ENVIRONMENTAL PRODUCT DECLARATION

in accordance with ISO 14025 and EN 15804:2012+A2:2019

AEIFOROS BULGARIA S.A.

Slag Aggregates

AEIFOROS BULGARIA S.A.

Programme	Programme operator	EPD registration number	Publication date	Valid until
The International EPD® System, www.environdec.com	EPD International AB	S-P-05126	2022-07-13	2027-07-12

Programme information

Programme

The International EPD® System

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EPD Based on Product Category Rules (PCR)

The CEN standard EN 15804 serves as the core Product Category Rules (PCR)
PCR 2019:14 Construction products (EN 15804:A2); Version 1.1; 2020-09-14.

PCR review was conducted by

The Technical Committee of the International EPD® System.

Independent third-party verification of the declaration and data, according to ISO 14025:2006

☐ EPD process certification ☒ EPD verification

Third party verifier:

Procedure for follow-up during EPD validity involves third party verifier

☐ Yes ☒ No

The EPD owner 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. For further information about comparability, see EN 15804 and ISO 14025.

Company information

AEIFOROS BULGARIA S.A. was established in 2004 for the processing of steel manufacturing by-products and wastes, aiming at the valorisation of those valuable secondary resources. Through circularity and industrial symbiosis, AEIFOROS BULGARIA contributes to the supply of abt 150.000 tons of secondary materials annually, to the saving of natural resources, and to the sustainability of the industry.

AEIFOROS BULGARIA S.A. is located in Pernik, south of the Bulgarian Capital Sofia and within the industrial complex of the steelworks STOMANA INDUSTRIES SA. AEIFOROS BULGARIA 's main activity is the processing of steelmaking wastes and by-products among which steel slags, mill scale, spent refractory bricks, shredder residues, scrap processing waste, etc. AEIFOROS BULGARIA produces a wide range of products for road construction and the cement industry. The company also recovers ferrous and non-ferrous metals from various industries and commercial activities, which after processing, are valorized in steelworks or foundries. The company invests continuously in order to increase the recovery rate of useful materials and proposes environment-friendly integrated solutions for waste management.

AEIFOROS BULGARIA is certified according to ISO 9001:2015 and ISO 14001:2015 by the independent organism CTEC Bulgaria.

The main products of the company are the following:

- Hard aggregates (anti-skid) for road construction certified acc. to CE 13043
- Aggregates for road base, sub-base, landfill certified acc. to CE 13242
- Secondary raw materials for the cement and concrete industry (mill scale, steel slags, etc.)
- Secondary raw materials for steelmaking (ferrous scrap, magnesia, etc.)
- Ferrous and non-ferrous metals (aluminium, copper, bronze, etc.)
- Waste management services

Product information

Base and sub-base aggregates, are manufactured in AEIFOROS BULGARIA 's plant in Pernik. The slag is transported from the steelworks to AEIFOROS storage area located less than 3km away and is stored before processing.

As first step of processing, the slag goes through screening installation. Through screening two different fractions of slag (0-40mm and 40-150mm) are separated while the overband magnet installed on the screening line removes the iron from the slag. The iron is recycled in the melt shop of the steelworks. The slag fraction 0-40mm goes to the slag crusher and is crushed to another two fractions: 0-4mm and 4-10mm. Fractions 40-150 mm, 0-40mm, 4-10mm and 0-4mm are the final products delivered to the customers. All fractions are certified according to factory production control Regulation 305/2011/EU.

The properties of the products included in the study are presented below:

Properties	Characteristics	Performance	Technical specification
Physical properties	Bulk density (Mg/m^3)	1,6	EN 1097-6
	Density on dry material (Mg/m^3)	3,3	EN 1097-6
	Water absorption	$WA_{24}2$	EN 1097-5
Chemical properties	Chemical composition	FeO 31-62%	EN 1744-1
		CaO 26-53%	
		SiO_2 9-25%	
		MnO 5-10%	
Mechanical properties	Resistance to wear (micro-Deval)	MDE10	
	Resistance to fragmentation (Los Angeles)	LA15	EN 1097-1
	Resistance to polishing	PSV62	EN 1097-2
	Resistance to surface abrasion	AAV10	EN 1097-8
	$MgSO_4$ soundness/ Resistance to freezing and thawing	MS18	EN 1367-2

This is a specific EPD and covers hard aggregates produced in Penik, Bulgaria plant.
The product does not contain any substances listed in the "Candidate List of Substances of Very High Concern (SVHC) for authorization" exceeding 0.1 % of the weight of the product.

DECLARED UNIT
The declared unit is 1 tonne of hard aggregates.

GOAL AND SCOPE
This EPD evaluates the environmental impacts of the production of 1 tonne of products from Cradle-to-gate (A1-A3), produced in the plant of Pernik.

CUT-OFF RULES
According to PCR 2019:14, where there is insufficient data for a unit process, the cut-off criteria are 1% of the total mass of input of that process and the total of neglected input flows per module is a maximum of 5% of energy usage and mass.

BACKGROUND DATA
The most recent version of Ecoinvent database (V3.8) was used as a source of background data.

SOFTWARE
The software used for the production of the LCA results is OpenLCA 1.10.3.

DATA QUALITY
Data on raw materials, transportation of materials and products along with energy and water consumption in manufacturing stage was collected by Aeiforos. Regarding electricity mix, the latest (2020) national residual electricity mix as published in DAPEEP SA was utilized.

TIME REPRESENTIVENESS
All primary data used in this study is for the entire year 2021.

GEOGRAPHICAL SCOPE
Worldwide

ASSUMPTIONS
For road transportation a lorry 16-32 metric ton, EURO4 was used.

CPC CODE
3931 Slag, dross, scalings and other waste from the manufacture of iron or steel.

ALLOCATIONS
Allocations in the LCA datasets used are documented accordingly in the datasets by Ecoinvent. Concerning the manufacturing stage, when needed, an allocation based on the mass of the products and co-products, such as aggregates for other uses, from the site has been applied.

System boundary

	X=included, MND=Module Not Declared																
	Product stage			Construction stage		Use stage								End of life stage				Resource recovery stage
	Raw Materials Supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use		De-construction and demolition	Transport	Waste processing for reuse, recovery and/or recycling	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	MND	MND	MND	MND	MND	MND	MND	MND	MND		MND	MND	MND	MND	MND
Geography	BG	EU	BG															
Specific data used	>90%			-	-	-	-	-	-	-	-	-		-	-	-	-	-
Variation-products	Not relevant			-	-	-	-	-	-	-	-	-		-	-	-	-	-
Variation-sites	Not relevant			-	-	-	-	-	-	-	-	-		-	-	-	-	-

A1: Raw Material Supply

The production starts with the material supply (A1). This stage includes the generation of electricity and fuels required for the manufacturing and the recycling process of secondary materials. The only raw material used is EAF slag, which is a secondary material derived from steel industries.

A2: Transportation of raw materials to manufacturer

Transportation is relevant for delivery of raw materials from the supplier to the gate of manufacturing plant (A2). The supplier of slag is nearby the manufacturing plant, approximately at 3km, minimizing the impacts of transportation.

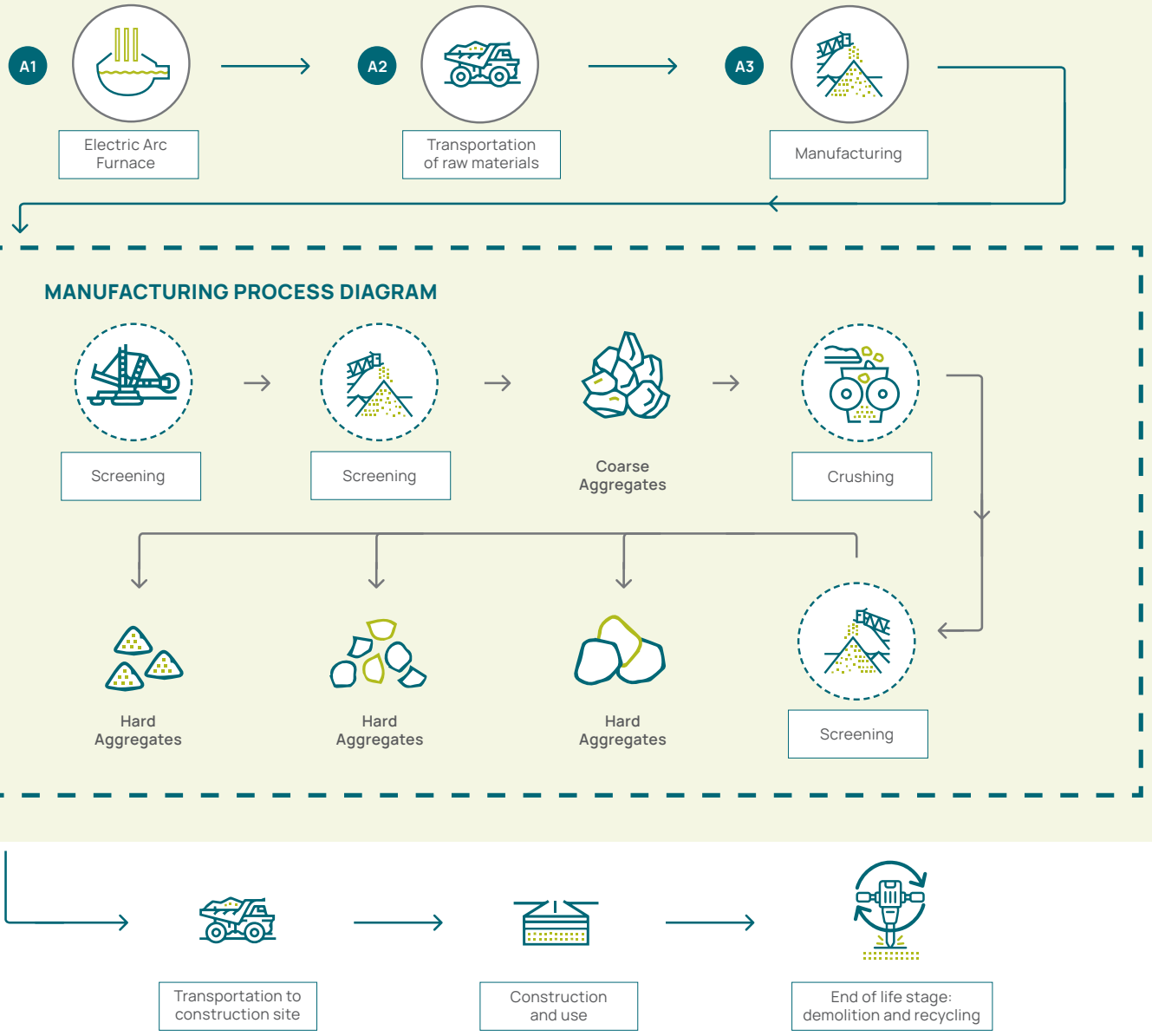
A3: Manufacturing

Manufacturing of the products includes all the processes required for the production of aggregates (A3), such as the screening and crushing of the slag.

Deconstruction and demolition of the products (C1), transportation of the discarded product (C2), re-use or recycling (C3), disposal (C4) and avoided burdens (D) will be omitted from the study, since aggregates fulfill all three of the conditions below, according to EN 15804-2012+A2 2019:

- the product or material is physically integrated with other products during installation so they cannot be physically separated from them at end of life, and
- the product or material is no longer identifiable at end of life as a result of a physical or chemical transformation process, and
- the product or material does not contain biogenic carbon.

System boundary



ENVIRONMENTAL IMPACTS

Parameter	Unit	A1-A3
Global Warming Potential-total	kg CO2 eq	1,98E+00
Global Warming Potential-fossil	kg CO2 eq	1,97E+00
Global Warming Potential-biogenic	kg CO2 eq	2,04E-03
Global Warming Potential-luluc	kg CO2 eq	9,07E-04
Global Warming Potential-GHG[1]	kg CO2 eq	1,96E+00
Ozone Depletion Potential	kg CFC-11 eq	4,02E-07
Acidification Potential	mol H+ eq	5,43E-03
Eutrophication Potential-freshwater	kg PO4-3 eq	1,05E-03
Eutrophication Potential-freshwater[2]	kg P eq	3,43E-04
Eutrophication Potential-marine	kg N eq	1,08E-03
Eutrophication Potential-terrestrial	mol N eq	1,12E-02
Photochemical Oxidation	kg NMVOC eq	3,56E-03
Abiotic Depletion Potential-non fossil resources	kg Sb eq	2,03E-06
Abiotic Depletion Potential-fossil resources	MJ	3,03E+01
Water use[3]	m^3 eq	1,05E+00

[1] This indicator includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide emissions and uptake and biogenic carbon stored in the product with characterization factors (CFs) based on IPCC (2013).
[2] Eutrophication aquatic freshwater shall be given in both kg PO4-3 eq and kg P eq.
[3] The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

Environmental performance of 1 tonne of aggregates

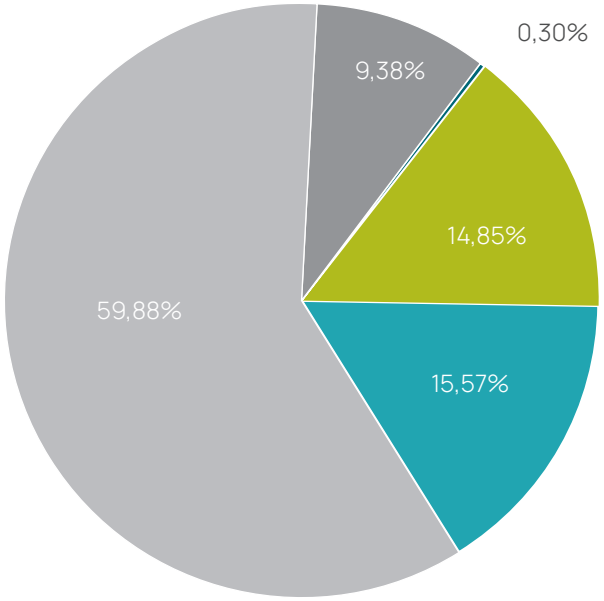
OUTPUT FLOWS AND WASTE CATEGORIES

Parameter	Unit	A1-A3
Hazardous waste disposed	kg	6,52E-05
Non-hazardous waste disposed	kg	2,64E-01
Radioactive waste disposed	kg	2,15E-04
Components for re-use	kg	0,00E+00
Materials for recycling	kg	0,00E+00
Materials for energy recovery	kg	0,00E+00
Exported energy	MJ	0,00E+00

RESOURCE USE

Parameter	Unit	A1-A3
Use of renewable primary energy excluding resources used as raw materials	MJ	1,29E+00
Use of renewable primary energy resources used as raw materials	MJ	1,00E+00
Total use of renewable primary energy resources	MJ	2,29E+00
Use of non-renewable primary energy excluding resources used as raw materials	MJ	3,03E+01
Use of non-renewable primary energy resources used as raw materials	MJ	1,00E+00
Total use of non-renewable primary energy resources	MJ	3,13E+01
Use of secondary material	kg	1,00E+03
Use of renewable secondary fuels	MJ	0,00E+00
Use of non-renewable secondary fuels	MJ	0,00E+00
Use of net fresh water	m^3	0,00E+00

GWP-TOTAL



On-site emissions	Diesel	Tap water	Transportation	Electricity
59,88%	9,38%	0,30%	14,85%	15,57%

Additional information
The EPD does not give information on release of dangerous substances to soil, water and indoor air because the horizontal standards on measurement of release of regulated dangerous substances from construction products using harmonized test methods according to the provisions of the respective technical committees for European product standards are not available.

References

- **General Programme Instructions**

of the International EPD® System. Version 3.01, 2019-09-18

- **PCR 2019:14**

v.1.11 Construction products. EPD System. Date 2021-02-05. Valid until 2024-12-20

- **EN 15804:2012+A2:2019**

Sustainability of construction works - Environmental Product Declarations - Core rules for the product category of construction products

- **ISO 14020:2000**

Environmental labels and declarations — General principles

- **ISO 14025:2006**

Environmental labels and declarations - Type III environmental declarations - Principles and procedures

- **ISO 14040:2006**

Environmental management - Life cycle assessment-Principles and framework

- **ISO 14044:2006**

Environmental management - Life cycle assessment - Requirements and guidelines

- **Ecoinvent / Ecoinvent Centre**

www.Eco-invent.org

- **Residual Energy Mix 2020**

from Renewable Energy Sources Operator & Guarantees of Origin (DAPEEP SA)

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