

DAPHABITAT SYSTEM ENVIRONMENTAL PRODUCT DECLARATION

WWW.DAPHABITAT.PT

[ACCORDING TO ISO 14025, EN 15804:2012+A2:2019 AND EN 15942]



Declaration number: **DAP 011:2024**



ISAC¹ - INERT STEEL AGGREGATES FOR CONSTRUCTION

ISSUE DATE: 04/10/2024

VALID UNTIL: 03/10/2029

SIDERURGIA NACIONAL, EMPRESA DE PRODUTOS LONGOS, S.A.



Version 1.4. Ed. March 2024

¹ ASIC in Portuguese (Agregado Siderúrgico Inerte para a Construção)

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1. GENERAL INFORMATION

1.1. The DAPHabitat System

Program operator:	Sustainable Construction Platform www.clusterhabitat.pt geral@clusterhabitat.pt	 Cluster Habitat Sustentável
Address:	Departamento Engenharia Civil Universidade de Aveiro 3810-193 Aveiro	
Email address:	deptecnico@clusterhabitat.pt	
Telephone number:	(+351) 234 401576	
Website:	www.daphabitat.pt	
Logo		

1.2. EPD owner

Name of the owner:	Siderurgia Nacional – Empresa de Produtos Longos, S.A.	
Production site:	Maia unit: Rua da Siderurgia, 4425-514 S. Pedro Fins, Maia, Portugal Seixal unit: Avenida da Siderurgia Nacional, 2840-075 Aldeia de Paio Pires, Seixal, Portugal	
Address (head office):	Seixal unit: Apartado 3, 2840-996 Aldeia de Paio Pires, Seixal, Portugal	
Telephone:	Maia unit: (+351) 229 699 000 Seixal unit: (+351) 212 278 500	
E-mail:	efraguela@megasa.pt ; acanelas@megasa.pt	
Website:	www.megasa.com	
Logo:		
Information concerning the applicable management Systems:	Both production premises have Environmental License and Management Systems implemented according to ISO 9001, ISO 14001, ISO 45001, ISO 50001 and Steel Sustainability.	
Specific aspects regarding the production:	Main CAE 24100 – Steelmaking and elaboration of ferro-alloys Secondary CAE 38322 – Valorisation of non-metallic wastes	
Organization's environmental policy:	Siderurgia Nacional – Empresa de Produtos Longos, S.A. is aware that the activity must be performed in a way that guarantees the achievement of the highest levels of protection for the people working in the premises, the sustainability and continuous growth of the company, the highest levels of quality in products and services and the maximisation of eco-efficiency, through the continual improvement of management and performance in the fields of Health and Safety, Sustainability, Quality, Environment and Major Risk Prevention involving dangerous substances. The complete integrated policies of both Maia and Seixal units are available on the website www.megasa.com .	

1.3. Information concerning the EPD

Authors:	Ana Cláudia Dias
Contact of the authors:	Address: University of Aveiro, Campus Universitário de Santiago, 3810-193 Aveiro, Portugal Phone number: +351 234 370 200 E-mail: acdias@ua.pt
Issue date:	04/10/2024
Registration date:	22/10/2024
Registration number:	DAP 011:2024
Valid until:	03/10/2029
Representativity of the EPD (location, manufacturer, group of manufacturers):	EPD of one (1) product prepared in two (2) industrial units, pertaining to two (2) producers.
Where to consult explanatory material:	www.megasa.com
Type of EPD:	Cradle-to-gate EPD (A1-A3) with modules C and D

1.4. Demonstration of the verification

External independent verification, accordingly with the standard ISO 14025:2010 and EN 15804:2012+A2:2019	
Certification Body	Verifier
	
(CERTIF – Associação para a Certificação)	(Marisa Almeida)

1.5. EPD Registration

Programme operator

(Plataforma para a Construção Sustentável)

1.6. PCR (product category rules) basic model

Name:	PCR: Basic module for construction products and services
Issue date:	Edition August 2023
Number of registration on the data base:	RCP-mb001
Version:	Version 2.3
Identification and contact of the coordinator (s):	Marisa Almeida marisa@ctcv.pt Luís Arroja arroja@ua.pt José Dinis Silvestre jose.silvestre@ist.utl.pt
Identification and contact of the authors:	Marisa Almeida marisa@ctcv.pt Luís Arroja arroja@ua.pt José Silvestre jds@civil.ist.utl.pt Fausto Freire Cristina Rocha Ana Paula Duarte Ana Cláudia Dias Helena Gervásio Victor Ferreira Ricardo Mateus António Baio Dias
Composition of the Sectorial Panel:	-
Consultation period:	18/11/2015 - 18/01/2016
Valid until:	01/06/2027

CEN standard EN 15804 serves as the core Product Category Rules (PCR).

1.7. Relevant c-PCR (Complementary product category rules)

Not applicable.

1.8. Information concerning the product/product class

Identification of the product:	ISAC - Inert Steel Aggregates for Construction
Illustration of the product:	
Brief description of the product:	ISAC is a product obtained after treating the slag that result from EAF (electric arc furnace) steelmaking. ISAC is sold in several particle sizes and this EPD is valid for aggregate dimensions of 0-40 mm (ISAC 0-40), 40-100 mm (ISAC 40-100), 0-6 mm (ISAC 0-6), 6-12 mm (ISAC 6-12) and 10-16 mm (ISAC 12-18).
Main technical characteristics of the product:	The technical characteristics of ISAC comply with the requirements of the following Standards: EN 13242 – Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction, EN 12620 – Aggregates for concrete, and EN 13043 – Aggregates for bituminous mixtures and surface treatments for roads, airfields and other trafficked areas.
Description of the product's application/use:	<ul style="list-style-type: none"> • Basic layers, sub-layer, road surface and landfilling for roads; • Landfilling layers, upper layer and sub-ballast for railway lines; • Drainage layers; • Accesses, machine parks and building site pavement; • Aggregates for concrete.
Placing on the market / Rules of application in the market / Technical rules of the product:	ISAC is marketed in bulk and subject to CE-marking according to the following Standards: EN 13242 – Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction, EN 12620 – Aggregates for concrete, and EN 13043 – Aggregates for bituminous mixtures and surface treatments for roads, airfields and other trafficked areas.
Quality control:	ISAC is subject to a Certificate of Conformity for the factory production control, thus to external quality control regarding the compliance of EN 13242, ANNEX C, EN 12620, and EN 13043.
Special delivery conditions:	In bulk.
Components and substances to declare:	Not applicable.
Where explanatory material may be obtained:	www.megasa.com
History of the LCA studies:	Not applicable.

1.9. Calculation rules of the LCA

Functional unit:	Not applicable.
Declared unit:	1 tonne (t) of ISAC.
System boundaries:	<p>The assessed system includes modules A1-A3 (product stage), C (end-of-life stage), and D (benefits and loads beyond the system boundary). In the end-of-life stage, the impacts of module C1 (deconstructions and demolition) were excluded due to the lack of information.</p> <p>The raw material of ISAC is EAF slag produced during the steelmaking process. This slag is a waste and, thus, all processes upstream its valorisation are excluded from the system boundaries.</p> <p>During slag processing, the metallic fraction is separated and reintroduced in the steelmaking process. This is considered as a closed-cycle valorisation system of metallic fraction and, thus, this valorisation process has been excluded from the system boundaries but the transportation of metallic fraction up to the valorisation site is considered.</p> <p>Most of the water consumed during ISAC production process comes from industrial purges; thus, its collection and treatment have not been considered.</p> <p>A more detailed description of the system boundary is presented in Section 2.1.</p>
Criteria for the exclusion:	<p>The LCA considered all the production processes of the materials and energy consumed in the system, as well as the management processes of the wastes generated, for which inventory data were available. The flows of materials and wastes excluded in the ISAC production process (absorbent rags, oil filters, wastes from sewer cleaning, and wastes from oil/water separators) are much lower than 1% of the total mass of the inputs to that process and 5% of the total mass of inputs to the respective information module (cut-off criteria defined in EN 15804).</p> <p>The consumption of energy and water in the administrative areas and workshops, as well as the production of wastewater and wastes from these areas, were excluded. The environmental burdens from the construction and maintenance of infrastructures and equipment (capital goods) were also excluded, except those associated with the maintenance of machinery and vehicles used in the production of ISAC.</p>
Assumption and limitations	The results of the environmental impacts and remaining indicators shown in this EDP refer to the year 2022 and constitute weighted average values based on the amount of ISAC produced by each production unit that year (49.5% in Seixal and 50.5% in Maia).
Quality and other characteristics about the information used in the LCA:	<p>In the case of processes on which the producer has influence (slag preparation and processing), real and specific data collected in both production units have been used. The exception are emissions to air resulting from diesel combustion in lorries and machines used during internal operations of transport and transference and from propane combustion in welding operations, which have been calculated with emission factors due to the lack of measured values.</p> <p>For the remaining processes, except for ferrous metals recycling considered in module D, generic data obtained from the Ecoinvent - version 3.9.1 database have been used, which meet the quality criteria defined for generic data (time-related, geographical and technological representativeness, plausibility, completeness, consistency, etc.).</p> <p>Data for ferrous metals recycling considered in module D were retrieved from an EPD for hot-rolled ribbed steel proceeding from an electric arc furnace produced in four Megasa plants (https://www.en.aenor.com/Productos_DAP_pdf/MEGASA_001-007.pdf).</p> <p>According to the criteria defined in Table E.1 of Annex E of the EN 15804 standard, defined by "UN Environment Global Guidance on LCA database development", the quality of relevant data and data used in module D is very good for both technological and temporal representativeness, and is good for the geographical representativeness, except for the production of electricity, for which it is considered very good.</p>
Allocation rules:	The production of ISAC with different particle sizes occurs simultaneously and their environmental impacts cannot be obtained individually. Thus, the results obtained are valid for all particle sizes.
Software used for the assessment:	SimaPro version 9.5.0.2.
Background database used for the LCA:	Ecoinvent version 3.9.1 database published in December 2022; "cut-off" approach.
Comparability of EPD for construction products	The EPD of construction products and services cannot be comparable in case they are not produced according to EN 15804 and EN 15942 and according to the comparability conditions determined by ISO 14025.

1.10. Use of average environmental performance

This EPD presents the average environmental performance of all particle sizes of ISAC produced by Siderurgia Nacional – Empresa de Produtos Longos, S.A. at the Seixal and Maia plants. For the core environmental impacts indicators, in the module A1-A3, the variability of the individual impacts of each production plant compared to the average values reported in this EPD ranges from 1 to 22%. In eight out of the thirteen core indicators this variability does not exceed 3%. In the module D, the variability of the individual core environmental impacts of each production plant compared to the average values does not exceed 0.6%.

1.11. Technical information for Reference Service Life (RSL)

Not applicable.

1.12. Flow diagram of input and output of the processes

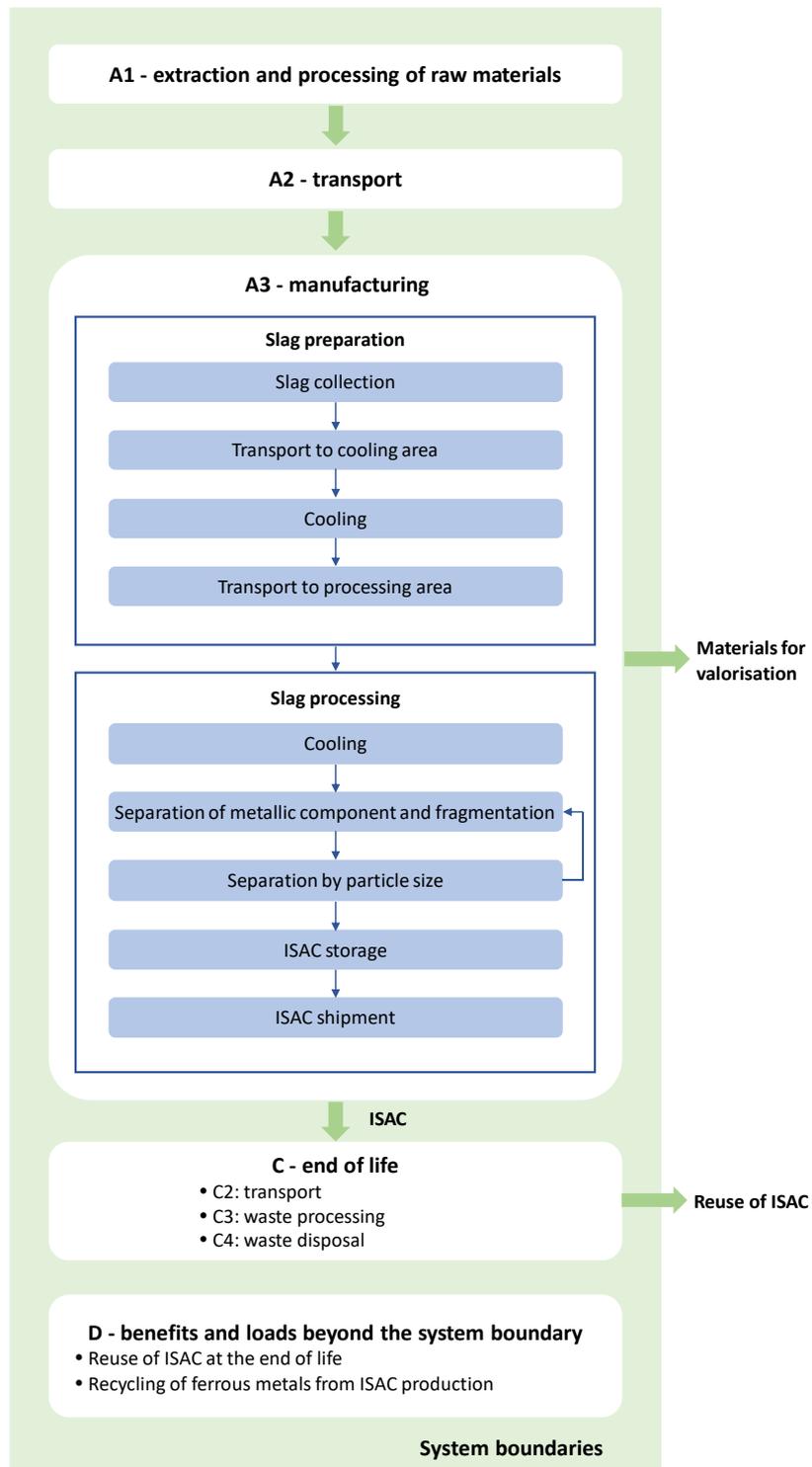


Figure 1: Life cycle stages and unit processes.

2. CORE ENVIRONMENTAL IMPACT INDICATORS

2.1. DESCRIPTION OF THE SYSTEM BOUNDARIES

(✓ = included; ND = module not declared)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END-OF-LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY
Raw material supply	Transport	Manufacturing	Transport	Construction installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-constructions, demolition	Transport	Waste processing	Disposal	Re-use, recovery, recycling potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
✓	✓	✓	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	✓	✓	✓	✓

The **product stage (module A1-A3)** considers the manufacturing of ISAC, as well as the extraction, processing, and transport of materials and energy vectors, and also waste processing until its end-of-life. ISAC production is divided into two processes: slag preparation and slag processing. Slag preparation starts with EAF slag collection for its solidification in the specific area so-called slag pit. Then, slag is transported to the water-cooling area, to be transported to the processing area after cooling.

During slag processing, it is cooled with water, with the further separation of metallic components and slag fragmentation. Slag is submitted to the following operations: (1) separation by sieving/calibration in particle size fractions appropriate for the different applications; (2) new mechanical fragmentation, eventually with a grinding operation for a better inclusion of fine particles and the increase of smaller particle sizes; (3) elimination of the smallest metallic chips which were not eliminated before. Then ISAC is stored outdoors. Finally, lorries are loaded for dispatch.

In the **end-of-life stage**, the impacts from module **C1 (deconstruction and demolition)** were excluded because, although mechanised deconstruction and demolition of structures containing ISAC may occur, there is no information available allowing the quantification of the respective impacts. The following submodules were considered:

- **C2 (transport)**: ISAC is assumed to be reused in the same place and, thus, no transport is required;
- **C3 (waste processing)**: ISAC reuse does not require any additional processing;
- **C4 (waste disposal)**: ISAC is reused and, therefore, does not undergo final disposal processes.

Module D considers the environmental benefits and loads associated with ISAC reuse at the end-of-life (replacing gravel) and with ferrous metals scrap generated in the ISAC manufacturing process that is recycled.

2.1.1. Justification for the exemption to declare modules C1, C2, C3, C4 and D

Not applicable.

2.2. Core environmental impact indicators

	Global warming potential total; GWP-total	Global warming potential fossil; GWP-fossil	Global warming potential biogenic; GWP-biogenic	Global warming potential land use and land use change; GWP-luluc	Depletion potential of the stratospheric ozone layer; ODP	Acidification potential; AP
Unit	kg CO ₂ eq.	kg CO ₂ eq.	kg CO ₂ eq.	kg CO ₂ eq.	kg CFC 11 eq.	mol H ⁺ eq.
Module A1-A3	7.49E+00	7.36E+00	1.28E-01	8.52E-03	1.61E-07	4.78E-02
Module C2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module D	-3.26E+00	-3.11E+00	-1.30E-01	-1.63E-02	-5.53E-08	-2.17E-02

LEGEND:

- Product stage
- End-of-life stage
- Benefits and loads beyond the system boundary

Values expressed per declared unit (1 t of ISAC).

	Eutrophication potential aquatic freshwater; EP-freshwater	Eutrophication potential aquatic marine; EP-marine	Eutrophication potential terrestrial; EP-terrestrial	Formation potential of tropospheric ozone; POCP	Abiotic depletion potential for non-fossil resources ADP-minerals&metals	Abiotic depletion potential for fossil resources potential ADP-fossil	Water (user) deprivation potential; WDP
Units	kg P eq.	kg N eq.	mol N eq.	Kg COVNM eq.	kg Sb eq.	MJ. P.C.I	m ³ World eq. deprived
Module A1-A3	1.74E-05	2.17E-02	2.36E-01	7.46E-02	1.77E-06	1.01E+02	6.38E-01
Module C2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module D	-4.98E-05	-7.41E-03	-8.11E-02	-2.54E-02	-7.49E-07	-4.18E+01	-5.47E+01

LEGENDA:

- Product stage
- End-of-life stage
- Benefits and loads beyond the system boundary

Values expressed per declared unit (1 t of ISAC).

The results obtained for the indicators “Abiotic depletion potential for non-fossil resources (ADP-minerals&metals)”, “Abiotic depletion potential for fossil resources potential (ADP-fossil)” and “Water (user) deprivation potential (WDP)” should be used with caution since the uncertainties associated with them are high or there is little experience with the indicator.

2.3. Additional environmental impact indicators

	Potential incidence of disease due to PM emissions PM	Potential Human exposure efficiency relative to U235 IRP	Potential Comparative Toxic Unit for ecosystems ETP-fw	Potential Comparative Toxic Unit for humans. cancer effects HTP-c	Potential Comparative Toxic Unit for humans. not cancer effects HTP-nc	Potential soil quality index SQP
Unit	Disease incidence	kBq U 235 eq.	CTUe	CTUh	CTUh	-
Module A1-A3	ND	ND	ND	ND	ND	ND
Module C2	ND	ND	ND	ND	ND	ND
Module C3	ND	ND	ND	ND	ND	ND
Module C4	ND	ND	ND	ND	ND	ND
Module D	ND	ND	ND	ND	ND	ND

LEGEND:

- Product stage
- End-of-life stage
- Benefits and loads beyond the system boundary

ND - not declared.

The impact indicator "POTENTIAL HUMAN EXPOSURE EFFICIENCY RELATIVE TO U235" focuses mainly on the possible impact of a low dose of ionising radiation on human health resulting from the nuclear fuel cycle. It does not consider effects arising from possible nuclear accidents, occupational exposure or the disposal of radioactive waste in underground facilities. Potential ionising radiation from soil, radon and some building materials is also not measured by this indicator.

The results of the indicators "POTENTIAL COMPARATIVE TOXIC UNIT FOR ECOSYSTEMS (ETP-FW)", "POTENTIAL COMPARATIVE TOXIC UNIT FOR HUMANS. CANCER EFFECTS", "POTENTIAL COMPARATIVE TOXIC UNIT FOR HUMANS. NOT CANCER EFFECTS" and "POTENTIAL SOIL QUALITY INDEX" should be used with caution as the uncertainties associated with them are high or there is little experience with the indicator.

2.4. Indicators describing resource use

	Primary energy					
	EPR	RR	TRR	EPNR	RNR	TRNR
Unit	MJ. P.C.I.	MJ. P.C.I.	MJ. P.C.I.	MJ. P.C.I.	MJ. P.C.I.	MJ. P.C.I.
Module A1-A3	6.21E+00	0.00E+00	6.21E+00	9.37E+01	6.93E+00	1.01E+02
Module C2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module D	-1.25E+01	0.00E+00	-1.25E+01	-4.20E+01	2.53E-01	-4.18E+01

LEGEND:

- Product stage
- End-of-life stage
- Benefits and loads beyond the system boundary

EPR = use of renewable primary energy excluding renewable primary energy resources used as raw materials; RR = use of renewable primary energy resources used as raw materials; TRR = total use of renewable primary energy resources (EPR + RR); EPNR = use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; RNR = use of non-renewable primary energy resources used as raw materials; TRNR = total use of non-renewable primary energy resources (EPNR + RNR).

Values expressed per declared unit (1 t of ISAC).

	Secondary materials and fuels, and use of water			
	MS	CSR	CSNR	Net use of fresh water
Unit	kg	MJ. P.C.I.	MJ. P.C.I.	m ³
Module A1-A3	1.01E+03	0.00E+00	0.00E+00	1.54E-02
Module C2	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module D	4.76E-02	0.00E+00	0.00E+00	-3.20E-01

LEGEND:

- Product stage
- End-of-life stage
- Benefits and loads beyond the system boundary

MS = use of secondary material; CSR = use of renewable secondary fuels; CSNR = use of non-renewable secondary fuels.

Values expressed per declared unit (1 t of ISAC).

2.5. Other environmental information describing different waste categories

	Hazardous waste disposed	Non-hazardous waste disposed	Radioactive waste disposed
Unit	kg	kg	kg
Module A1-A3	4.94E-02	4.07E-02	0.00E+00
Module C2	0.00E+00	0.00E+00	0.00E+00
Module C3	0.00E+00	0.00E+00	0.00E+00
Module C4	0.00E+00	0.00E+00	0.00E+00
Module D	7.89E-07	1.42E-03	8.76E-06

LEGENDA:

- Product stage
- End-of-life stage
- Benefits and loads beyond the system boundary

Values expressed per declared unit (1 t of ISAC).

2.6. Environmental information describing output flows

	Components for re-use	Materials for recycling	Materials for energy recovery	Exported energy
Unidade	kg	kg	kg	MJ
Module A1-A3	3.75E-02	8.93E+00	0.00E+00	0.00E+00
Module C2	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module C3	0.00E+00	1.00E+03	0.00E+00	0.00E+00
Module C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module D	1.00E+03	1.68E-03	8.31E-06	0.00E+00

LEGENDA:

- Product stage
- End-of-life stage
- Benefits and loads beyond the system boundary

Values expressed per declared unit (1 t of ISAC).

2.7. Information describing the biogenic carbon content at the factory gate

Biogenic carbon content	Units	Modules A1-A3 (results)
Biogenic carbon content in product	kg C	Not applicable
Biogenic carbon content in accompanying packaging	kg C	Not applicable

3. SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION

3.1. C2 Transport – End-of-life of the product

Parameter	Units	Results expressed per declared unit
Distance	km	0

3.2. C3 Waste processing for reuse, recovery and/or recycling – End-of-life of the product

Parameter	Units	Results expressed per declared unit
Material for reuse	kg	1,000

3.3. C4 Disposal – End-of-life of the product

Parameter	Units	Results expressed per declared unit
Material for final deposition	kg	0

3.4. Scenario and technical information for module D

Parameter	Units	Results expressed per declared unit	
		Reuse of ISAC	Recycling of ferrous metals
Net output flow	kg	1,000	0.048
Avoided production of gravel	kg	1,000	-
Avoided production of steel	kg	-	0.042
Location of end-of-waste point	-	In the place of reuse.	In the place of recycling.
Point of functional equivalence	-	ISAC is assumed to have the same quality as gravel.	Steel manufactured from scrap is considered to have the same quality as steel manufactured from primary material.
Assumptions	-	-	The net output flow of ferrous metals is equal to the difference between the flow of ferrous metals that will be recycled and the input flow of ferrous metals of secondary origin consumed in ISAC production.

3.5. Additional information on release of dangerous substances to indoor air, soil, and water during the use stage

Not applicable.

4. REFERENCES

- ✓ General Instructions of the DAPHabitat System. Version 2.1. Edition August 2023 (in www.daphabitat.pt);
- ✓ PCR – basic module for construction products and services. DAPHabitat System. Version 2.3. August 2023 (in www.daphabitat.pt);
- ✓ ISO 14025:2009 Environmental declarations and labels – Type III environmental declarations – Principles and procedures;
- ✓ EN 15804:2012 + A2:2019 Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products;
- ✓ EN 15942:2021 Sustainability of construction works – Environmental product declarations – Communication format business-to-business.