to-consumer communication. The manufacturer has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programs may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804 and if they are not compared in a building context.

PRODUCT

Product name	AC 12.5 RC and Other Bituminous Mixtures for Road Construction – Koropi Plant - Athens Greece
Additional labels	AC 10, AC 12.5, AC 12.5 RAP, AC 31.5, AC 31.5 RC, AC 31.5 RAP, AC 20, AC 12.5 Skid Resistance I, AC 12.5 Skid Resistance I (50/70 Add.)
Product reference	-
Place(s) of raw material origin	Greece
Place of production	Koropi - Athens Greece
Place(s) of installation and use	Road and pavement construction, primarily in Greece
Period for data	1/1/2024 - 31/12/2024
Averaging in EPD	Multiple products
Variation in GWP-fossil for A1-A3 (%)	-10,21% / +45,11%
A1-A3 Specific data (%)	58,1

ENVIRONMENTAL DATA SUMMARY

Declared unit	1 tonne of hot mix asphalt (HMA)
Declared unit mass	1000 kg
Mass of packaging	0 kg
GWP-fossil, A1-A3 (kgCO_2e)	30,6
GWP-total, A1-A3 (kgCO_2e)	30,7
Secondary material, inputs (%)	0
Secondary material, outputs (%)	66
Total energy use, A1-A3 (kWh)	117
Net freshwater use, A1-A3 (m^3)	0,09

PRODUCT AND MANUFACTURER

ABOUT THE MANUFACTURER

Elliniki Techniki A.T.E.V.E. is a Greek civil engineering and construction company founded in 1984, with long-standing activity in both public and private sector projects across Greece.

The company operates a fully licensed asphalt production facility in the Industrial Area of Koropi, Attica, with a daily production capacity of approximately 1,000 tonnes. The plant occupies a privately owned 20,000 m² site and is equipped with modern technology for the production of asphalt mixtures and aggregates. All asphalt mixtures produced by the company are CE-marked in accordance with the applicable European construction products regulations.

The production facility also includes an authorised C&D waste (AEKK) recovery and recycling unit, enabling the use of recycled aggregates and RAP in asphalt mix production, in line with circular economy principles and national waste management requirements.

Elliniki Techniki A.T.E.V.E. maintains an integrated management system certified to a broad range of international standards, including ISO 9001 (quality), ISO 14001 (environment), ISO 45001 (occupational health and safety), ISO 50001 (energy management), ISO 39001 (road traffic safety), ISO 37001 (anti-bribery), ISO 22301 (business continuity), ISO 27001 (information security) and ISO 30415 (diversity & inclusion). The company also implements a Social Accountability Management System aligned with SA 8000.

Through its modern facilities, certified systems and integrated AEKK recycling operations, **Elliniki Techniki A.T.E.V.E.** ensures reliable production of high-quality asphalt mixtures with enhanced resource efficiency.

PRODUCT DESCRIPTION

The declared product is a group of hot mix asphalt (HMA) mixtures intended for road construction and pavement works, including base courses, binder courses and wearing courses. The mixes are produced at the Koropi asphalt plant in Attica and are supplied in bulk for direct paving.
Hot mix asphalt is a composite material made mainly of mineral aggregates and asphalt bitumen. For the mixtures covered by this EPD, the Koropi plant uses:

- Natural aggregates from local quarries (sand, fine and coarse aggregates, anti skid aggregates and mineral filler), forming the structural skeleton of the pavement.
- Asphalt bitumen 50/70 as the primary binder, selected according to project specifications and performance requirements.
- Recycled aggregates and RAP (reclaimed asphalt pavement) delivered from a CE marked C&DW (AEKK) facility located next to the asphalt plant.

The product group includes distinct mix types based on specific mix designs: conventional mixes (no suffix) are produced with natural aggregates from quarries, RC mixes are produced with recycled aggregates, and RAP mixes incorporate RAP according to the approved mix design.

No bio based materials are used in the mixtures or the manufacturing process, and biogenic carbon flows are therefore not relevant for this product group.

Manufacturing process

The hot mix asphalt is produced in a temperature controlled industrial process with the following main steps:

1. Receiving and storage of aggregates – Natural and recycled aggregates are delivered to the plant and stored in dedicated on site stockpiles according to size fraction and origin.
2. Drying and heating – Aggregates are dosed from cold feed hoppers into a dryer drum, where moisture is removed and the material is heated using fuel combustion to the required production temperature.
3. Screening and hot storage – Dried aggregates are screened into defined fractions and stored in hot bins above the mixer.
4. Dosing of constituents – Aggregates, recycled aggregates and RAP are proportioned according to the asphalt mix design. Bitumen, stored in thermostatically controlled tanks, is accurately weighed and fed into the mixer.
5. Mixing – All components are mixed to obtain a homogeneous asphalt mixture with the specified grading, binder content and workability.
6. Loading and dispatch – The finished mixture is discharged into insulated trucks and transported in bulk to the construction site; no packaging materials are used.

Product range covered by the EPD

This EPD covers ten hot mix asphalt types produced at the Koropi Plant – Athens, Greece:

• AC 10
• AC 12.5
• AC 12.5 RC
• AC 12.5 RAP
• AC 20
• AC 31.5
• AC 31.5 RC
• AC 31.5 RAP
• AC 12.5 Skid Resistance I
• AC 12.5 Skid Resistance I (50/70 Add.)

AC 12.5 RC is used as the representative product for this group. The declared A1–A3 results in the main LCA tables correspond to this mix, with a GWP fossil of 30,57 kg CO_2e per declared unit. All mixtures are manufactured with similar raw materials and process conditions; differences in impacts arise mainly from variations in mix design (aggregate grading, RAP and recycled aggregate content, binder content and skid resistance additives).

For modules A1–A3, the variation in GWP fossil of the other mixes relative to the representative mix is as follows (rounded to the nearest percentage point):

• AC 10: +15,60 % (35,34 kg CO_2e/DU)
• AC 12.5: +15,64 % (35,35 kg CO_2e/DU)
• AC 12.5 RC: 0 % (30,57 kg CO_2e/DU) - Representative
• AC 12.5 RAP: +12,33 % (34,34 kg CO_2e/DU)
• AC 20: +13,08 % (34,57 kg CO_2e/DU)
• AC 31.5: +10,44% (33,76 kg CO_2e/DU)
• AC 31.5 RC: -10,21 % (27,45 kg CO_2e/DU) – Best Case Mix
• AC 31.5 RAP: +4,97 % (32,09 kg CO_2e/DU)
• AC 12.5 Skid Resistance I: +42,95 % (43,70 kg CO_2e/DU)
• AC 12.5 Skid Resistance I (50/70 Add.): +45,11 % (44,36 kg CO_2e/DU) – Worst Case Mix

Consequently, the variation in GWP fossil (A1–A3) for the product group, when expressed relative to the representative mix AC 12.5 RC, is −10,21 % / +45,11 % between the best case and worst case mixtures. All assessed products fall within the ±50% variation limit as specified by EN 15804+A2 and EPD Hub General Programme Instructions that cover multiple products using a representative product approach.

Substances of very high concern (REACH)

The product does not contain any substances of very high concern (SVHC) listed in accordance with REACH in concentrations above 0.1 % by weight of the product.

Further information can be found at:
www.elltech.gr/

PRODUCT RAW MATERIAL MAIN COMPOSITION

Raw material category	Amount, mass %	Material origin
Metals	-	-
Minerals	95,61	Greece
Fossil materials	4,39	Greece
Bio-based materials	-	-

BIOGENIC CARBON CONTENT

Product's biogenic carbon content at the factory gate

Biogenic carbon content in product, kg C	-
Biogenic carbon content in packaging, kg C	-

FUNCTIONAL UNIT AND SERVICE LIFE

Declared unit	1 tonne of hot mix asphalt (HMA)
Mass per declared unit	1000 kg
Functional unit	-
Reference service life	-

SUBSTANCES, REACH - VERY HIGH CONCERN

The product does not contain any REACH SVHC substances in amounts greater than 0,1 % (1000 ppm).

PRODUCT LIFE-CYCLE

SYSTEM BOUNDARY

This EPD covers the life-cycle modules listed in the following table.

Product stage			Assembly stage		Use stage							End of life stage				Beyond the system boundaries		
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D		
x	x	x	x	ND	ND	ND	ND	ND	ND	ND	ND	x	x	x	x	x		
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction/ demolition	Transport	Waste processing	Disposal	Reuse	Recovery	Recycling

Not declared = ND.

MANUFACTURING AND PACKAGING (A1-A3)

The environmental impacts considered for the product stage cover the manufacturing of raw materials used in the production as well as packaging materials and other ancillary materials. Also, fuels used by machines, and handling of waste formed in the production processes at the manufacturing facilities are included in this stage. The study also considers the material losses occurring during the manufacturing processes as well as losses during electricity transmission.

A market-based approach is used in modelling the electricity mix utilized in the factory.

For this EPD, the product stage (A1–A3) includes the upstream supply of virgin and recycled raw materials, their transport to the Koropi asphalt plant and the manufacturing processes at the plant. Site specific annual data for energy and fuel consumption, raw material use and waste generation from the Koropi facility have been combined with generic background data from established LCA databases in line with EN 15804+A2 and the EPD Hub General Programme Instructions and Core PCR.

Module A1 – Raw material supply covers the extraction and processing of natural aggregates from quarries (sand, fine and coarse gravel, crushed stone and anti skid aggregates), the production of asphalt bitumen 50/70, as well as the treatment of CE marked recycled aggregates and reclaimed asphalt pavement (RAP) at the neighboring Construction and Demolition waste treatment plant. All energy use, auxiliary materials and waste handling in these upstream processes are included.

Module A2 – Transport includes road transport of all raw materials and recycled inputs (virgin aggregates, recycled aggregates, RAP and bitumen) from suppliers to the Koropi asphalt plant using appropriate truck types and average transport distances representative of typical supply routes. Fuel production and exhaust emissions from transport vehicles, as well as the related infrastructure burdens, are accounted for in this stage.

Module A3 – Manufacturing represents the hot mix asphalt production at the Koropi plant and includes all on site energy use, fuels, ancillary materials and waste management. The main steps of the process are:
1.Reception and storage of materials: Virgin aggregates from quarries and recycled aggregates and RAP from the adjacent Construction and Demolition waste treatment facility are received and stored in separate on site stockpiles or silos according to size fraction and material type.
2.Feeding, drying and heating: For each asphalt recipe, the required aggregate fractions (including recycled aggregates and RAP where applicable) are fed from the stockpiles into cold feed hoppers and conveyed to a rotating dryer, where moisture is removed and the material is heated to the target production temperature.
3.Screening and hot storage: The heated aggregates are lifted to a screening unit, separated into defined size fractions and stored in hot bins above the mixer.
4.Bitumen storage and dosing: Asphalt bitumen 50/70 is stored in insulated, temperature controlled tanks and pumped to the mixer. The binder is weighed and added according to the mix design; where specified, additives for skid resistance mixtures are dosed in parallel.
5.Mixing: Hot aggregates, recycled materials (recycled aggregates and/or RAP) and bitumen are combined in a pugmill mixer to produce a homogeneous hot mix asphalt with the required grading and binder content.
6.Loading and dispatch: The finished hot mix asphalt is discharged into insulated tipper trucks and delivered in bulk to road construction sites.

Packaging: The asphalt mixtures are supplied in bulk without product packaging. Any minor packaging associated with ancillary materials (such as additive containers or wrapping used upstream) is included in the life cycle inventory but does not accompany the declared product to the construction site.
The use of green energy in manufacturing is demonstrated through contractual instruments (GOs, RECs, etc.), and its use is ensured throughout the validity period of this EPD.

TRANSPORT AND INSTALLATION (A4-A5)

Transportation impacts occurred from final products delivery to construction site (A4) cover fuel direct exhaust emissions, environmental impacts of fuel production, as well as related infrastructure emissions.

The construction stage includes the transport of the hot mix asphalt from the Koropi plant to the construction site (module A4). Installation on site (module A5) is outside the scope of this EPD and is therefore not declared (MND), in line with EN 15804+A2 and the EPD Hub Core PCR, which allow A4–A5 to be modelled as optional scenarios.

A4 – Transport to the construction site

The asphalt mixtures are delivered in bulk by road directly from the Koropi asphalt plant to road construction and maintenance sites. The A4 scenario includes direct exhaust emissions from fuel combustion in the trucks, upstream impacts from fuel production and distribution, and the infrastructure burdens associated with road freight transport, as represented in the underlying LCA database.

For this EPD, the following generic assumptions are applied for module A4:

Transport mode: road freight transport by diesel-powered tipper trucks compliant with current European emission standards (EURO 5), with a typical payload capacity of 16–32 tonnes per trip.

Average transport distance: an average one-way distance of 15.55 km from the Koropi asphalt plant to typical construction sites in the Athens/Attica area is used in the LCA model. This distance reflects the typical delivery range for projects supplied from the Koropi plant.

Load factor and return trips: a full truckload is assumed for deliveries from the plant to the site. Return trips are assumed to be logistically allocated to other transports and are therefore not specifically assigned to this product system; this corresponds to an average capacity utilisation consistent with standard freight transport datasets.

Product handling and losses: the hot mix asphalt is loaded into insulated truck bodies at the plant and unloaded directly into the paver hopper at the site. Due to controlled loading and unloading and the bulk nature of the product, material losses during transport are considered negligible.

Packaging: the product is delivered without packaging; no additional packaging materials are associated with module A4.

The A4 results reported in the LCA tables reflect the above scenario and are representative of typical deliveries for projects supplied from the Koropi plant.

A5 – Installation in road works (module not declared)

Module A5 covers on-site installation activities such as operation of pavers and rollers, any temporary storage or reheating of the asphalt mixture, on-site fuel consumption, and any waste or losses occurring during paving. These processes are strongly project-specific and depend on site conditions, paving equipment, construction scheduling and the final pavement design.

In this EPD, module A5 is not modelled and is declared as “ND – Module not declared. Impacts related to the installation phase (e.g. diesel use for paving machinery, site works, construction crew transport, and site-specific waste management) are therefore excluded from the quantified results and should be assessed at the project or building/road level where required by the applicable assessment method.

PRODUCT USE AND MAINTENANCE (B1-B7)

This EPD does not declare modules B1–B7.
Air, soil, and water impacts during the use phase have not been studied.

PRODUCT END OF LIFE (C1-C4, D)

The end-of-life stage describes the fate of the asphalt pavement after its service life, including deconstruction, transport, processing, final disposal and the potential benefits from re-use and recycling of reclaimed asphalt. The scenario is consistent with typical practice for road pavements in Europe and follows the same approach as applied in the Elliniki Techniki S.A. Koropi asphalt EPD.

C1 – Deconstruction / demolition
At the end of its useful life, the asphalt layer produced with the declared mixtures is removed from the pavement by cold milling. The milling process is assumed to be fully mechanised and to collect the asphalt as reclaimed material (reclaimed asphalt, RA) without significant losses.

Deconstruction method: cold milling of the asphalt layer using standard road milling machines.

Collection rate: 100% of the asphalt is collected separately as construction waste (site-won asphalt). No mass loss is assumed, so the end-of-life mass corresponds to 1 tonne per declared unit.

Energy use: the average energy consumption of the milling process is modelled as diesel use of approximately 0.2 litres per tonne of asphalt milled. This fuel use and the associated exhaust emissions are included in module C1.

C2 – Transport to waste processing
After milling, the reclaimed asphalt is transported from the road work site to facilities where it is processed for re-use, recycling or disposal.

Transport mode: road transport by EURO 5–compliant tipper or bulk trucks with a payload capacity of more than 32 metric tonnes.

Average distance: an average one-way transport distance of 50 km between the pavement site and the processing / disposal facilities is assumed, in line with the scenario used for the Koropi plant.

Modelling: module C2 includes direct diesel combustion emissions in the trucks, upstream fuel production and distribution, and the related transport infrastructure burdens as represented in the background LCA datasets.

C3 – Waste processing
In the waste processing stage, the recovered asphalt is sorted and treated for different end-of-life routes: re-use in new asphalt, recycling in road base or civil engineering applications, and disposal. The assumed split between these routes reflects European statistics for reclaimed asphalt usage. Based on data reported by the European Asphalt Pavement Association (Asphalt in Figures 2022), the following distribution is applied:

- 10.7% recycled,
- 55.0% re-used, and
- 34.3% landfilled.

Re-use:
Reclaimed asphalt destined for re-use is processed to meet quality requirements for incorporation into new asphalt mixtures. This includes crushing, screening and, where necessary, the addition of rejuvenators to restore binder properties. These processing steps, including energy and ancillary material use, are modelled in module C3. The processed RA is assumed to retain functional properties equivalent to conventional aggregates and binder when used in new hot mix asphalt.
Recycling:

Reclaimed asphalt used for recycling is treated (crushing and screening) and applied in unbound or hydraulically bound layers such as road base, sub-base or fill material, where the original binder performance is not fully exploited. The environmental burdens of this processing are also included in C3.

C4 – Final disposal
A share of the reclaimed asphalt is not recovered and is instead sent to landfill.

Landfill share: 34.3% of the asphalt is assumed to be disposed of in controlled landfills.

Modelling: module C4 includes the emissions and resource use associated with landfilling operations, such as landfill operation energy, leachate and gas management, and the occupation of landfill space, as represented in the background LCA data.

D – Benefits and loads beyond the system boundary
The re-use and recycling of reclaimed asphalt (RA) generate benefits for future product systems, which are reported in module D in accordance with EN 15804+A2 and the EPD Hub Core PCR.
The following potential benefits are considered:

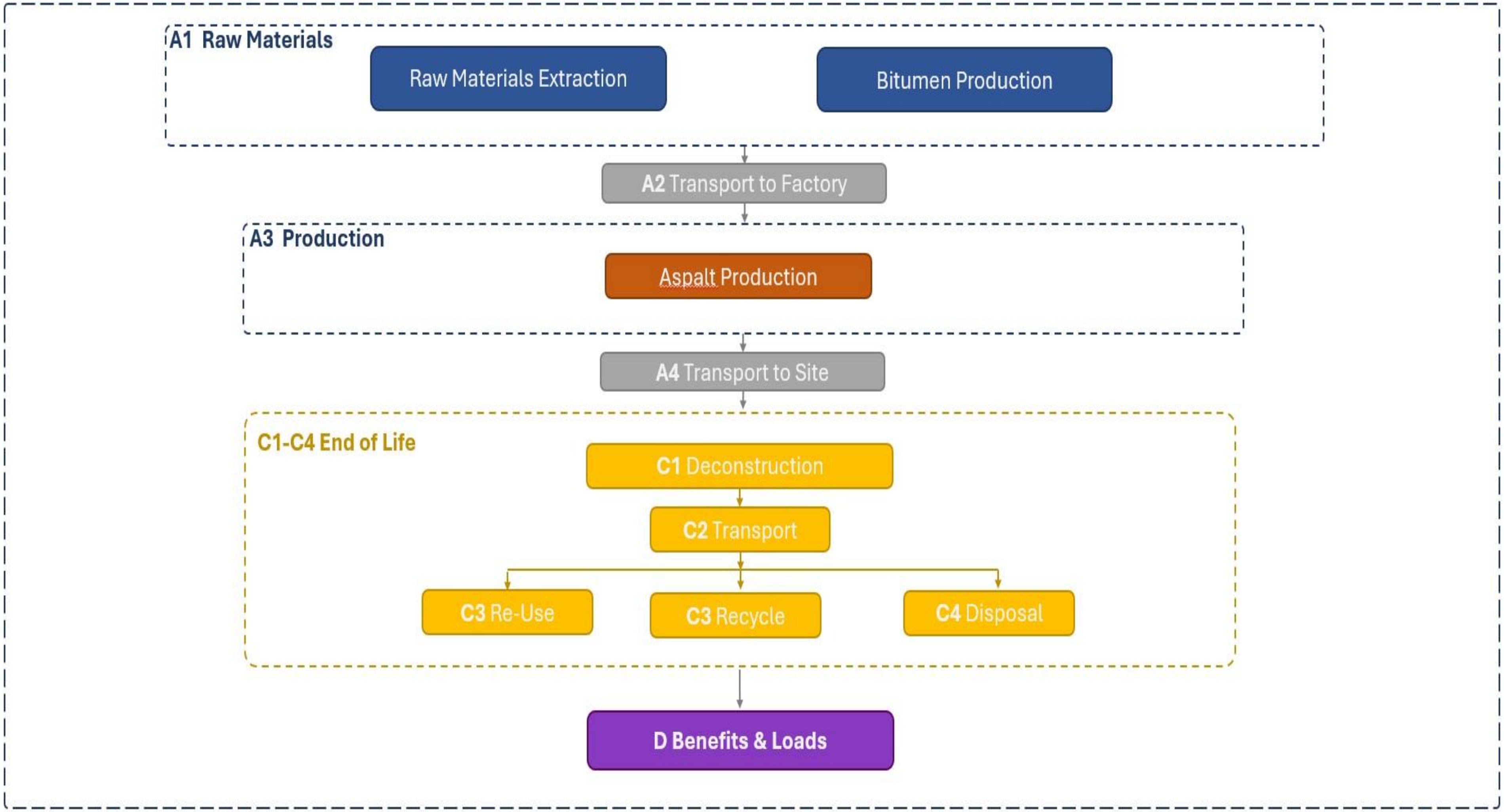
Avoided production of virgin aggregates and bitumen: RA that is re-used in new asphalt mixtures substitutes a corresponding quantity of virgin aggregates and a share of paving grade bitumen. The extraction, processing and transport burdens of these avoided virgin materials are credited in module D.

Avoided impacts from alternative base materials: RA recycled into unbound or bound layers replaces other construction materials (e.g. natural aggregates) that would otherwise be used for road base, sub-base or fill, generating additional avoided burdens.

Reduced landfill requirements: diverting RA from landfill decreases final disposal volumes and associated environmental impacts; this reduction is reflected as an additional benefit.

Module D thus reports the net benefits (credits) and remaining loads associated with these recovered materials after they have reached the end-of-waste state and are used in subsequent product systems. The calculation follows the polluter-pays and modularity principles laid down in EN 15804+A2 and the EPD Hub General Programme Instructions, with system boundaries, allocation and end-of-waste criteria applied as specified in the Core PCR and GPI.

MANUFACTURING PROCESS



LIFE-CYCLE ASSESSMENT

CUT-OFF CRITERIA

The study does not exclude any modules or processes which are stated mandatory in the reference standard and the applied PCR. The study does not exclude any hazardous materials or substances. The study includes all major raw material and energy consumption. All inputs and outputs of the unit processes, for which data is available for, are included in the calculation. There is no neglected unit process more than 1% of total mass or energy flows. The module specific total neglected input and output flows also do not exceed 5% of energy usage or mass.

The production of capital equipment, construction activities, and infrastructure, maintenance and operation of capital equipment, personnel-related activities, energy and water use related to company management and sales activities are excluded.

Processes related to construction and maintenance of capital goods (asphalt plant, quarry machinery, buildings and laboratory equipment), general administration and office activities (heating, cooling, lighting, IT equipment) and employee commuting are excluded from the system boundaries.
In addition, auxiliary materials and consumables used in very small quantities in the plant (e.g. lubricants, cleaning agents, laboratory chemicals) are excluded.
All excluded flows are estimated to contribute less than 1 % of the total mass and primary energy use in each information module and in total less than 5 % of the environmental impacts, in line with the cut-off criteria of EN 15804:2012+A2:2019/AC2021 and the EPD Hub Core PCR v1.2.

VALIDATION OF DATA

Data collection for production, transport, and packaging was conducted using time and site-specific information, as defined in the general information section on page 1 and 2. Upstream process calculations rely on generic data as defined in the Bibliography section. Manufacturer-provided specific and generic data were used for the product's manufacturing stage. The analysis was performed in One Click LCA EPD Generator, with the 'Cut-Off, EN 15804+A2' allocation method, and characterization factors according to EN 15804:2012+A2:2019/AC:2021 and JRC EF 3.1.

ALLOCATION, ESTIMATES AND ASSUMPTIONS

Allocation is required if some material, energy, and waste data cannot be measured separately for the product under investigation. All allocations are done as per the reference standards and the applied PCR. In this study, allocation has been done in the following ways:

Data type	Allocation
Raw materials	No allocation
Packaging material	Not applicable
Ancillary materials	Allocated by mass or volume
Manufacturing energy and waste	Allocated by mass or volume

The LCA follows the "cut-off by classification approach as applied in the EPD Hub Core PCR and General Programme Instructions. The declared unit is 1 tonne of hot mix asphalt at the plant gate, with a cradle-to-gate system boundary (modules A1–A3).

Primary data on fuel and electricity consumption, raw material inputs and internal recycling were collected at the Koropi asphalt plant for a representative 12-month production period. Energy and material consumption in A3 are allocated to the asphalt mixtures based on annual production volumes for each recipe.

All ten asphalt mixtures covered by this group EPD are produced in the same plant using the same manufacturing process. Upstream processes for aggregates, bitumen, recycled aggregates and RAP, fuels and electricity are modelled with pre-verified generic background datasets provided in the EPD Hub asphalt EPD generator, representative for European/Greek conditions.

PRODUCT & MANUFACTURING SITES GROUPING

Type of grouping	Multiple products
Grouping method	Based on a representative product
Variation in GWP-fossil for A1-A3, %	-10,21% / +45,11%

This EPD is a grouped declaration for ten asphalt concrete (AC) mixtures for road construction produced at a single asphalt mixing plant located in Koropi, Attica, Greece, operated by Elliniki Techniki S.A.. All mixtures are manufactured with the same batch mixing process, fuel and electricity supply, and quality control system, and are intended for use in road pavements with comparable technical performance. The mixes differ only in aggregate grading, the share of reclaimed asphalt pavement (RAP) and recycled aggregates, and the binder type/content (50/70 paving grade bitumen).

AC 12.5 RC is used as the representative product, as it accounts for the highest production volume at the Koropi plant during the reference year and uses the same raw material supply and manufacturing process as the other mixtures. The product group comprises ten AC mixtures produced at this plant (AC 10, AC 12.5, AC 12.5 RC, AC 12.5 RAP, AC 31.5, AC 31.5 RC, AC 31.5 RAP, AC 20, AC 12.5 Skid Resistance I, AC 12.5 Skid Resistance I (50/70 Add.)).

For modules A1–A3, the GWP-fossil results of the individual mixes vary between −10,21% (best case) and +45,11% (worst case) compared to the representative AC 12.5 RC mix; all variants remain within the ±50% variation limit for grouped EPDs defined in the EPD Hub GPI Annex I.

LCA SOFTWARE AND BIBLIOGRAPHY

This EPD has been created using One Click LCA EPD Generator for EPD Hub V3 and EPD Process Certification v3.2.4. The LCA and EPD have been prepared according to the reference standards and ISO 14040/14044. The EPD Generator uses Ecoinvent v3.10.1/3.11/3.12 and One Click LCA databases as sources of environmental data. Allocation used in Ecoinvent 3.10.1/3.11/3.12 environmental data sources follow the methodology ‘allocation, Cut-off, EN 15804+A2‘.

ENVIRONMENTAL IMPACT DATA

The estimated impact results are only relative statements which do not indicate the end points of the impact categories, exceeding threshold values, safety margins or risks.

CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, EF 3.1

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP – total[1]	kg CO_2e	1,26E+01	2,74E-01	1,78E+01	3,07E+01	3,01E+00	ND	ND	ND	ND	ND	ND	ND	ND	4,71E+00	5,39E+00	0,00E+00	5,92E+00	-2,44E+01
GWP – fossil	kg CO_2e	1,25E+01	2,74E-01	1,78E+01	3,06E+01	3,01E+00	ND	ND	ND	ND	ND	ND	ND	ND	4,71E+00	5,38E+00	0,00E+00	5,94E+00	-2,43E+01
GWP – biogenic	kg CO_2e	9,86E-02	5,76E-05	5,78E-03	1,04E-01	5,96E-04	ND	ND	ND	ND	ND	ND	ND	ND	4,80E-04	1,22E-03	0,00E+00	-2,15E-02	0,00E+00
GWP – LULUC	kg CO_2e	1,88E-03	1,03E-04	1,11E-03	3,09E-03	1,06E-03	ND	ND	ND	ND	ND	ND	ND	ND	4,82E-04	2,41E-03	0,00E+00	2,83E-03	-8,04E-03
Ozone depletion pot.	kg CFC-$_{11}$e	2,04E-06	5,50E-09	3,06E-06	5,10E-06	5,98E-08	ND	ND	ND	ND	ND	ND	ND	ND	7,21E-08	7,95E-08	0,00E+00	1,01E-07	-1,74E-06
Acidification potential	mol H^+e	3,14E-01	8,83E-04	1,21E-01	4,36E-01	9,40E-03	ND	ND	ND	ND	ND	ND	ND	ND	4,25E-02	1,84E-02	0,00E+00	2,87E-02	-9,39E-02
EP-freshwater[2]	kg Pe	1,83E-04	1,84E-05	2,12E-03	2,32E-03	1,99E-04	ND	ND	ND	ND	ND	ND	ND	ND	1,36E-04	4,19E-04	0,00E+00	4,25E-04	-2,24E-03
EP-marine	kg Ne	6,12E-02	3,00E-04	2,08E-02	8,23E-02	3,17E-03	ND	ND	ND	ND	ND	ND	ND	ND	1,97E-02	6,03E-03	0,00E+00	4,11E-02	-1,68E-02
EP-terrestrial	mol Ne	6,74E-01	3,26E-03	2,16E-01	8,93E-01	3,45E-02	ND	ND	ND	ND	ND	ND	ND	ND	2,16E-01	6,56E-02	0,00E+00	1,13E-01	-1,84E-01
POCP ("smog")[3]	kg NMVOCe	2,05E-01	1,44E-03	6,68E-02	2,73E-01	1,47E-02	ND	ND	ND	ND	ND	ND	ND	ND	6,43E-02	2,70E-02	0,00E+00	3,94E-02	-2,26E-01
ADP-minerals & metals[4]	kg Sbe	9,69E-06	7,55E-07	1,30E-05	2,34E-05	9,84E-06	ND	ND	ND	ND	ND	ND	ND	ND	1,69E-06	1,50E-05	0,00E+00	9,12E-06	-4,68E-05
ADP-fossil resources	MJ	1,68E+02	3,96E+00	2,37E+02	4,09E+02	4,22E+01	ND	ND	ND	ND	ND	ND	ND	ND	6,16E+01	7,81E+01	0,00E+00	8,65E+01	-1,15E+03
Water use[5]	m^3e depr.	3,10E+00	2,03E-02	5,13E+01	5,44E+01	2,07E-01	ND	ND	ND	ND	ND	ND	ND	ND	1,54E-01	3,86E-01	0,00E+00	5,44E-01	-7,07E+00

1) GWP = Global Warming Potential; 2) EP = Eutrophication potential. Required characterisation method and data are in kg P-eq. Multiply by 3,07 to get PO4e; 3) POCP = Photochemical ozone formation; 4) ADP = Abiotic depletion potential; 5) EN 15804+A2 disclaimer for Abiotic depletion and Water use and optional indicators except Particulate matter and Ionizing radiation, human health. The results of these environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

ADDITIONAL (OPTIONAL) ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, EF 3.1

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Particulate matter	Incidence	2,31E-06	2,72E-08	1,32E-06	3,66E-06	2,36E-07	ND	ND	ND	ND	ND	ND	ND	ND	1,21E-06	5,39E-07	0,00E+00	6,23E-07	-9,80E-07
Ionizing radiation[6)]	kBq U235e	1,08E+00	4,78E-03	7,73E-01	1,86E+00	5,39E-02	ND	ND	ND	ND	ND	ND	ND	ND	2,73E-02	6,80E-02	0,00E+00	8,76E-02	-7,77E-01
Ecotoxicity (freshwater)	CTUe	1,04E+02	4,67E-01	8,85E+01	1,93E+02	5,55E+00	ND	ND	ND	ND	ND	ND	ND	ND	3,39E+00	1,10E+01	0,00E+00	1,15E+01	-4,52E+01
Human toxicity, cancer	CTUh	2,72E-09	4,50E-11	4,29E-09	7,05E-09	5,13E-10	ND	ND	ND	ND	ND	ND	ND	ND	4,84E-10	8,88E-10	0,00E+00	9,06E-10	-4,46E-09
Human tox. non-cancer	CTUh	9,17E-08	2,57E-09	8,62E-08	1,80E-07	2,65E-08	ND	ND	ND	ND	ND	ND	ND	ND	7,66E-09	5,06E-08	0,00E+00	2,30E-08	-1,31E-07
SQP[7)]	-	1,76E+01	3,99E+00	7,42E+00	2,90E+01	2,51E+01	ND	ND	ND	ND	ND	ND	ND	ND	4,31E+00	7,87E+01	0,00E+00	1,98E+02	-1,01E+02

6) EN 15804+A2 disclaimer for Ionizing radiation, human health. 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; 7) SQP = Land use related impacts/soil quality.

USE OF NATURAL RESOURCES

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Renew. PER as energy[8)]	MJ	7,50E+00	6,45E-02	8,43E+00	1,60E+01	7,30E-01	ND	ND	ND	ND	ND	ND	ND	ND	3,90E-01	1,07E+00	0,00E+00	1,38E+00	-9,00E+00
Renew. PER as material	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use of renew. PER	MJ	7,50E+00	6,45E-02	8,43E+00	1,60E+01	7,30E-01	ND	ND	ND	ND	ND	ND	ND	ND	3,90E-01	1,07E+00	0,00E+00	1,38E+00	-9,00E+00
Non-re. PER as energy	MJ	1,68E+02	3,96E+00	2,32E+02	4,04E+02	4,22E+01	ND	ND	ND	ND	ND	ND	ND	ND	6,16E+01	7,81E+01	0,00E+00	-6,24E+02	-5,97E+02
Non-re. PER as material	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use of non-re. PER	MJ	1,68E+02	3,96E+00	2,32E+02	4,04E+02	4,22E+01	ND	ND	ND	ND	ND	ND	ND	ND	6,16E+01	7,81E+01	0,00E+00	-6,24E+02	-5,97E+02
Secondary materials	kg	7,96E-03	1,71E-03	3,52E-03	1,32E-02	1,93E-02	ND	ND	ND	ND	ND	ND	ND	ND	2,56E-02	3,32E-02	0,00E+00	3,18E-02	-1,52E-01
Renew. secondary fuels	MJ	3,68E-05	2,16E-05	2,94E-02	2,95E-02	2,44E-04	ND	ND	ND	ND	ND	ND	ND	ND	6,68E-05	4,22E-04	0,00E+00	5,83E-04	-5,21E-04
Non-ren. secondary fuels	MJ	0,00E+00	0,00E+00	3,11E-01	3,11E-01	0,00E+00	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of net fresh water	m^3	7,34E-02	5,85E-04	1,51E-02	8,90E-02	5,69E-03	ND	ND	ND	ND	ND	ND	ND	ND	4,07E-03	1,15E-02	0,00E+00	-1,26E+00	-1,70E-01

8) PER = Primary energy resources.

END OF LIFE – WASTE

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Hazardous waste	kg	2,32E-01	5,74E-03	4,36E-02	2,81E-01	6,06E-02	ND	ND	ND	ND	ND	ND	ND	ND	6,85E-02	1,32E-01	0,00E+00	1,76E-01	-7,25E-01
Non-hazardous waste	kg	7,73E+00	1,15E-01	5,80E+00	1,36E+01	1,28E+00	ND	ND	ND	ND	ND	ND	ND	ND	9,34E-01	2,45E+00	0,00E+00	1,70E+03	-1,28E+01
Radioactive waste	kg	1,03E-03	1,18E-06	9,93E-04	2,03E-03	1,34E-05	ND	ND	ND	ND	ND	ND	ND	ND	6,69E-06	1,67E-05	0,00E+00	2,14E-05	-1,89E-04

END OF LIFE – OUTPUT FLOWS

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	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	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	5,50E+02	0,00E+00	0,00E+00
Materials for recycling	kg	0,00E+00	0,00E+00	3,45E-10	3,45E-10	0,00E+00	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	2,20E+02	0,00E+00	0,00E+00
Materials for energy rec	kg	0,00E+00	0,00E+00	1,80E-18	1,80E-18	0,00E+00	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	ND	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	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy – Heat	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

ENVIRONMENTAL IMPACTS – EN 15804+A1, CML

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Global Warming Pot.	kg CO_2e	0,00E+00	2,72E-01	1,74E+01	1,77E+01	2,99E+00	ND	ND	ND	ND	ND	ND	ND	ND	4,68E+00	5,35E+00	0,00E+00	5,84E+00	-2,38E+01
Ozone depletion Pot.	kg CFC_{-11}e	0,00E+00	4,38E-09	2,46E-06	2,47E-06	4,76E-08	ND	ND	ND	ND	ND	ND	ND	ND	5,71E-08	6,34E-08	0,00E+00	8,04E-08	-1,38E-06
Acidification	kg SO_2e	0,00E+00	6,70E-04	9,16E-02	9,22E-02	7,15E-03	ND	ND	ND	ND	ND	ND	ND	ND	2,99E-02	1,40E-02	0,00E+00	2,15E-02	-7,78E-02
Eutrophication	kg PO_4^{3}e	0,00E+00	1,69E-04	1,17E-02	1,18E-02	1,82E-03	ND	ND	ND	ND	ND	ND	ND	ND	6,98E-03	3,41E-03	0,00E+00	9,82E-03	-1,07E-02
POCP ("smog")	kg C_2H_4e	0,00E+00	6,29E-05	3,67E-03	3,73E-03	6,81E-04	ND	ND	ND	ND	ND	ND	ND	ND	2,24E-03	1,25E-03	0,00E+00	2,05E-03	-9,25E-03
ADP-elements	kg Sbe	0,00E+00	7,38E-07	1,19E-05	1,26E-05	9,61E-06	ND	ND	ND	ND	ND	ND	ND	ND	1,64E-06	1,46E-05	0,00E+00	8,85E-06	-4,58E-05
ADP-fossil	MJ	0,00E+00	3,88E+00	2,32E+02	2,36E+02	4,13E+01	ND	ND	ND	ND	ND	ND	ND	ND	6,11E+01	7,70E+01	0,00E+00	8,51E+01	-1,14E+03

ADDITIONAL INDICATOR – GWP-GHG

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP-GHG[9)]	kg CO_2e	1,25E+01	2,74E-01	1,78E+01	3,06E+01	3,01E+00	ND	ND	ND	ND	ND	ND	ND	ND	4,71E+00	5,38E+00	0,00E+00	5,94E+00	-2,44E+01

9) This indicator includes all greenhouse gases excluding biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. In addition, the characterisation factors for the flows – CH4 fossil, CH4 biogenic and Dinitrogen monoxide – were updated. This indicator is identical to the GWP-total of EN 15804:2012+A2:2019 except that the characterisation factor for biogenic CO2 is set to zero.

SCENARIO DOCUMENTATION

Manufacturing energy scenario documentation

Scenario parameter	Value
Electricity data source and quality	Electricity, Greece, residual mix, 2024, Greece, One Click LCA
Electricity CO_2e / kWh	0,58
District heating data source and quality	-
District heating CO_2e / kWh	-

Transport scenario documentation - A4

Scenario parameter	Value
Fuel and vehicle type. Eg, electric truck, diesel powered truck	Market for transport, freight, lorry 16-32 metric ton,EURO5
Average transport distance, km	15,55km
Capacity utilization (including empty return) %	50
Bulk density of transported products	2466
Volume capacity utilization factor	1

End-of-life scenario documentation

Scenario information	Value
Collection process – kg collected separately	1
Collection process – kg collected with mixed waste	-
Recovery process – kg for re-use	550
Recovery process – kg for recycling	110
Recovery process – kg for energy recovery	-
Disposal (total) – kg for final deposition	340
Scenario assumptions e.g. transportation	Transport mode: road transport by EURO 5–compliant tipper or bulk trucks with a payload capacity of 32 metric tonnes. Average distance: an average one-way transport distance of 50 km between the pavement site and the processing / disposal facilities is assumed, in line with the scenario used for the Koropi plant. transported 50 km with an average lorry.

THIRD-PARTY VERIFICATION STATEMENT

EPD Hub declares that this EPD is verified in accordance with ISO 14025 by an independent, third-party verifier. The project report on the Life Cycle Assessment and the report(s) on features of environmental relevance are filed at EPD Hub. EPD Hub PCR and ECO Platform verification checklist are used.

EPD Hub is not able to identify any unjustified deviations from the PCR and EN 15804+A2 in the Environmental Product Declaration and its project report.

EPD Hub maintains its independence as a third-party body; it was not involved in the execution of the LCA or in the development of the declaration and has no conflicts of interest regarding this verification.

The company-specific data and upstream and downstream data have been examined as regards plausibility and consistency. The publisher is responsible for ensuring the factual integrity and legal compliance of this declaration.

The software used in creation of this LCA and EPD is verified by EPD Hub to conform to the procedural and methodological requirements outlined in ISO 14025:2010, ISO 14040/14044, EN 15804+A2, and EPD Hub Core Product Category Rules and General Program Instructions.

Verified tools

Tool verifier: Magaly Gonzalez Vazquez
Tool verification validity: 27 March 2025 - 26 March 2028

Imane Uald Lamkaddam as an authorized verifier for EPD Hub Limited
06.03.2026

VERIFIED ISO 14025