ENVIRONMENTAL PRODUCT DECLARATION

In accordance with the standards UNE-EN ISO 14025:2010, UNE-EN 15804: EN 15804:2012 + A2:2019 and PCR 2019:14 Construction products version 1.11

ZINC CONCENTRATE

LEAD CONCENTRATE

Programme:	**The International EPD® System, www.environdec.com**
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Programme Information

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Product category rules (PCR):	**PCR 2019:14 Construction products version 1.11** (EN 15804+A2)
The PCR review was performed by: The Technical Committee of the International EPD® System. Full list of members available at *www.environdec.com* *(Members of the Committee were requested to state any potential conflict of interest with the PCR moderator or PCR committee and if so were excused from the review)* Chair: Claudia A.Peña. Contact Via *info@environdec.com*	
Independent third-party verification of the EPD and data, according to ISO 14025:2006: ☐ EPD process certification ☒ EPD verification	
Third Party Verifier: Verifier accredited by the International EPD® System. Marcel Gomez Ferrer. Marcel Gómez Environmental Consulting (www.marcelgomez.com) Phone: 0034 630 64 35 93 Email: info@marcelgomez.com Approved by: The International EPD® System	
The procedure for tracking data during the validity of the EPD involves a third-party verifier: ☒ Yes ☐ No	
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Development of the EPD: **SGS TECNOS S.A.U**	

The owner of the EPD presents the exclusive ownership and responsibility of the EPD. EPDs within the same product category, but from different programs may not be comparable. EPD construction products may not be comparable if they do not comply with the EN 15804 standard. For more information on comparability, see EN 15804 and ISO 14025.

Overview

Manufacturer: **MINECO GROUP – GROSS DOO GRADIŠKA PJ SREBRENICA**
Sase b.b., 75430 Srebrenica,
Republic of Srpska, Bosnia and Herzegovina

Company Overview: Mineco now employs some 2,000 people in 8 European countries. Through our London office we procure, market and move non-ferrous & precious metals (including all of our own concentrates and metals). Mineco Ltd operates 4 base metal mines in South East Europe; Gross in Bosnia and Herzegovina and Rudnik, Veliki Majdan and Bosilegrad in Serbia. Furthermore, Mineco's in-house Project Delivery Team are working on several development projects in the Region. Mineco is an international group focused on the natural resources sector. Established in 2003 they operate in three key areas: base metal mining, commodities trading and the smelting & refining of metals.

- Commodity Trading – Through our London office we procure, market and move non-ferrous & precious metals (including all of our own concentrates and metals).
- Base Metal Mining – Mineco Ltd operates 5 mines in Bosnia and Herzegovina and Serbia. Furthermore Mineco's in-house Project Delivery Team are working on several development projects in the Western Balkans.
- Smelting & Refining

The Gross Mine is situated in Eastern Bosnia and Herzegovina. Limited Liability Company for Production, Trade and Services "Gross" d.o.o. Gradiška was founded on April 1, 2005 and registered in the register of the Basic Court in Banja Luka (label and decision number U/I 2445/04). The registered number of the Company is 01990012, and the JIB is 4402115510008. The main activity of the Company was foreign trade.

In 2010, the Company was granted permission by the Ministry of Economy, Energy and Development to exploit lead and zinc ore in Srebrenica and began to engage in the production and processing of lead and zinc ore. On 26.11.2007. year "Gross" d.o.o. Gradiška signs the Concession Agreement for the exploration, exploitation and processing of lead and zinc ores with the Government of the Republic of Srpska at the "Srebrenica", "Srebrenica II", "Kazani" and "Vitlovac" deposits in the municipality of Srebrenica.

With 7.37 million tonnes of reserves and a further about 23 million tonnes of resources Gross is Mineco’s biggest mine.

Product description

Name of the product or family of products covered by this EPD: This Environmental Product declaration (EPD) describes the environmental impacts corresponding to 1 ton of ore concentrate.

Description of the product and its use:

Concentrates of lead and zinc are powder materials, dark blue color (grey). The content of pure lead in lead concentrate is approximately 72%, while the content of pure zinc in zinc concentrate is approximately 51%.

Figure 1: Lead and Zinc concentrate, respectively.

Lead and zinc concentrates are used to obtain pure metals (99.99%) lead and zinc, which as pure ingots are intended for use in the following industries: Metal processing, Production of batteries, Surface protection of metals, Medicine, Special industry, Auto industry, Shipbuilding etc.
Zinc and lead concentrates are intermediate products with classification UN CPC 41542 and 41544 that are used in different types of industry.

Chemical data and physical propierties:

Appearance	Solid, grey-blue fine powder
Odour	Odourless
Melting point/freezing point	About 900 °C
Density	3,1-3,5 g/cm3
Specific mass	7-7,2 g/cm3
Solubility(ies)	Insoluble in water.
Explosive properties	No explosive material.
Reactivity	No hazardous reactions known under normal ambient anticipated storage and handling conditions of temperature and pressure.
Chemical stability	Product is stable under normal ambient anticipated storage conditions of temperature and pressure
Possibility of hazardous reactions	Reacts violently with iodine pentachloride.
Incompatible materials	Strong acid, strong oxidizing agents, iodine monochloride, hydrogen peroxide
Hazardous decomposition products	Hydrogen sulphide, sulfur oxides, metal oxides, carbon disulphide

Description of the system components:

Board 1: Table composition of Zinc.

	PRODUCT COMPONENTS	WHEIGHT, kg	POST-CONSUMER MATERIAL, WEIGHT, %	RENEWABLE MATERIAL, WEIGHT, %
ZINC CONCENTRATE	Copper sulphate	30,0-160,0	0,0	0,0
	Calcium oxide (CaO)	500,0-950,0	0,0	0,0
	Iron balls	10,0-140,0	0,0	0,0
	Iron rods	2,0-190,0	0,0	0,0
	Rest	7,0-35,0	0,0	0,0
	TOTAL	100,0%	0,0	0,0
LEAD CONCENTRATE	Copper sulphate	10,0-90,0	0,0	0,0
	Sodium carbonate	190,0-350,0	0,0	0,0
	Iron balls	70,0-150,0	0,0	0,0
	Iron rods	2,0-350,0	0,0	0,0
	Rest	250,0-400,0	0,0	0,0
	TOTAL	100,0%	0,0	0,0
	PACKAGING MATERIALS	WHEIGHT, kg	WEIGHT, % (VERSUS THE PRODUCT)	
ZINC AND LEAD CONCENTRATE	PVC bags	0,008	0,008	
	Waste pressed barrels	0,001	0,014	
	TOTAL	0,009	0,002	

During the life cycle of the product, no hazardous substance included in the "List of Candidate Substances (SVHC)" has been used in a percentage greater than 0.1% of the weight of the product. All the quantities specified in the system component description table refer to the ore concentrates, unifying all stages of the life cycle.

Board 2: Amount of biogenic carbon in the product.

Results per declared unit		
BIOGENIC CARBON CONTENT	**UNIT**	**QUANTITY**
Medium biogenic carbon contained in the product	kg C	0,0
Medium biogenic carbon contained in the packaging	kg C	0,0

LCA Information

DECLARED UNIT	1 metric ton of ore concentrate with powder format
SYSTEM LIMITS	From “Cradle to gate” with options, module C1-C4, module D and optional modules
REFERENCE SERVICE LIFE (RSL)	Reference life depends on the project
CUTTING RULES	At least 99% of energy consumption is considered for manufacturing facilities 99% of the raw material is considered in mass. The following processes have been excluded: - Manufacture of equipment used in production, buildings or any other equipment; - Transport of personnel to the plant; - Transport of personnel within the plant; - Research and development activities; - Long-term emissions.
ASSIGNMENTS	Whenever possible, allocations have been avoided. For cases where it has not been possible, a physical assignment based on mass is made. The data referring to the composition of the system have been obtained directly and have been analyzed following the principles of *modularity* and *polluter pays*.
GEOGRAPHICAL COVERAGE	Global
PERIOD	2021
LCA SOFTWARE USED FOR CALCULATION	Ecoinvent 3.8 with database Simapro 9.3.0.2 used for LCS calculations. The LCA methods used are in accordance with the UNE-EN 15804 Standard: EN 15804:2012 + A2:2019

Data quality

The data collected for components and energy correspond to the year 2021 and include data on raw materials consumed and energy consumption. The plausibility and consistency of the data collected has been verified. It can therefore be considered a good quality of data.
Flows related to the construction of production plants, application machines or the transport of employees have not been considered in the calculation of the LCA of the system.

Other information:

This LCA has been carried out by **SGS TECNOS S.A.U**. Material and energy consumption bills have been collected and checked. The study covers at least 95% of the materials and energy per module and at least 99% of the total material and energy use of each unit process.

Lifecycle and compliance:

This EPD includes the stages shown in Table 1. This statement is of the type from “Cradle to gate” with options, module C1-C4, module D and optional modules.

This statement may not be comparable with those developed in other programs or in accordance with different reference documents; in particular, it may not be comparable with Declarations not prepared in accordance with UNE-EN 15804 Standard: EN 15804:2012 + A2:2019. Similarly, environmental claims may not be comparable if the source of the data is different, the same information modules are not included, or they are not based on the same scenarios.

Board 3 : System limits. X: Declared module; GLO: Global; ~~BA~~: Republic of Srpska; MND: undeclared module; EU: Europe.

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transportation	Manufacturing	Transportation	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transportation	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	S4	D
Modules declared	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Geography	BA	BA	BA	EU	ND	ND	ND	ND	ND	ND	ND	ND	ND	GLO	ND	GLO	GLO
Specific data used	>90% GWP-GHG					-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	2 products to analyze					-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	1 production center					-	-	-	-	-	-	-	-	-	-	-	-

Life cycle stages

Understanding System Limits: "Cradle to gate" with options, module C1-C4, module D and optional modules.

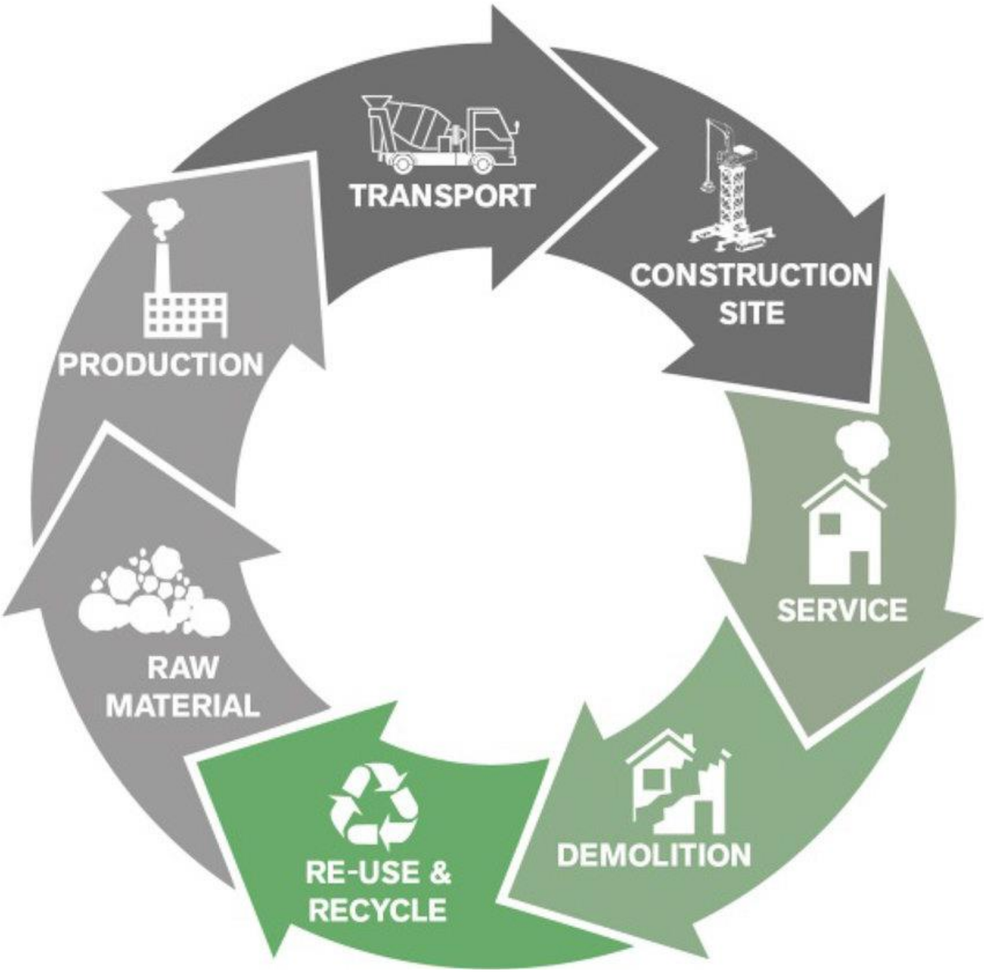

Figure 1: Stages of the life cycle of a product according to the analysis from "Cradle to gate" with options, module C1-C4, module D and optional modules.

Product Stage A1 - A3

Description of the stage:

The product stage of the Zinc and Lead concentrate range is subdivided into modules A1 supply of raw materials, A2 transport to the manufacturer and A3 manufacturing. The grouping of these three modules is a possibility contemplated by the UNE-EN 15804:2012 + A2:2019 standard that applies in this EPD.

A1 Supply of Raw Materials

This module refers to the extraction and pre-processing of the raw materials and energy sources used in the manufacture of the products that make up the system. This module begins with the extraction of the ore, starting with specialized heavy equipment and machinery, such as shovel loaders, haul trucks and dump trucks, which transport the ore to the transport the ore to the facilities for processing.

A2 Transport

This module includes the transport of raw materials to the manufacturing plant. For this module, a Euro VI lorry is used as transport. Where no supplier data are available, 1000 km is used.

A3 Manufacturing

This module mainly covers energy consumption during the manufacture of the product, as well as the manufacture of the product. Stage A3, corresponding to manufacturing. The Ore processing begins with:

1. Crushing and screening of ore

The ore is brought from the pit by wagons and emptied into receiving bunkers, from where it is extracted using a feeder with an eccentric and added through a stationary grate to a jaw crusher. Primary crushed ore falls on inclined conveyors that bring it to screening. The over-mesh products of the vibrating screen are crushed in cone crushers, and the under-mesh products of the vibrating screens are added to the common collecting inclined conveyor with the help of short horizontal conveyors, together with the products of the cone crushers and taken off on the horizontal - inclined conveyor. This conveyor further transports the ore to the crushed ore bunkers.

2. Grinding and grading (classification) of ore

Grinding and grading of ore is done in three identical sections. Grinding is two-stage in rod and ball mills, with ball mills operating in a closed circuit with hydrocyclones. From the crushed ore bunker using a belt feeder, the ore is fed to the rod mill, where water and the necessary reagents are added. The output from the rod mill goes into the cyclone pump box, from where, together with the ball mill output, the pulp is taken to the hydrocyclone battery by the cyclone pump. The sand from the hydrocyclone is returned to the ball mill for grinding, and the overflow from the hydrocyclone is sent to lead mineral flotation. A pulp sampler is placed on the overflow of the hydrocyclone of each section, which takes a sample of the pulp at the entrance to the lead mineral flotation. The processing capacity and the amount of processed ore in the grinding phase is regulated and registered by the system of automatic control and regulation of ore dosing to the mills. This system of automatic control and regulation in the grinding system provides a set amount of processing capacity independent of the change in the granulometric characteristics and physical properties of the ore. Pulp is a suspension of water, reagents and ore.

3. Flotation of lead minerals

Flotation of lead minerals is carried out in three sections, two of which are identical. In the old section, basic and control flotation and purification of lead and zinc minerals is carried out in mechanical flotation machines. In the new sections, which are identical, basic and control flotation of lead and zinc minerals is carried out in pneumomechanical flotation machines, and purification in mechanical flotation machines. The essence of the process is that lead minerals are concentrated in the first stage, and zinc minerals in the second stage.

4. Flotation of zinc minerals

The flotation swell goes to a two-stage conditioning, then from the conditioner to the basic zinc mineral flotation, where the coarse zinc concentrate is taken to a three-stage purification, and the swell to the zinc control flotation. After purification, the concentrate is taken to thickening, and the control flotation of zinc is taken as definitive tailings to the flotation landfill, and solutions of appropriate reagents are added to the zinc at the appropriate places (foamer, zinc collector, zinc activator, pH regulator...).

5. Dewatering of the concentrate

Definitive concentrates are free-falling to thickeners. Thickened material ie. lead concentrate, as well as zinc with 50% solids, is pumped to a disk vacuum filter. Each filter is equipped with a receiver, dripper, compressed air blower, vacuum pump and filter pump.
The cake of lead concentrate with 7 - 8% moisture and zinc concentrate with 9 - 10% moisture falls into special concentrate warehouses from where it is loaded into trucks with a loader and sent further for metallurgical processing.

6. Disposal of flotation tailings

The sediment of zinc flotation, as the definitive tailings of flotation, with all wastewaters from operations: crushing, grinding, flotation, dewatering, preparation and dissolution of reagents, as well as side activities are drained into the box of tailings pumps. From the box, the tailings in the form of a suspension are transported by pipes and pumps to the flotation disposal site. Hydrocyclones are located at the flotation disposal site, with the help of which the pulp is separated into sand and overflow (with a smaller amount of suspension). The sand of the hydrocyclone is used to upgrade the crown of the flotation landfill, and the overflow of the hydrocyclone goes into the sedimentation lake of the landfill. In the sedimentation lake, the finest particles are deposited, and the clarified water passes into another sedimentation lake, from where it is taken and introduced into flotation as technological water.

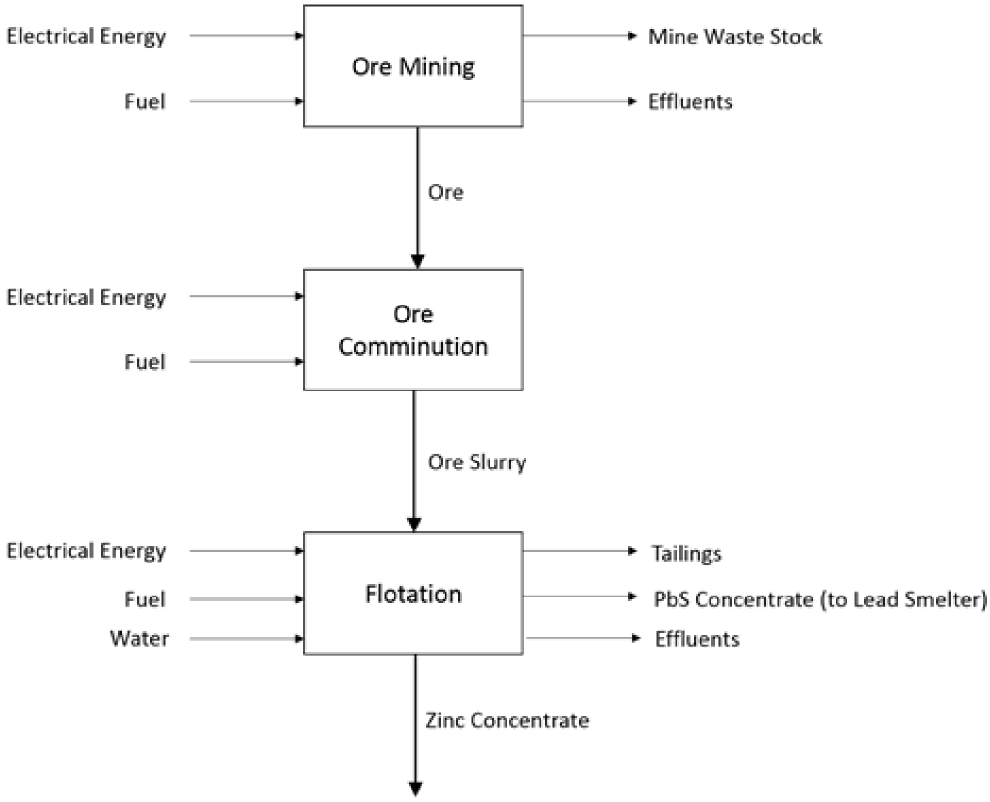

Figure 2: Simplified flow scheme of ore processing.

The origin of the energy used in the manufacturing plant is Serbian electricity mix defined in Ecoinvent 3.8. This module considers the waste and wastage produced during the production process as well as the packaging necessary to transport the product.

Construction process stage A4 - A5

Description of the stage:

The construction process stage of the Zinc and Lead concentrate is subdivided into modules A4 transport to the site and A5 installation.

A4 Transport to the construction site

This module covers the transport of system components from the production site to the application site, including the possibility of intermediate storage. An average distance of transport is estimated depending on the destination of the product.

The transport is calculated based on a scenario whose characteristic parameters are described in the following table.

PARAMETER	VALUE (expressed by Declared unit)
Fuel consumption of the vehicle or means of transport used	Truck with an average load of 16-32 t (Euro 6)
Distance	204 km
Bulk density of the transported product	N.A.
Utilization of load capacity (in volume, including return of unloaded transport)	% assumed in the Ecoinvent database
Load capacity utilization factor, in volume	1 (default)
Fuel consumption of the vehicle or means of transport used	Railway
Distance	1052 km
Bulk density of the transported product	N.A.
Utilization of load capacity (in volume, including return of unloaded transport)	% assumed in the Ecoinvent database
Load capacity utilization factor, in volume	1 (default)

Figure 3: **Stage A4.**

A5 Installation

This module covers the application of the product on site. As the applications of the product depend on the type of use and manufacture of the components and this is not under the control of the MINECO GROSS company, this module has not been included in the life cycle.

Stage of Use (excluding possible savings) B1 - B7

Description of the stage:

This stage refers to the operation of the building including any emission to the environment caused by the use of the product (module B1) or by subsequent technical operations: maintenance (B2), repair (B3), replacement (B4) or rehabilitation (B5).

- B1: Emissions of volatile organic compounds into the environment of the applied product are considered irrelevant.
- B2-B5: The performance of the product under consideration makes it possible to conclude that its service life equals or exceeds the useful life of the building. Once applied, the components of the system do not require technical actions or operations until the end-of-life stage, so it is considered that the product does not generate environmental loads at this stage.

The use stage also includes the use of energy in service (module B6) and the use of water in service (module B7).

- B6, B7: The product does not use water or electricity during the operational life of the building. And the energy savings and emissions derived from the insulating properties of the system have not been accounted for.

End of life stage, C1 - C4

Description of the stage:

This phase consists of the modules related to the end of useful life, C1 to C4, detailed below:

- C1 Deconstruction, demolition: As the demolition and/or dismantling of the product is part of the demolition of the building itself, it is assumed that the environmental impact is extremely low and therefore can be disregarded.
- C2 Transport: Includes the transfer of construction waste from the construction site to the waste treatment point.
- C3 Waste treatment: Includes the reuse, recovery and/or recycling of waste. The product is not destined for recovery or recycling.
- C4 Waste disposal: It is assumed that 100% of the waste is taken to a controlled landfill.

PARAMETER	VALUE (expressed by declared unit)	
Collection process (mixed with the rest of the RCDs)	ZINC	1
	LEAD	1
Recovery system	0%	
Disposal (in landfill)	ZINC	100%
	LEAD	100%
Transport assumptions for scenario development	Medium load truck 16-32 t (euro 6)	
Distance to recovery center	50km	

Figure 4: Stage C1-C4

Reuse/recovery/recycling potential, D

Module D declares the environmental benefits resulting from the reuse and recycling of products, as well as energy recovery.

In this module, no savings have been computed because of the recycling carried out throughout the life cycle. Nor have benefits derived from the waterproofing granted by the product been computed.

In this EPD the avoided environmental loads are considered because of the recycling carried out throughout the life cycle of the product, however, there is no recycling of products in this module and all the product is taken to landfill so it has been considered that the environmental benefit is 0.

Environmental impacts of ore concentrate

The results of the LCA are detailed in the tables on the following pages together with the interpretation of the global impacts produced per declared unit (1 metric ton of ore concentrate with powder format). In this case, the environmental results of the Zinc concentrate are shown, subsequently, in annex I the impacts for the rest of the concentrates declared in this EPD are shown. Estimated impact results are only relative statements that do not indicate the endpoints of impact categories, exceedance of threshold values, safety margins or risks

To perform the LCA, the Simapro 9.3.0.2 software has been used, together with the Ecoinvent 3.8 database.

Impact models have been used:

- CML-IA baseline V3.07/ EU25.
- ReCiPe 2016 Midpoint (H) V1.06 / World (2010) H.
- EDIP 2003 V1.07 / Default.
- Cumulative Energy Demand V1.11
- EF 3.0 Method (adapted) V1.02 / EF 3.0 normalization and weighting set.
- IPCC 2021 GWP100 V1

POTENTIAL ENVIRONMENTAL IMPACTS OF ZINC CONCNETRATE

Parameters		Product Stage	Construction Process Stage		Stage of use							End of life stage				Module D
		A1 / A2 / A3	A4 Transport	A5 Installation	B1 Usage	B2 Maintenance	B3 Repair	B4 Replacement	B5 Rehabilitation	B6 In-service power usage	B7 Use of water in service	C1 Deconstruction / demolition	C2 Transport	C3 Waste treatment	C4 Waste disposal	D Reuse Potential Recovery and Recycling
Global Warming Potential, GWP - *kg CO_2 eq (NA)*	Fossil- *kg CO_2 Eq*	2,30E+03	6,77E-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	8,14E+00	ND	2,52E+00	ND
	Biogenic- *kg CO_2 Eq*	4,46E+00	5,85E-05	ND	ND	ND	ND	ND	ND	ND	ND	ND	7,03E-03	ND	7,82E-03	ND
	Land use and transformation- *kg CO_2 Eq*	8,21E-01	2,71E-05	ND	ND	ND	ND	ND	ND	ND	ND	ND	3,26E-03	ND	6,39E-05	ND
	TOTAL– *kg CO_2 Eq*	2,31E+03	6,78E-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	8,15E+00	ND	2,52E+00	ND
Stratospheric Ozone Layer (ODP) Depletion Potential	*kg CFC11 eq (NA)*	2,87E-04	1,57E-08	ND	ND	ND	ND	ND	ND	ND	ND	ND	1,89E-06	ND	5,22E-07	ND
Acidification potential of soil and water resources, (AP)	*mol H+ eq (NA)*	1,51E+01	1,92E-04	ND	ND	ND	ND	ND	ND	ND	ND	ND	2,31E-02	ND	2,59E-02	ND
Eutrophication potential, Fraction of nutrients that reach fresh water as a final compartment (EP-freshwater) *(NA)*	*KG PO_4 Eq*	7,18E-01	1,48E-06	ND	ND	ND	ND	ND	ND	ND	ND	ND	1,78E-04	ND	2,78E-05	ND
	kg P eq	2,34E-01	4,83E-07	ND	ND	ND	ND	ND	ND	ND	ND	ND	5,81E-05	ND	9,06E-06	ND

Eutrophication potential, Fraction of nutrients that reach seawater as a final compartment (EP-marine)	***- kg N eq (NA)***	1,75E+00	3,82E-05	ND	ND	ND	ND	ND	ND	ND	ND	ND	4,59E-03	ND	1,13E-02	ND
Eutrophication potential, Accumulated excess (EP-terrestrial)	***mol N eq (NA)***	2,03E+01	4,26E-04	ND	ND	ND	ND	ND	ND	ND	ND	ND	5,12E-02	ND	1,24E-01	ND
Tropospheric Ozone Formation Potential (POCP)	***kg NMVOC eq (NA)***	5,76E+00	1,64E-04	ND	ND	ND	ND	ND	ND	ND	ND	ND	1,97E-02	ND	3,44E-02	ND
Potential for abiotic resource depletion for non-fossil resources (ADP - minerals &metals)	***kg Sb eq (2)***	1,05E+00	2,40E-07	ND	ND	ND	ND	ND	ND	ND	ND	ND	2,89E-05	ND	1,25E-07	ND
Potential for depletion of abiotic resources for fossil resources (ADP - fossil)	***MJ, net calorific value (2)***	2,70E+04	1,03E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	1,23E+02	ND	3,35E+01	ND
Water (use) potential weighted and water consumption (WDP)	***m^3 depriv. (2)***	5,56E+02	3,13E-03	ND	ND	ND	ND	ND	ND	ND	ND	ND	3,76E-01	ND	1,46E-02	ND

Disclaimer-(1)- This impact category mainly refers to the eventual impact of low doses of ionizing radiation on the human health of the nuclear fuel cycle. It does not take into account the effects due to possible nuclear accidents, occupational exposure or underground radioactive waste disposal facilities. Potential ionizing radiation from soil, radon, and some building materials is also not measured by this indicator.
Disclaimer-(2)- The results of this environmental impact indicator should be used with caution, as uncertainties about these results are high or experience with the indicator is limited.

POTENTIAL ENVIRONMENTAL IMPACTS OF ZINC CONCNETRATE ADDITIONAL AND MANDATORY IMPACTS																
Parameters		Product Stage	Construction Process Stage		Stage of use							End of life stage				Module D
		A1 / A2 / A3	A4 Transport	A5 Installation	B1 Usage	B2 Maintenance	B3 Repair	B4 Replacement	B5 Rehabilitation	B6 In-service power usage	B7 Use of water in service	C1 Deconstruction /	C2 Transport	C3 Waste treatment	C4 Waste disposal	Reuse Potential Recovery and Recycling
GWP –GHG²	**kg CO2 eq**	2,30E+03	6,76E-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	8,13E+00	ND	2,49E+00	ND

Disclaimer-(1)- This impact category mainly refers to the eventual impact of low doses of ionizing radiation on the human health of the nuclear fuel cycle. It does not take into account the effects due to possible nuclear accidents, occupational exposure or underground radioactive waste disposal facilities. Potential ionizing radiation from soil, radon, and some building materials is also not measured by this indicator.
Disclaimer-(2)- The results of this environmental impact indicator should be used with caution, as uncertainties about these results are high or experience with the indicator is limited.

POTENTIAL ENVIRONMENTAL IMPACTS OF ZINC CONCNETRATE ADDITIONAL AND VOLUNTARY IMPACTS

Parameters		Product Stage	Construction Process Stage		Stage of use							End of life stage				Module D
		A1 / A2 / A3	A4 Transport	A5 Installation	B1 Usage	B2 Maintenance	B3 Repair	B4 Replacement	B5 Rehabilitation	B6 In-service power usage	B7 Use of water in service	C1 Deconstruction / demolition	C2 Transport	C3 Waste treatment	C4 Waste disposal	D Reuse Potential Recovery and Recycling
Potential incidence of PM (PM) emission diseases	disease inc. (NA)	7,05E-05	5,44E-09	ND	ND	ND	ND	ND	ND	ND	ND	ND	6,54E-07	ND	6,94E-07	ND
Potential human exposure efficiency relative to U235 (IRP)	*kBq U-235 eq (1)*	1,08E+02	4,46E-03	ND	ND	ND	ND	ND	ND	ND	ND	ND	5,36E-01	ND	1,41E-01	ND
Potential comparative toxic unit for humans (HTP-c)	*CTUh (2)*	2,24E+05	8,06E-01	ND	ND	ND	ND	ND	ND	ND	ND	ND	9,69E+01	ND	1,70E+01	ND
Potential comparative toxic unit for humans (HTP-nc)	*CTUh (2)*	9,70E-06	2,59E-11	ND	ND	ND	ND	ND	ND	ND	ND	ND	3,12E-09	ND	2,03E-10	ND
Potential comparative toxic unit for ecosystems	*CTUe (2)*	1,78E-04	8,15E-10	ND	ND	ND	ND	ND	ND	ND	ND	ND	9,79E-08	ND	2,53E-08	ND
Potential soil quality index (SQP)	*Pt (2)*	1,29E+04	7,16E-01	ND	ND	ND	ND	ND	ND	ND	ND	ND	8,60E+01	ND	4,13E+01	ND

Disclaimer-(1)- This impact category mainly refers to the eventual impact of low doses of ionizing radiation on the human health of the nuclear fuel cycle. It does not take into account the effects due to possible nuclear accidents, occupational exposure or underground radioactive waste disposal facilities. Potential ionizing radiation from soil, radon, and some building materials is also not measured by this indicator.
Disclaimer-(2)- The results of this environmental impact indicator should be used with caution, as uncertainties about these results are high or experience with the indicator is limited.

ZINC CONCNETRATE RESOURCE USAGE

Parameters		Product Stage	Construction Process Stage		Stage of use							End of life stage				Module D
		A1 / A2 / A3	A4 Transport	A5 Installation	B1 Usage	B2 Maintenance	B3 Repair	B4 Replacement	B5 Rehabilitation	B6 In-service power usage	B7 Use of water in service	C1 Deconstruction / demolition	C2 Transport	C3 Waste treatment	C4 Waste disposal	D Reuse Potential Recovery and Recycling
Primary energy resources - Renewables	**Used as an energy source *MJ, net calorific value***	1,65E+03	1,47E-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	1,76E+00	ND	1,55E-01	ND
	Used as raw material *MJ, net calorific value*	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	ND	0,00E+00	ND
	TOTAL *MJ, net calorific value*	1,65E+03	1,47E-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	1,76E+00	ND	1,55E-01	ND
Primary energy resources - Non-renewable	**Used as an energy source *MJ, net calorific value***	2,90E+04	1,09E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	1,31E+02	ND	3,56E+01	ND
	Used as raw material - *MJ, net calorific value*	3,28E+01	0,00E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	ND	0,00E+00	ND

	TOTAL *MJ, net calorific value*	2,91E+04	1,09E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	1,31E+02	ND	3,56E+01	ND
Secondary materials	*kg*	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	ND	0,00E+00	ND
Renewable secondary fuels	*MJ, net calorific value*	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	ND	0,00E+00	ND
Non-renewable secondary fuels	*MJ, net calorific value*	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	ND	0,00E+00	ND
Net freshwater use	*m³*	1,68E+01	1,16E-04	ND	ND	ND	ND	ND	ND	ND	ND	ND	1,40E-02	ND	7,52E-04	ND

CATEGORY OF ZINC CONCNETRATE WASTE

Parameters		Product Stage	Construction Process Stage		Stage of use							End of life stage				Module D
		A1 / A2 / A3	A4 Transport	A5 Installation	B1 Usage	B2 Maintenance	B3 Repair	B4 Replacement	B5 Rehabilitation	B6 In-service power usage	B7 Use of water in service	C1 Deconstruction / demolition	C2 Transport	C3 Waste treatment	C4 Waste disposal	Reuse Potential Recovery and Recycling
Hazardous waste disposed of	*kg*	2,68E-01	2,68E-06	ND	ND	ND	ND	ND	ND	ND	ND	ND	3,22E-04	ND	8,45E-05	ND
Non-hazardous waste disposed of	*kg*	1,25E+02	5,38E-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	6,46E+00	ND	9,99E+02	ND
Radioactive waste disposed of	*kg*	1,35E-01	6,94E-06	ND	ND	ND	ND	ND	ND	ND	ND	ND	8,34E-04	ND	2,31E-04	ND

OTHER ZINC CONCNETRATE OUTPUT FLOWS

Parameters		Product Stage	Construction Process Stage		Stage of use							End of life stage				Module D
		A1 / A2 / A3	A4 Transport	A5 Installation	B1 Usage	B2 Maintenance	B3 Repair	B4 Replacement	B5 Rehabilitation	B6 In-service power usage	B7 Use of water in service	C1 Deconstruction / demolition	C2 Transport	C3 Waste treatment	C4 Waste disposal	Reuse Potential Recovery and Recycling
Components for reuse	*kg*	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	ND	0,00E+00	ND
Material for recycling	*kg*	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	ND	0,00E+00	ND
Materials for energy recovery (energy recovery)	*kg*	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	ND	0,00E+00	ND
Energy exported, electricity	*Mj*	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	ND	0,00E+00	ND
Exported energy, thermal	*Mj*	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	ND	0,00E+00	ND

Interpretation of LCA

The following graphs allow to determine which stages of the Life Cycle have the greatest impact on the selected environmental indicators.

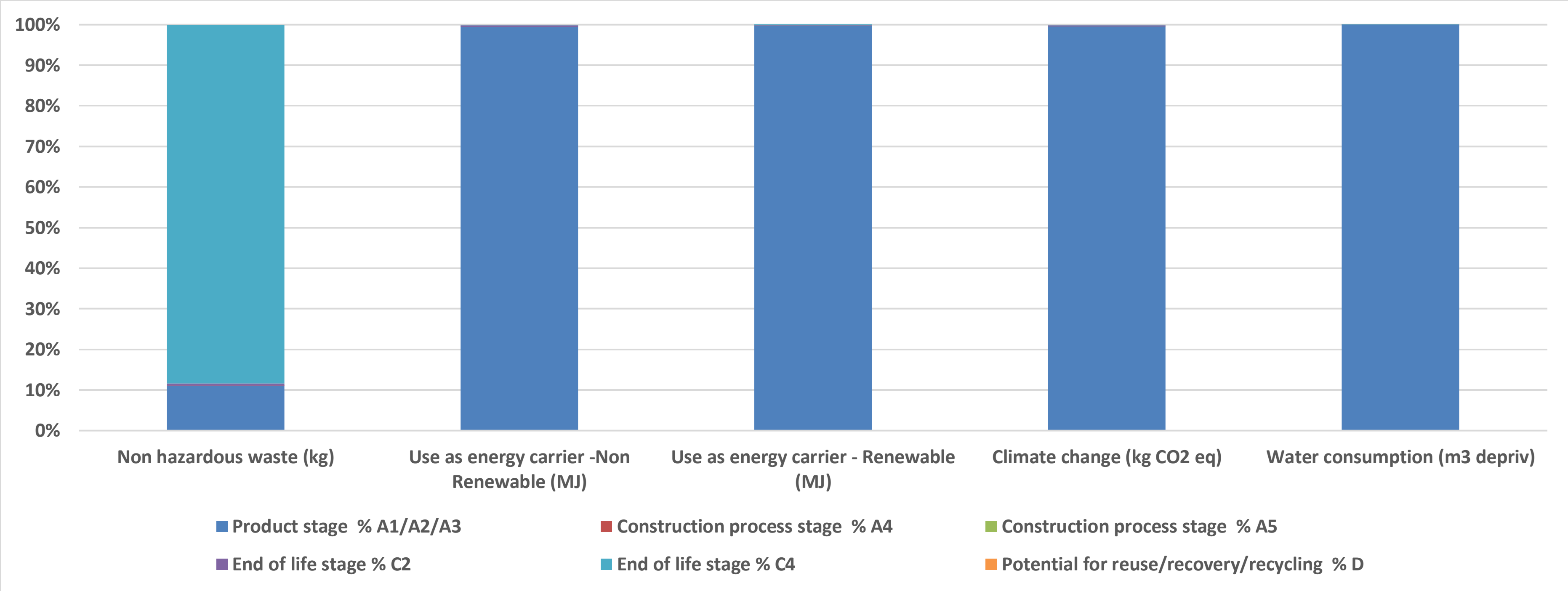

Figure 5: Environmental impacts of Zinc Concentrate.

Health Information

View the safety data sheets for system components.
Base Metal Mining and Smelting from Mineco (minecogroup.com)

Positive contributions to the environment

In MINECO GROUP – GROSS DOO GRADIŠKA PJ SREBRENICA, an international group focused on the natural resources sector., in addition to committing ourselves to comply with the policy of quality, environmental management and health and safety, linked to our management system, we show a firm commitment to the environment and develop our products thinking about a sustainable and efficient future, betting on R&D, one of our hallmarks.
For more information go to: **Свjетски дан заштите животне средине 2022. године | Gross d.o.o. Gradiška (gross-doo.com); СВЈЕТСКИ ДАН ЗАШТИТЕ ЖИВОТНЕ СРЕДИНЕ 2021. ГОДИНЕ | Gross d.o.o. Gradiška (gross-doo.com); Završen prvi rudarsko-geološki forum Republike Srpske „Srebrenica 2015“ | Gross d.o.o. Gradiška (gross-doo.com)**

The development of zinc and lead concentrates makes it possible from an environmentally friendly point of view to obtain pure metals (99.99%) for the metal processing industry, battery production, metal surface protection, medicine, special industries, the automotive industry, shipbuilding, etc.

Information relating to the EPD sector

This EDP is a statement of ore concentrate product line (ZINC and LEAD concentrate)

Origin of the information

Ambit: Serbia

Period: 2021

The information has been obtained from the Ecoinvent 3.8 databases and/or from the suppliers of raw materials

Raw Materials	Generic databases, and information from suppliers or producer associations
Production	Own data
Transport	Generic or specific information
Application	Generic or specific information
Life in Use	Generic information
End of Life	Generic information
Energy	Specific information

References

1. ISO 14020:2000: Environmental labels and declarations — General principles
2. ISO 14025:2006, Environmental labels and declarations – Type III environmental declarations – Principles and procedures (2010).
3. ISO 14040, Environmental Management – Life Cycle Analysis – Principles and Framework (2006).
4. ISO 14044:2006, Environmental Management – Life Cycle Assessment – Requirements and Guidelines (2006).
5. PCR 2019:14 Construction products - version 1.11 CEN (2019): EN 15804:2012+A2:2019, Sustainability of construction works – Environmental product declarations – Core rules for product category of construction products)
6. General Programme Instructions of the International EPD® System. Version 3.01.
7. LCA Zinc and Lead year 2022 v1.

ANNEXES

ANNEX I. LEAD impacts

Parameters		Product Stage	Construction Process Stage		Stage of use							End of life stage				Module D
		A1 / A2 / A3	A4 Transport	A5 Installation	B1 Usage	B2 Maintenance	B3 Repair	B4 Replacement	B5 Rehabilitation	B6 In-service power usage	B7 Use of water in service	C1 Deconstruction / demolition	C2 Transport	C3 Waste treatment	C4 Waste disposal	D Reuse Potential Recovery and Recycling
Global Warming Potential, GWP - ***kg CO_2 eq (NA)***	**Fossil-** ***kg CO_2 Eq***	1,77E+03	6,77E-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	8,14E+00	ND	2,52E+00	ND
	Biogenic- ***kg CO_2 Eq***	2,29E+00	5,85E-05	ND	ND	ND	ND	ND	ND	ND	ND	ND	7,03E-03	ND	7,82E-03	ND
	Land use and transformation- ***kg CO_2 Eq***	4,71E-01	2,71E-05	ND	ND	ND	ND	ND	ND	ND	ND	ND	3,26E-03	ND	6,39E-05	ND
	TOTAL– ***kg CO_2 Eq***	1,77E+03	6,78E-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	8,15E+00	ND	2,52E+00	ND
Stratospheric Ozone Layer (ODP) Depletion Potential	***kg CFC11 eq (NA)***	1,96E-04	1,57E-08	ND	ND	ND	ND	ND	ND	ND	ND	ND	1,89E-06	ND	5,22E-07	ND
Acidification potential of soil and water resources, (AP)	***mol H+ eq (NA)***	1,31E+01	1,92E-04	ND	ND	ND	ND	ND	ND	ND	ND	ND	2,31E-02	ND	2,59E-02	ND

Eutrophication potential, Fraction of nutrients that reach fresh water as a final compartment (EP-freshwater) *(NA)*	***KG PO_4 Eq***	6,90E-01	1,48E-06	ND	ND	ND	ND	ND	ND	ND	ND	ND	1,78E-04	ND	2,78E-05	ND
	kg P eq	2,25E-01	4,83E-07	ND	ND	ND	ND	ND	ND	ND	ND	ND	5,81E-05	ND	9,06E-06	ND
Eutrophication potential, Fraction of nutrients that reach seawater as a final compartment (EP-marine)	***kg N eq (NA)***	1,45E+00	3,82E-05	ND	ND	ND	ND	ND	ND	ND	ND	ND	4,59E-03	ND	1,13E-02	ND
Eutrophication potential, Accumulated excess (EP-terrestrial)	***mol N eq (NA)***	1,70E+01	4,26E-04	ND	ND	ND	ND	ND	ND	ND	ND	ND	5,12E-02	ND	1,24E-01	ND
Tropospheric Ozone Formation Potential (POCP)	***kg NMVOC eq (NA)***	4,76E+00	1,64E-04	ND	ND	ND	ND	ND	ND	ND	ND	ND	1,97E-02	ND	3,44E-02	ND
Potential for abiotic resource depletion for non-fossil resources (ADP - minerals &metals)	***kg Sb eq (2)***	1,02E+00	2,40E-07	ND	ND	ND	ND	ND	ND	ND	ND	ND	2,89E-05	ND	1,25E-07	ND
Potential for depletion of abiotic resources for fossil resources (ADP -fossil)	***MJ, net calorific value (2)***	2,07E+04	1,03E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	1,23E+02	ND	3,35E+01	ND
Water (use) potential, weighted and water consumption (WDP)	***m^3 depriv. (2)***	4,49E+02	3,13E-03	ND	ND	ND	ND	ND	ND	ND	ND	ND	3,76E-01	ND	1,46E-02	ND

Disclaimer-(1)- This impact category mainly refers to the eventual impact of low doses of ionizing radiation on the human health of the nuclear fuel cycle. It does not consider the effects due to possible nuclear accidents, occupational exposure or underground radioactive waste disposal facilities. Potential ionizing radiation from soil, radon, and some building materials is also not measured by this indicator.
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POTENTIAL ENVIRONMENTAL IMPACTS OF LEAD CONCENTRATE ADDITIONAL AND MANDATORY IMPACTS

Parameters		Product Stage	Construction Process Stage		Stage of use							End of life stage				Module D
		A1 / A2 / A3	A4 Transport	A5 Installation	B1 Usage	B2 Maintenance	B3 Repair	B4 Replacement	B5 Rehabilitation	B6 In-service power usage	B7 Use of water in service	C1 Deconstruction / ...	C2 Transport	C3 Waste treatment	C4 Waste disposal	Reuse Potential Recovery and Recycling
GWP –GHG2	**kg CO2 eq**	1,77E+03	6,76E-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	8,13E+00	ND	2,49E+00	ND

Disclaimer-(1)- This impact category mainly refers to the eventual impact of low doses of ionizing radiation on the human health of the nuclear fuel cycle. It does not consider the effects due to possible nuclear accidents, occupational exposure or underground radioactive waste disposal facilities. Potential ionizing radiation from soil, radon, and some building materials is also not measured by this indicator.
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POTENTIAL ENVIRONMENTAL IMPACTS OF LEAD CONCENTRATE ADDITIONAL AND VOLUNTARY IMPACTS																
Parameters		Product Stage	Construction Process Stage		Stage of use							End of life stage				Module D
		A1 / A2 / A3	A4 Transport	A5 Installation	B1 Usage	B2 Maintenance	B3 Repair	B4 Replacement	B5 Rehabilitation	B6 In-service power usage	B7 Use of water in service	C1 Deconstruction /	C2 Transport	C3 Waste treatment	C4 Waste disposal	D Reuse Potential Recovery and Recycling
Potential incidence of PM (PM) emission diseases	disease inc. (NA)	5,69E-05	5,44E-09	ND	ND	ND	ND	ND	ND	ND	ND	ND	6,54E-07	ND	6,94E-07	ND
Potential human exposure efficiency relative to U235 (IRP)	*kBq U-235 eq (1)*	7,94E+01	4,46E-03	ND	ND	ND	ND	ND	ND	ND	ND	ND	5,36E-01	ND	1,41E-01	ND
Potential comparative toxic unit for humans (HTP-c)	*CTUh (2)*	2,09E+05	8,06E-01	ND	ND	ND	ND	ND	ND	ND	ND	ND	9,69E+01	ND	1,70E+01	ND
Potential comparative toxic unit for humans (HTP-nc)	*CTUh (2*	9,22E-06	2,59E-11	ND	ND	ND	ND	ND	ND	ND	ND	ND	3,12E-09	ND	2,03E-10	ND
Potential comparative toxic unit for ecosystems	*CTUe (2)*	1,69E-04	8,15E-10	ND	ND	ND	ND	ND	ND	ND	ND	ND	9,79E-08	ND	2,53E-08	ND
Potential soil quality index (SQP)	*Pt (2)*	1,16E+04	7,16E-01	ND	ND	ND	ND	ND	ND	ND	ND	ND	8,60E+01	ND	4,13E+01	ND

Disclaimer-(1)- This impact category mainly refers to the eventual impact of low doses of ionizing radiation on the human health of the nuclear fuel cycle. It does not take into account the effects due to possible nuclear accidents, occupational exposure or underground radioactive waste disposal facilities. Potential ionizing radiation from soil, radon, and some building materials is also not measured by this indicator.
Disclaimer-(2)- The results of this environmental impact indicator should be used with caution, as uncertainties about these results are high or experience with the indicator is limited.

USE OF LEAD CONCENTRATE RESOURCES

Parameters		Product Stage	Construction Process Stage		Stage of use							End of life stage				Module D
		A1 / A2 / A3	A4 Transport	A5 Installation	B1 Usage	B2 Maintenance	B3 Repair	B4 Replacement	B5 Rehabilitation	B6 In-service power usage	B7 Use of water in service	C1 Deconstruction	C2 Transport	C3 Waste treatment	C4 Waste disposal	D Reuse Potential Recovery and Recycling
Primary energy resources - Renewables	**Used as an energy source *MJ, net calorific value***	1,48E+03	1,47E-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	1,76E+00	ND	1,55E-01	ND
	Used as raw material *MJ, net calorific value*	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	ND	0,00E+00	ND
	TOTAL *MJ, net calorific value*	1,48E+03	1,47E-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	1,76E+00	ND	1,55E-01	ND
Primary energy resources - Non-renewable	**Used as an energy source *MJ, net calorific value***	2,24E+04	1,09E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	1,31E+02	ND	3,56E+01	ND

	Used as raw material - ***MJ, net calorific value***	3,28E+01	0,00E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	ND	0,00E+00	ND
	TOTAL ***MJ, net calorific value***	2,24E+04	1,09E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	1,31E+02	ND	3,56E+01	ND
Secondary materials	***kg***	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	ND	0,00E+00	ND
Renewable secondary fuels	***MJ, net calorific value***	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	ND	0,00E+00	ND
Non-renewable secondary fuels	***MJ, net calorific value***	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	ND	0,00E+00	ND
Net freshwater use	***m^3***	1,39E+01	1,16E-04	ND	ND	ND	ND	ND	ND	ND	ND	ND	1,40E-02	ND	7,52E-04	ND

CATEGORY OF LEAD CONCENTRATE WASTE																
Parameters		Product Stage	Construction Process Stage		Stage of use							End of life stage				Module D
		A1 / A2 / A3	A4 Transport	A5 Installation	B1 Usage	B2 Maintenance	B3 Repair	B4 Replacement	B5 Rehabilitation	B6 In-service power usage	B7 Use of water in	C1 Deconstructio	C2 Transport	C3 Waste treatment	C4 Waste disposal	Reuse Potential Recovery and Recycling
Hazardous waste disposed of	*kg*	9,47E-02	2,68E-06	ND	ND	ND	ND	ND	ND	ND	ND	ND	3,22E-04	ND	8,45E-05	ND
Non-hazardous waste disposed of	*kg*	8,72E+01	5,38E-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	6,46E+00	ND	9,99E+02	ND
Radioactive waste disposed of	*kg*	9,53E-02	6,94E-06	ND	ND	ND	ND	ND	ND	ND	ND	ND	8,34E-04	ND	2,31E-04	ND

OTHER LEAD CONCENTRATE OUTPUT FLOWS

Parameters		Product Stage	Construction Process Stage		Stage of use							End of life stage				Module D
		A1 / A2 / A3	A4 Transport	A5 Installation	B1 Usage	B2 Maintenance	B3 Repair	B4 Replacement	B5 Rehabilitation	B6 In-service power usage	B7 Use of water in service	C1 Deconstruction / demolition	C2 Transport	C3 Waste treatment	C4 Waste disposal	Reuse Potential Recovery and Recycling
Components for reuse	***kg***	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	ND	0,00E+00	ND
Material for recycling	***kg***	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	ND	0,00E+00	ND
Materials for energy recovery (energy recovery)	***kg***	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	ND	0,00E+00	ND
Energy exported, electricity	***MJ***	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	ND	0,00E+00	ND
Exported energy, thermal	***MJ***	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	ND	0,00E+00	ND

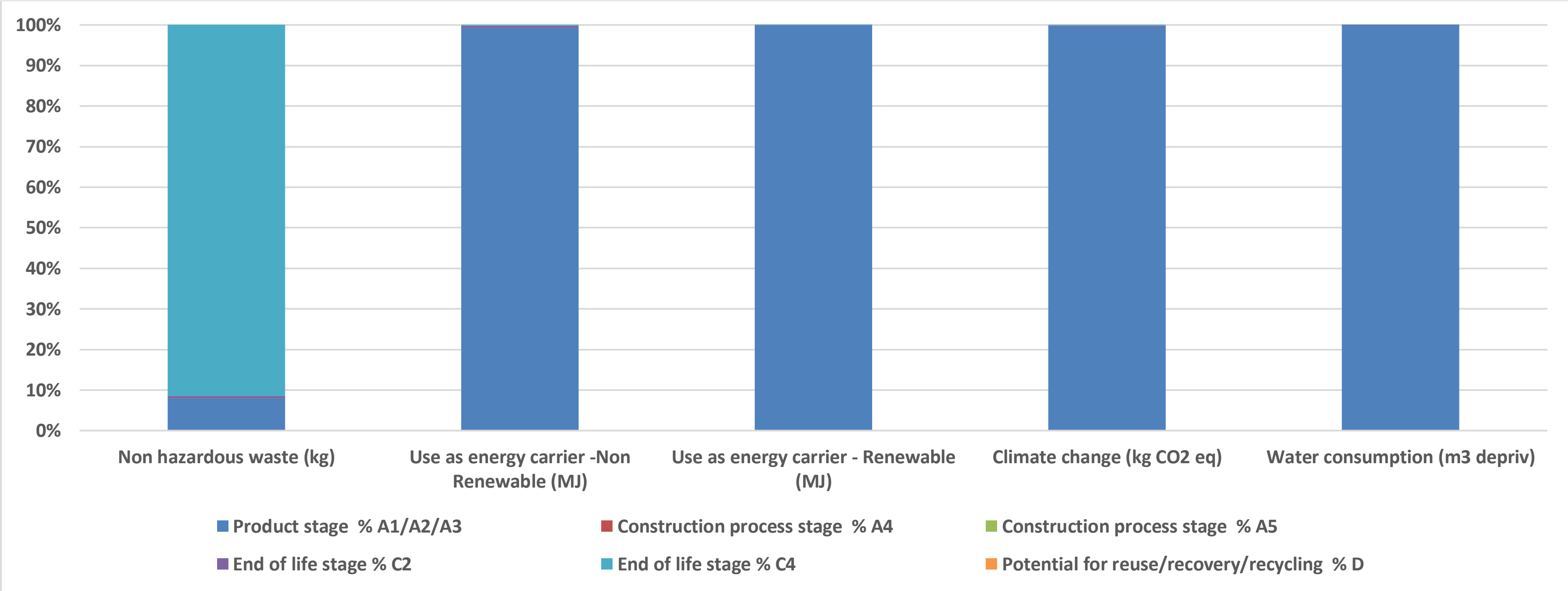

Figure 8: LEAD impacts.