GlobalEPD

A VERIFIED ENVIRONMENTAL DECLARATION

AENOR

Long products of hot rolled structural non-alloy steel coming from electric furnace: wire rod intended for the production of cold formed wire for reinforcing and pre-stressing steel for concrete

Environmental Product Declaration

EN ISO 14025:2010
UNE 36904-1:2018
EN 15804:2012+A1:2013

Publication date: 2020-07-31
Modification date: 2025-07-30
Expiry date: 2025-10-31

GlobalEPD Code: 001-001 rev1

Asociación Sostenibilidad Siderúrgica

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The holder of this EPD is responsible for its content, as well as for keeping the supporting documentation that justifies the data and statements included during the validity period

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AENOR is a founding member of ECO Platform, the European Association of Verification Programs for Environmental Product Declarations

UNE 36904-1:2018
The European Standard EN 15804:2012+A1:2013 serves as the basis for the PCR

Independent verification of the Declaration and data, according to EN ISO 14025:2010

☐ Internal ☑ **External**

Verification body
AENOR
Product certification body accredited by ENAC with accreditation No. 1/C-PR468

1 General information

1.1. Organisation carrying out the EPD

Sostenibilidad Siderúrgica is an associative and non-profit entity whose members are the main Spanish steel companies.

Sostenibilidad Siderúrgica aims to promote Corporate Social Responsibility strategies, in a coordinated manner among all associated companies, with the clear reference of serving as support to the interests of the members of this organisation, in their business trajectory, in their interlocution with different sectors business and with the different Administrations.

Sostenibilidad Siderúrgica wants to become a meeting point for joint actions between Public Administrations, Private Institutions, Companies and the rest of Economic, Social and Trade Union Agents.

The main objectives of Sostenibilidad Siderúrgica are:

• Maintain and strengthen cooperation among its members.

• Promote the concept of sustainability in the steel sector.

• Creation of a Sustainability Brand.

• Represent and defend the common interests of the members.

• Promotion of steel certification techniques.

• Collaborate with the different Public Administrations and private Institutions in order to promote good practices in the steel sector.

• Boost and promotion of the Spanish presence in international forums.

• Organize activities to achieve the objectives of the association.

This sectoral Environmental Product Declaration (EPD) has been prepared by the Spanish Association for Sustainable Steel "Sostenibilidad Siderúrgica" for the following organisations:

• A.G. Siderúrgica Balboa, S.L., Alfonso Gallardo Group. Jerez de los Caballeros, Badajoz (Spain).

• Celsa Atlantic, S.L., Celsa Group. Laracha, La Coruña (Spain).

• Cía. Española de Laminación, S.L. – CELSA, Celsa Group. Castellbisbal, Barcelona (Spain).

• Global Steel Wire S.A., Celsa Group. Santander, Cantabria (Spain).

• SN Seixal, S.A., Megasa Group. Seixal (Portugal).

1.2. Scope

This EPD describes environmental information regarding the production life cycle stages from cradle to factory gate with options, i.e. A1, A2, A3, A4 and D, of steel wire rod.

The function performed by the product system studied is the production of wire rod as an intermediate product used in the manufacture of drawn wires for reinforcing steel and wires for pre-stressing steel for concrete structures.

1.3. Life cycle and compliance

This EPD has been developed and verified in accordance with EN ISO 14025:2010, EN 15804:2012+A1:2013 and UNE 36904-1:2018 Standards.

UNE 36904-1:2018 standard has been prepared by the technical committee CTN 36 Siderurgia (Iron and steel) of UNE.

This EPD includes the following life cycle stages: A1 to A3, A4 and D. Therefore, this EPD is of the cradle-to-gate type with options.

Subsequent processing, assembly and/or installation are outside the scope of this EPD.

This EPD may not be comparable with those developed in other Programs or according to different reference documents; in particular, it may not be comparable with EPDs not developed and verified in accordance with the EN 15804 Standard.

Similarly, EPDs may not be comparable if the origin of the data is different (for example, databases), not all relevant information modules are included, or they are not based on the same scenarios.

Product stage	A1	Raw material supply	X
	A2	Transport	X
	A3	Manufacturing	X
Const. stage	A4	Transport to construction work	X
	A5	Construction Installation process	MNE
Use stage	B1	Use	MNE
	B2	Maintenance	MNE
	B3	Repair	MNE
	B4	Replacement	MNE
	B5	Refurbishmentg	MNE
	B6	Operational energy use	MNE
	B7	Operational water use	MNE
End of life stage	C1	De-construction / demolition	MNE
	C2	Transport	MNE
	C3	Waste processing	MNE
	C4	Disposal	MNE
	D	Benefits and loads beyond the system boundary	X

X = Information module included in LCA/EPD
MNE = Module not evaluated

Table 1. System boundaries. Information modules considered

1.4. EPD Representativity

Steel production of the participating steel mills represents more than 90% of the market for wire rod in Spain and Portugal.

2 Product

2.1. Product identification

This sectoral EPD applies to wire rod (long product of structural hot rolled non-alloy steel for construction coming from electric furnace) intended for reinforcing and pre-stressing steel for concrete structures. CPC code 4124.

Wire rod is a hot rolled product with a solid circular, elliptical or polygonal cross-section.

Wire rod is supplied in the rough for rolling, in coils of one single length, coiled in not-aligned turns than can be de-coiled normally during subsequent transformations.

2.2. Product application

Wire rod is a semi-finished product that undergoes subsequent processes of cold forming (drawing, stretching or rolling) to produce plain or ribbed wire intended for reinforcing and pre-stressing steel for concrete.

Wire rod for standard welded fabric is used to produce plain and ribbed wire for reinforcement for concrete: reinforcing steel (welded fabrics and lattice girders).

Wire rod for pre-stressing steel is used to produce high-yield-strength wire for wires and strands for pre-stressed concrete.

2.3. Product composition

Steel is composed mainly of iron (over 95 %), with a small content of carbon (usually less than 2 %) and a very small content of other materials (see EN 10020 Definition and classification of grades of steel). The minimum levels of composition for certain elements that define non-alloy steel are found in the standard EN 10020.

The chemical composition and properties of the steel product are established in the following product standards:

- UNE 36066, Non-alloy steel wire rod used for cold forming of plain or ribbed wire for the reinforcement of concrete.
- EN ISO 16120-1, Non-alloy steel wire rod for conversion to wire - Part 1: General requirements.
- EN ISO 16120-4, Non-alloy steel wire rod for conversion to wire - Part 4: Specific requirements for wire rod for special applications.

None of the components of steel as a final product are included in the "List of Candidate Substances of Very High Concern subject to authorization".

3 LCA Information

3.1. Life cycle analysis

This EPD is based on a Life Cycle Assessment "cradle to gate with options" complying with the recommendations and requirements of the international standards ISO 14040:2006 and ISO 14044:2006. As Product Category Rule (PCR) of reference, the European Standard EN 15804:2012+A1:2013 and UNE 36904-1:2018 have been used.

The life cycle analysis report for the sectoral EPD has been prepared by the company Abaleo S.L. and completed in June 2019.

The specific data of the steel production process used in the LCA study come from the steel involved in the elaboration of this EPD and correspond to the production data for the years 2016 and 2017.

For the selection of non-specific data (e.g.: raw material production), the Ecoinvent 3.5 database (November 2018) was used.

SimaPro 9.0.0.30 tool was used to create the model and for calculating. The methodology used for the impact assessment is the CML-IA baseline V3.05 / EU25+3. The global warming potential has been assessed using the EF Method 2.0 V1.00 / Global (2010) / with tox categories methodology.

3.2. Functional or declared unit

The declared unit is the production of 1000 kg (1 ton) of steel product.

3.3. Reference Service Life (RSL)

Steel product Reference Service Life (RSL): Unspecified, as this EPD is cradle to gate with options.

3.4. Allocation and cutoff criteria

Allocation rule applied:

• When possible, the product system has been expanded to avoid assigning environmental impacts to the co-products of multi-output unit processes, within the main process.

• When it has not been possible to avoid the assignment, an assignment of the inputs and outputs of the system has been made, based on mass.

The cut-off criterion is 1% of the use of renewable and non-renewable primary energy; and 1% of the total incoming mass, in a determined unit process. The total of the input flows not considered per module must be a maximum of 5% of the energy use and mass.

As a general rule, the gross weight/volume of all materials used in the steel rod production process has been included, so that at least 99% of the total weight of the products used for the declared unit has been included. There has been no exclusion of energy consumption.

3.5. Representativity, quality and selection of data

To model the wire rod manufacturing process, the production data of the iron and steel mills that are part of this sectoral EPD for the years 2016 and 2017 have been used. From these mills, the data of material and energy consumption, air emissions, discharges and waste generation have been obtained. With this information, the LCA of the wire rod production has been developed, differentiating the phases:

• A1, extraction and processing of the raw materials used to manufacture the wire rod.

• A2, transport of raw materials to the mill.

• A3, wire rod manufacturing.

• A4, transport of the final product to the construction site.

• D, benefits and loads beyond the system.

All the data used in the LCA relating to the production of wire rod have been provided by the mills participating in this sectoral EPD. When necessary, the Ecoinvent 3.5 database (November 2018) was used, which is the most updated version available at the time of performing the LCA.

For the election of the most representative processes, the following criteria have been applied:

• Representative data of the technological development applied in the manufacturing processes. If no information is available, a representative data of an average technology has been chosen.

• Average European data.

• Most up-to-date data as possible.

All the LCA data has been processed with the SimaPro 9.0.0.30 software, which is the most up-to-date version available at the time of the LCA. With this software the LCA has been modeled and the environmental impact categories requested by the PCR have been calculated.

To assess the quality of the primary data used in the LCA of wire rod production, the semi-quantitative evaluation criteria of data quality are applied, proposed by the European Union in its Guide to the Environmental Footprint of Products and Organisations. The results obtained are the following:

• Very good integrity: more than 90% of the materials and inputs to the system are covered. Rating 1.

• Reasonable methodological suitability and coherence: Approach based on the attributive process and fulfilment of the two methodological requirements of the HAP Guide: treatment of multifunctionality; system boundary. Rating 3.

• Very good temporal representation: 12 months of production process data, from the years 2016 and 2017, which are representative years of the sector's production; the data for obtaining raw materials comes from the Ecoinvent 3.5 database, updated in November 2018, which is the most up-to-date possible. Rating 1.

• Very good technological representativity: most of the data comes from the facilities themselves, which represent almost the entire sector; others come from the Ecoinvent 3.5 database, updated in November 2018, which has very updated generic processes. Rating 1.

• Good geographic representativity: most of the data is from the facilities themselves, which represent almost the entire sector; others come from the Ecoinvent 3.5 database, updated in November 2018, which has regionalized processes. Rating 1.

• Low data uncertainty: most of the data is from the facility itself; others come from the Ecoinvent 3.5 database, of renowned prestige, updated in November 2018, which has generic processes with low uncertainties. Rating 2.

The uncertainty of the data is considered low for the following reasons:

- The data on the weights and quantities of the materials and water used have been obtained directly from the facilities of the iron and steel industries that participate in this sectoral EPD, which have advanced production management systems.

- The energy consumption data is obtained from an external source, whose trust is guaranteed by being backed by the national metrology system.

- The well water consumption data is controlled by its own meters.

Consequently, the data on the materials used and on energy and water consumption are accurate. When it has been necessary to make assignments, weight-based assignment has been applied, which is the first criterion recommended in PCR; and that it has also been considered adequate by the production managers of the facilities that have collaborated in the study.

According to the previous data, the Data Quality Rating (DQR) takes the following value: 9/6 = 1.5, which indicates that the data quality level is excellent.

To better understand the data evaluation carried out, the rating for each of the criteria varies from 1 to 5 (the lower the rating, the higher the quality) and following table is applied to obtain the final rating:

Data quality rating (DQR)	Overall quality level of data
≤ 1,6	Excelent quality
1,6 a 2,0	Very good quality
2,0 a 3,0	Good quality
3,0 a 4,0	Reasonable quality
> 4,0	Insufficient quality

Overall data quality level based on the obtained data quality rating

4 System boundaries, scenarios and additional technical information

4.1. Processes prior to manufacturing (upstream) and product manufacturing (A1-A3)

A1 Production of raw materials

This sectoral EPD applies to wire rod (long product of structural hot rolled non-alloy steel for construction coming from electric furnace). The raw material is mostly steel scrap (>85%), together with small quantities of pig iron (<2%) and direct-reduced iron (<3%) as additional iron provision. Other raw materials used (<10 %) in the manufacturing of steel are lime (quicklime and dolomitic lime), coal, ferro-alloys, fluorite and calcium carbide.

This information module includes the manufacturing of raw and ancillary materials covering:

• Extraction of resources.

• Transport to the steel mill / production centers.

• Energy and fuel consumption.

• Consumption of other resources (e.g. water).

• The generation of waste, air emissions and release into water and soil.

This information module also includes the previous treatment that steel scrap undergoes to be suitable for steelmaking in the following processes: transport to steel mills, classification by quality classes and compaction.

Steel scrap can be classified in base of its origin as pre-consumer and post-consumer:

• Pre-consumer scrap: Steel scrap produced during the manufacturing of steel parts and components such as machine shavings, tools, press and guillotine cuttings, etc.

• Post-consumer scrap: Steel scrap coming from the dismantling of steel structures of buildings, industrial plants, ships, automobiles, home appliances, etc.

60.95% of the scrap consumed to manufacture this product is post-consumer and 39.05% is pre-consumer.

A2 Transport of raw material to mill

The transport of all raw and ancillary materials has been taken into account from the production sites (suppliers) to the steel mills. In each case, the different types of transport have been considered, whether boat, truck or train. The internal transport within the steel mills has also been taken into consideration.

A3 Manufacturing

The manufacturing process has two clearly differentiated parts:

• The electric furnace steelmaking process in which the steel is produced and refined to achieve the appropriate chemical composition for the product and in which billet (semi-finished) is produced through a continuous casting process.

• The hot rolling of billets which produces the end product. The final performance characteristics are reached by thermo-mechanical processes.

In this stage the following are considered: consumption of materials (including ancillary materials), energy consumption, release into water and soil due to the manufacturing process, and waste that is generated in this life cycle stage.

As a result of this manufacturing process some products like slag, mill dust and rolling scabs are generated and are either sold or given away for another use.

4.2. Transport and construction process (A4-A5)

A4 Transport to the place of use

The transport of manufactured products (wire rod) has been taken into account, from the production sites (suppliers) to the facilities where they are used. In each case, the different types of transport have been considered, whether boat, truck or train.

4.3. Benefits and loads beyond the building system boundaries

Module D: Potential for reuse, recovery and recycling

Wastes sent for recovery for later use have been considered:

• Steel, 100% recycled at the end of its service life.

• Steel mill dust, valued to recover its high zinc content by replacing the use of zinc of natural origin.

• Furnace refractories, valued as aggregates for various uses, mainly in the manufacture of concrete and as an aggregate for civil construction.

• Rolling scabs, mainly made up of iron and iron oxides, are used as counterweights, substituting the use of primary iron.

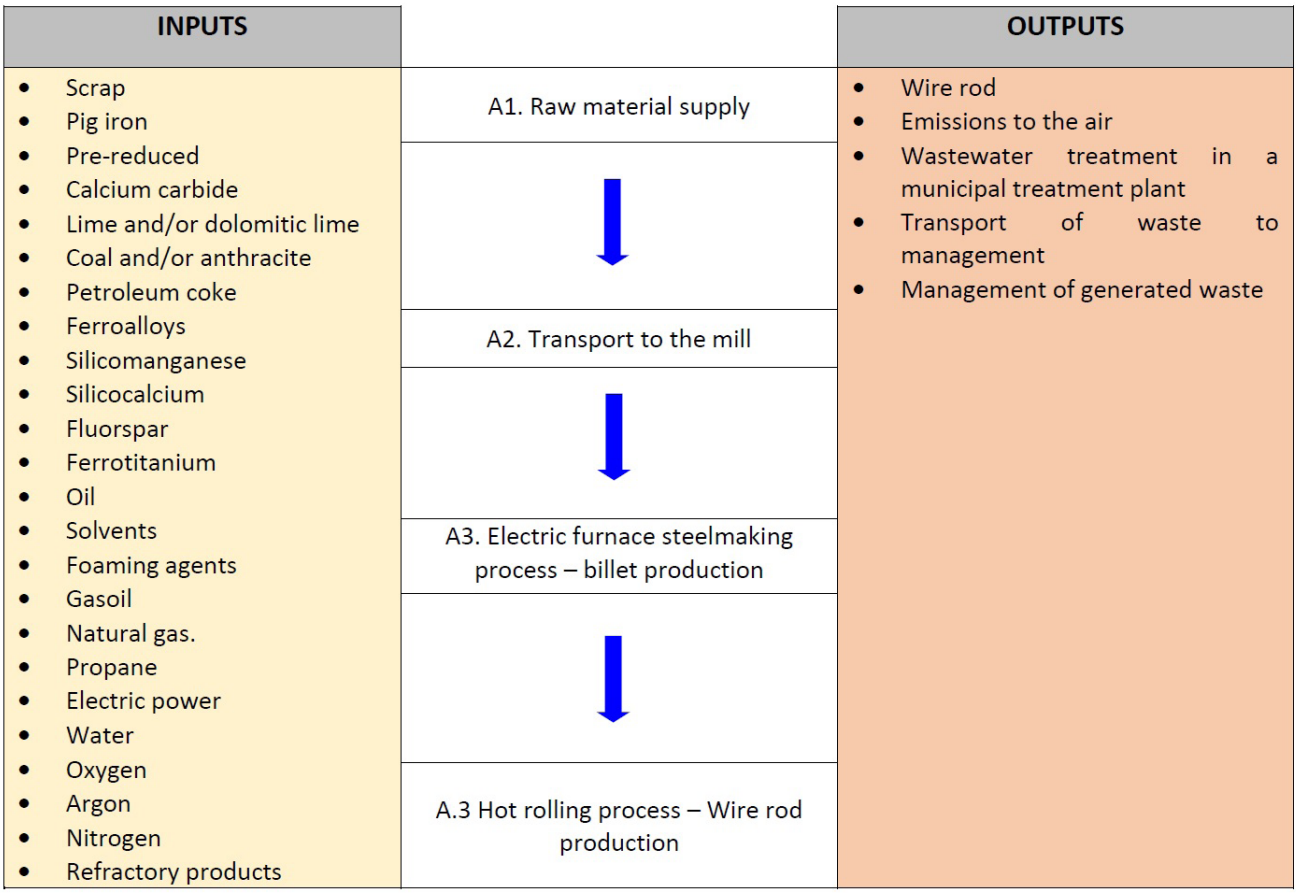

Figure 1. Wire rod production process diagram

5 Declaration of environmental parameters derived from LCA and LCI

The following tables include the averaged data of the LCA parameters.

	A1	A2	A3 EAF steelmaking	A3 hot-rolling	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP	524,85	77,73	244,17	157,76	19,46	MNE	MNE	MNE	MNE	MNE	MNE	MNE	MNE	MNE	MNE	MNE	MNE	-50,09
ODP	3,55E-05	1,44E-05	4,86E-05	2,91E-05	3,56E-06													-5,09E-06
AP	2,21	7,75E-01	2,13	5,52E-01	1,09E-01													-2,93E-01
EP	3,43E-01	8,33E-02	2,94E-01	6,08E-02	1,30E-02													-1,63E-01
POCP	3,14E-01	2,62E-02	1,02E-01	2,49E-02	4,14E-03													-1,98E-02
ADPE	6,09E-03	1,54E-07	1,91E-03	8,34E-06	3,78E-08													-1,18E-02
ADPF	5.653,37	1.116,39	4.338,45	3.505,03	275,39													-579,20

GWP *[kg CO_2 eq]* Global warming potential

ODP *[kg CFC-11 eq]* Ozone depletion potential

AP *[kg SO_2 eq]* Acidification potential of soil and water

EP *[kg $(PO_4)^{3-}$ eq]* Eutrophication potential

POCP *[kg etileno eq]* Photochemical ozone formation potential

ADPE *[kg Sb eq]* Abiotic depletion potential for non-fossil resources

ADPF *[MJ]* Abiotic depletion potential for fossil resources

Table 2. Parameters describing environmental impacts as defined in EN 15804 standard

	A1	A2	A3 EAF steelmaking	A3 hot-rolling	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PERE	380,61	2,59	1.623,69	506,87	0,68	MNE	MNE	MNE	MNE	MNE	MNE	MNE	MNE	MNE	MNE	MNE	MNE	-53,60
PERM	0,00	0,00	0,00	0,00	0,00													0,00
PERT	380,61	2,59	1.623,69	506,87	0,68													-53,60
PENRE	6.805,79	1.190,54	7.074,85	4.315,32	293,80													-706,38
PENRM	0,00	0,00	0,00	0,00	0,00													0,00
PENRT	6.805,79	1.190,54	7.074,85	4.315,32	293,80													-706,38
SM	1142,61	0,00	0,00	0,00	0,00													0,00
RSF	0,00	0,00	0,00	0,00	0,00													0,00
NRSF	0,00	0,00	0,00	0,00	0,00													0,00
FW	2,52	6,24E-02	2,09	1,02	1,54E-02													1,01

PERE	*[MJ]*	Use of renewable primary energy excluding renewable primary energy resources used as raw materials
PERM	*[MJ]*	Use of renewable primary energy used as raw materials
PERT	*[MJ]*	Total use of renewable primary energy
PENRE	*[MJ]*	Use of non-renewable primary energy, excluding non-renewable primary energy resources used as raw material
PERNRM	*[MJ]*	Use of non-renewable primary energy used as raw materials
PERNRT	*[MJ]*	Total use of non-renewable primary energy resources
SM	*[Kg]*	Use of secondary fuels
RSF	*[MJ]*	Use of renewable secondary fuels
NRSF	*[MJ]*	Use of non-renewable secondary fuels
FW	*[m³]*	Use of net freshwater resources

Table 3. Parameters describing the use of resources

	A1	A2	A3 EAF steelmaking	A3 hot-rolling	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
HWD	3,96E-02	2,09E-04	1,88E-02	4,23E-03	5,07E-05	MNE	MNE	MNE	MNE	MNE	MNE	MNE	MNE	MNE	MNE	MNE	MNE	-3,52E-03
NHWD	9,10E-03	2,80E-04	1,63E-03	5,34E-05	5,80E-05													-7,52E-03
RWD	1,88E-02	8,12E-03	4,54E-02	8,42E-03	2,00E-03													-1,82E-03
CRU	0,00	0,00	0,00	0,00	0,00													0,00
MFR	0,00	0,00	0,00	0,00	0,00													0,00
MER	0,00	0,00	0,00	0,00	0,00													0,00
EE	0,00	0,00	0,00	0,00	0,00													0,00
EET	0,00	0,00	0,00	0,00	0,00													0,00

HWD	*[kg]*	Hazardous waste disposed
NHWD	*[kg]*	Non-hazardous waste disposed
RWD	*[kg]*	Radioactive waste disposed
CRU	*[kg]*	Components for re-use
MFR	*[kg]*	Materials for recycling
MER	*[kg]*	Materials for energy recovery
EE	*[MJ]*	Exported energy
EET	*[MJ]*	Exported energy (thermal)

Table 4. Parameters describing output flows and waste categories

6 Additional environmental information

6.1. Indoor air emissions

The use of steel wire rod in construction products does not produce indoor air emissions during its service life.

6.2. Release into soil and water

The use of steel wire rod in construction products does not produce release into the soil or water during its service life.

6.3. Results of the ILCD 2011 Midpoint + methodology

As additional information, the results of applying the ILCD 2011 Midpoint + methodology have been calculated, defined in the Commission Recommendation (2013/179/EU) of April 9, 2013, on the use of common methods to measure and communicate environmental behavior of products and organisations throughout their life cycle, to the production of steel wire rod.

The calculation of these indicators, which are shown in the following table, is not part of the compliance with the UNE 36904-1:2018, EN 15804:2012+A1:2013 Standards.

Potential environmental impacts of 1 ton of product								
Impact category	**Unit**	A1-A3	A1	A2	A3 EAF steelmaking	A3 Hot rolling	A4	D
Climate change	kg CO2 eq	1001,39	494,73	77,17	265,98	163,51	19,34	-48,16
Ozone depletion	kg CFC-11 eq	1,28E-04	3,55E-05	1,44E-05	4,86E-05	2,91E-05	3,56E-06	-5,09E-06
Human toxicity, non-cancer effects	CTUh	8,20E-04	6,88E-04	7,34E-06	1,14E-04	1,04E-05	3,32E-06	-2,03E-05
Human toxicity, cancer effects	CTUh	2,99E-04	2,97E-04	4,93E-08	1,70E-06	3,63E-07	1,49E-08	-1,66E-06
Particulate matter	kg PM2.5 eq	8,25E-01	5,81E-01	4,90E-02	1,58E-01	3,63E-02	1,07E-02	-5,45E-02
Ionizing radiation HH	kBq U235 eq	82,80	19,06	4,96	47,98	10,81	1,23	-2,18
Ionizing radiation E (interim)	CTUe	6,33E-04	1,49E-04	3,52E-05	3,67E-04	8,19E-05	8,69E-06	-1,79E-05
Photochemical ozone formation	kg NMVOC eq	4,75	2,20	6,61E-01	1,56	3,25E-01	9,83E-02	-2,22E-01
Acidification	molc H+ eq	7,11	2,74	9,63E-01	2,68	7,17E-01	1,37E-01	-3,56E-01
Terrestrial eutrophication	molc N eq	15,94	6,22	2,52	5,40	1,80	3,73E-01	-7,09E-01
Freshwater eutrophication	kg P eq	9,28E-02	4,76E-02	9,30E-05	4,20E-02	2,98E-03	2,29E-05	-4,47E-02
Marine eutrophication	kg N eq	1,14	4,99E-01	2,27E-01	3,09E-01	1,03E-01	3,36E-02	-6,81E-02
Freshwater ecotoxicity	CTUe	3702,75	3328,40	140,58	213,72	20,05	68,29	-196,27
Land use	kg C deficit	512,80	166,37	4,94E-01	255,01	90,92	1,29E-01	-27,71
Water resource depletion	m3 water eq	2,75	5,89E-03	1,91E-02	1,91	8,18E-01	4,96E-03	1,11
Mineral, fossil & ren resource depletion	kg Sb eq	4,78E-02	3,46E-02	1,35E-05	1,27E-02	4,38E-04	3,34E-06	-8,41E-02

Table 5. Potential environmental impacts of 1 ton of product

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[6] Report on the Life Cycle Analysis for the wire rod EPD. Abaleo S.L. 2020.

[7] COMMISSION RECOMMENDATION, of April 9, 2013, on the use of common methods to measure and communicate the environmental behaviour of products and organisations throughout their life cycle (Published in OJEU on 05/04/2013).

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