Wire rod and galvanized wire from steel scrap

Environmental Product Declaration
In accordance with ISO 14025:2006 and EN 14804:2012

Programme:	The International EPD® System EPD registered through the fully aligned regional programme/hub: EPD Latin America
Programme operator:	EPD International AB Regional Hub: EPD Latin America
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Content

1. DEACERO

DEACERO is a world-class company that produces a wide range of steel products. Through productivity, excellence in quality and innovation in its products, as well as the focus on customer service, DEACERO has managed to meet the needs of local and international markets, positioning itself as a leader in the field.

DEACERO is a 100% Mexican company that has managed to transform and grow firmly to efficiently respond to the demands of an international market of high level of competition in more than 20 countries in America and Europe.

The quality of DEACERO is a tradition in the market, therefore, it has invested in more training, better products and in integrated production processes that allow serving the agricultural, industrial, construction and domestic sectors.

DEACERO conceives sustainability in its three dimensions: social, economic and environmental, in relation to the latter, it is a company that takes care of the environment of the communities through advanced water, air and soil protection systems. DEACERO conceives progress as productivity that develops with an ecological sense.

DEACERO is strongly committed to a sustainable strategy of growth that benefits the company, the environment, their employees and the communities in which operates. DEACERO is a fully integrated company with an infrastructure for recycling, processing waste, steel mills, finished product plants and distribution centers. As an organization DEACERO strives for physical health and implementation of values, smart use of natural resources, and stable growth together with their customers and suppliers. The company owns developments in advanced technology for steel recycling facilities and its transformation to finish products.

With its new steel plant and hot roll mills in Ramos Arizpe, Coahuila, Mexico. DEACERO has become a new source for customers seeking high quality bars, shapes and beams. DEACERO produces hot rolled ASTM-grade products including: ASTM A36 | ASTM A529-50 | ASTM A529-55 | ASTM A572-50 | ASTM A992 | 44 & 50W Canadian spec.

This Environmental Product Declaration (EPD) is in accordance with ISO 14025 and EN 15804, for Wire rod and galvanized wire from steel scrap.
EPD of constructions products may not be comparable if they do not comply with EN 15804 Sustainability of constructions works – Environmental product declarations – Core rules for product category of construction products.

Environmental product declarations within the same product category from different programs may not be comparable

2. General Information

Product	Wire rod and galvanized wire from steel scrap
Declaration owner	DEACERO S.A.P.I de CV Avenida Lázaro Cárdenas, Zona Loma Larga Oriente, San Pedro Garza García, Nuevo León, México. C.P. 66266 www.deacero.com Contact person: Daniel Armando Guajardo Hernández dguajardo@deacero.com
Description of the construction product	Wire rod- steel wire made with hot rolled carbon steel mainly used to form reinforcing steel elements and Galvanized wire- soft wire made of zinc-coated steel for multiple uses.
Declared Unit	One metric ton of wire rod One metric ton of galvanized wire
Construction product identification	Central Product Classification: CPC 4124 Bars and rods, hot rolled, of iron or steel
Description of the main product components and or materials	100% Steel manufactured using scrap steel as source of iron
Life cycle stages not considered	Distribution, use, end of life
Content of the declaration	This EPD is based on information modules that do not cover the aspects of use and end of life of the product. It contains in detail, for Module A1, A2 and A3: -Product definition and physical data -Information about raw materials and origin -Specifications on manufacturing the product -Notes on product processing -LCA based on a declared unit, cradle-to-gate -LCA results -Evidence and verifications
For more information consult	www.deacero.com/en/
Site for which this EPD is representative	Ramos Arizpe plant: Carretera a Monclova Km 4 #25000 tramo Santa Cruz - Ojo Caliente, Ramos Arizpe, Coahuila, C.P. 25903, México Saltillo plant: Autopista Monterrey - Saltillo Km 8.5 Ramos Arizpe, Coahuila, C.P. 25000, México
Public intended	B2B (Business to Business)

3. Product Description

This document applies to both products: wire rod and galvanized wire.

Wire rod

Carbon steel wire with a black annealed finish that is used either in building projects or industrial processes for several different purposes. It is manufactured with hot rolled carbon steel, in which its controlled cooling process allows a better behavior in subsequent processes. The wire rod for drawing is a black annealed carbon steel wire rod is used to manufacture other finished wires, wire products or finished goods formed with wire depending on each industrial process. Complies with ASTM-A-510. The wire rod for construction is used to form figures or elements of reinforcing steel, in mooring structures and steel enabled. Among its advantages are its smooth and flawless surface, high resistance to tension. Its main characteristics are that it is hot rolled and manufactured in different diameters and presentations. Complies with ASTM-A-510.

Galvanized wire

The carbon steel wire with galvanized finish (zinc coated) is obtained from the process of cold rolling or wire drawing of the wire rod. Its main characteristics are the galvanized by immersion with state-of-the-art technology, the uniform diameter, presentation in continuous rolls without cuts and it is manufactured in a wide variety of sizes. This product has wide applications in the industry among which is its use in electrical installations, temporary repairs, fastening in meshes and barbed wire, gardening, false skies, plumbing and installation of pipelines. Complies with ASTM-A-641. For more details visit: https://www.deacero.com

4. Content declaration

The wire rod manufactured by DEACERO are made of 100% low alloyed steel manufactured in electric arc furnace with 90.1 % of recycled material.

The typical composition of the low alloyed is presented in Table 1.

Table 1. Typical content of low-alloyed steel manufactured by DEACERO

Element	Typical content
Iron	94.6 %
Carbon	3.4 %
Manganese	1.4 %
Silicon	0.2 %
Phosphorus	0.1 %
Sulfur	< 0.1 %
Copper	0.3 %

The galvanized wire manufactured by DEACERO are made of wire rod with 90.1% of recycled material and zinc. The recycled material content of the galvanized wire is 84.9%

The typical composition of the galvanized wire is presented in Table 2.

Table 2. Typical content of galvanized wire manufactured by DEACERO

Element	Typical content
Wire rod	94 %
Zinc	6 %

5. LCA Rules

Environmental potential impacts were calculated according to EN 15804:2012 and PCR 2012:01 Construction products and construction services Version 2.2 (2017-05-30). This EPD is in accordance with ISO 14025:2006.

Environmental potential impacts were calculated through Life Cycle Assessment (LCA) methodology according to ISO 14040:2006 and ISO 14044:2006. An external third party critical review process of the LCA was conducted according to ISO/TS 14071:2014.

5.1 Declared unit

One metric ton of wire rod manufactured from steel scrap.

One metric ton of galvanized wire manufactured from steel scrap.

5.2 System boundary

This is a cradle to gate EPD. The following life cycle stages were considered:

A1 – Raw material supply.

A2 – Transport.

A3 – Manufacturing.

Description of the system boundary is in Table 3.

Table 3. Wire rod and galvanized wire product system

Environmental information in the life cycle of 1 wire rod and galvanized wire manufactured from 100% scrap							Additional environmental information
A1 - A3			A4 - A5		B1 - B7	C1 - C4	D
Product stage			Construction stage		Use stage	End-of-life stage	Reuse and recovery
A1	A2	A3	A4	A5	B1 - B7	C1 - C4	
Wire rod manufacturing. Generation of electricity and production and processing of natural gas used during manufacturing.	Transport of steel scrap, transport of other raw materials, transport of auxiliary inputs from the production site to the DEACERO plant and internal transports.	Production and consumption of auxiliary materials: oxygen, argon, nitrogen, oil, grease, etc. Waste transport and waste treatment. Emissions to air and water from the operations of DEACERO.	Product distribution	Construction and instalation	Use, maintenance, replacement, refurbishment on, repair, use of energy and water during the operation.	Demolition, deconstruc-tion, transport, waste processing and final disposal.	Reuse- recovery-recycling potential
X	X	X	MND	MND	MND	MND	MND
(Cradle-to-gate) Declared unit							

(X = included in LCA; MND = Module Not Declared).

5.3 Description of the manufacturing process

The manufacturing process is described in the following Figure 1:

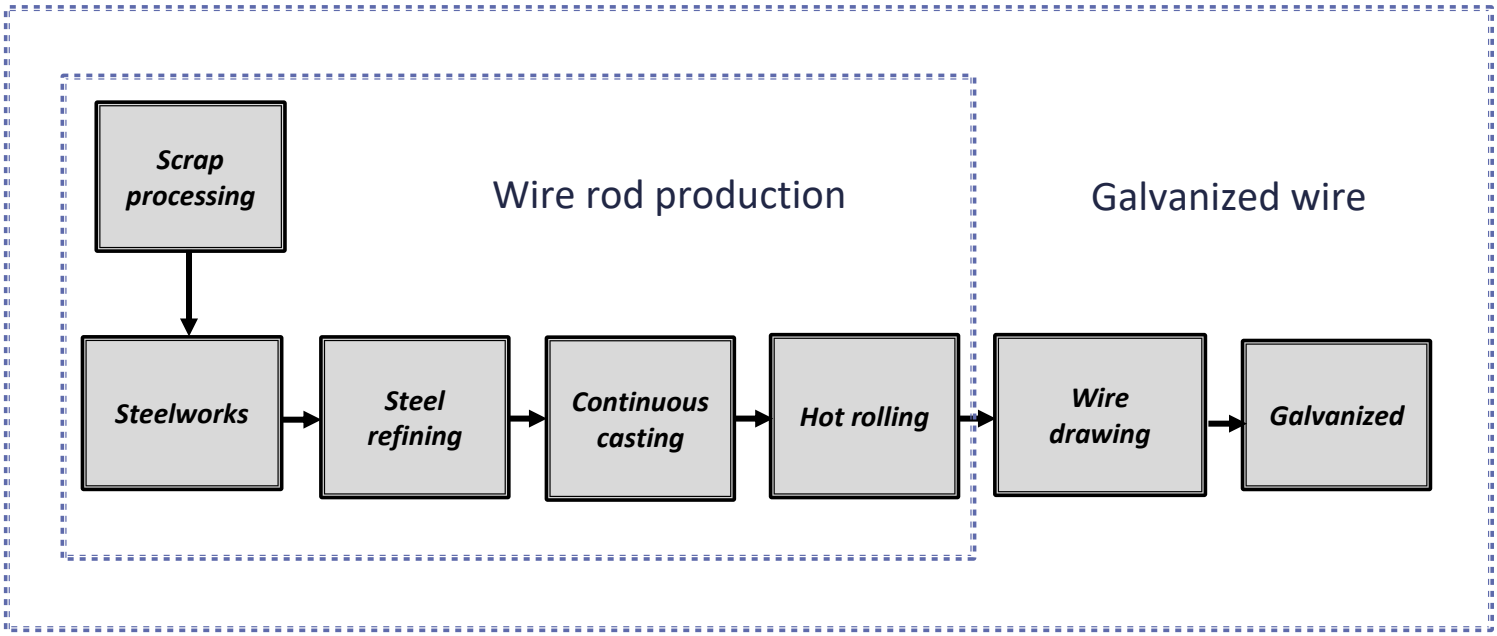

Figure 1. Flow diagram of wire rod and galvanized wire manufacturing process

5.4 Assumptions

Wire rod

- The scrap yard located in the municipality of Guadalupe, Nuevo León and owned by DEACERO, was considered the most representative for the collection and pre-processing of scrap. It is assumed that all scrap yards of suppliers work in the same way.
- Ferroalloys are obtained in polypropylene bags.
- Plastic waste is recycled in the same municipality.
- The consumption of nitrogen, argon and oxygen is the same as in the steel mill (Celaya, Gto) and comes from the same supplier.
- The performance of the steel mills of Ramos Arizpe, Coahuila and Celaya, Gto is the same.
- Hazardous waste is spent oil.
- Oil input added to complement the material balance.
- The diesel consumed at the Ramos Arizpe, Coahuila plant is obtained from the Cadereyta refinery, N.L.

- The natural gas consumed at the Ramos Arizpe plant in Coahuila comes from the gas processing complex Burgos, Tamaulipas.
- The diesel consumed in Ramos Arizpe is obtained from the Cadereyta refinery, N.L.
- The supplier of the treatment of hazardous waste for both plants mentioned is the same.

Galvanized wire

- Wire rod performance is the same as in 2014.
- Zinc consumption is the same as in 2014.
- The energy consumption for the galvanizing process is identical to 2014.
- The hazardous waste generated in the galvanized area is sent to confinement to the same supplier that the hazardous waste from the Ramos steelworks is sent.

5.5 Cut-off criteria

A minimum of 95% of the total flows (matter and energy) in the A1 and A3 modules were included. Company infrastructure, employee's transportation and administrative activities were kept out of the scope of this study.

5.6 Allocation

Allocation of inputs and outputs of the system between product and coproducts was based on a mass relation, considering the quantity produced per year of each product and coproduct at the level of unit process.

Table 4 and Table 5 shows the coproducts generated during wire rod and galvanized wire manufacturing.

Table 4. Coproduct generated in wire rod manufacturing.

Unit process	Coproduct
Steelworks	Slag
Hot rolling	Steel scale

Table 5. Coproduct generated in galvanized wire

Unit process	Coproduct
Galvanized	Zinc

The polluter pays principle was applied for the allocation procedure during recycling. In this way, in each case when there was an input of secondary material to the wire rod and galvanized wire product system, recycling process and transportation to the site were included in life cycle inventory (for example, steel scrap). In those cases, in which output of material to recycling were presented, material transportation to recycling plant was included. This principle was applied to plastic and metal containers recycled by a third party. For generic data Mexicaniuh and Ecoinvent 3.3 (Allocation - Recycled Content version) databases were used.

5.7 Time representativeness

Direct data obtained from DEACERO is representative for 2017.

5.8 Data quality assessment

Data quality assessment per information module is provided in Tables 6, 7 and 8.

Table 6. Raw material supply module data quality assessment

Data quality Data	*Time related coverage*	*Geographical coverage*	*Technological covegare*	*Data source*	*Measured or estimated*
Raw materials consumption	2017	Mexico	Modern	DEACERO	M
Transport distance of scrap to DEACERO scrap yard	2017	Mexico	Modern	DEACERO	M
Consumption of energy and materials for the processing of scrap in scrap yards, as well as waste and generated emissions	2017	Mexico	Modern	DEACERO	M
Consumption of energy by type for the manufacturing process	2017	Mexico	Modern	DEACERO	M
Consumption of fuels and emissions related to the generation and distribution of electricity in Mexico	2017	Mexico	Mexican energy mix	Mexicaniuh	M&E
Energy consumption and generation of emissions related to natural gas production in Mexico	2017	Mexico	Mexican context	Mexicaniuh	M&E
Consumption of energy and materials for the manufacture of raw materials for the steelworks and galvanized	1990-2016	European mix	Modern	Ecoinvent 3.3	M&E

Table 7. Transportation module data quality assessment

Data quality **Data**	***Time related coverage***	***Geographical coverage***	***Technological covegare***	***Data source***	***Measured or estimated***
Transport distance of scrap and other raw materials	2017	Mexico	Not Applicable	DEACERO	M
Transport distance of auxiliary supplies	2017	Mexico	Not Applicable	DEACERO	M
Transport distance of maintenance materials	2017	Mexico	Not Applicable	DEACERO & Google Maps	M
Transport distance of natural gas	2017	Mexico	Not Applicable	DEACERO & Google Maps	M&E
Production and transport of diesel for internal transport	2017	Mexico	Not Applicable	DEACERO & Google Maps	M&E
Consumption of materials and energy and emissions related to the transport requirements of raw materials and auxiliary inputs.	1992-2014	World average based on Europe	World average based on Europe	Ecoinvent 3.3	M&E

Table 8. Manufacture module data quality assessment

Data quality **Data**	**Time related coverage**	**Geographical coverage**	***Technological covegare***	***Data source***	***Measured or estimated***
Production efficiency and generation of by-products.	2017	Mexico	Modern	DEACERO	M
Consumption of auxiliary materials during manufacturing	2017	Mexico	Modern	DEACERO	M&E
Consumo de energía y de materiales para la fabricación de materiales auxiliares	1990 – 2016	World average based on Europe	World average based on Europe	Ecoinvent 3.3	M&E
Generation of waste during manufacturing	2017	Mexico	Modern	DEACERO	M
Consumptions of materials and related energy during waste treatment	1990 - 2016	World average based on Europe	World average based on Europe	Ecoinvent 3.3	M&E
Emissions to air and water during the manufacturing process	2017	Mexico	Modern	DEACERO EPA AP42	M&E
Distance for waste transportation	2017	Mexico	Modern	DEACERO & Google Maps	M&E
Consumption of materials and energy and emissions related to waste transport requirements	1992-2014	World average based on Europe	World average based on Europe	Ecoinvent 3.3	M&E

6. Environmental performance

SimaPro 8.4 was used for Life Cycle Impact Assessment

6.1 Use of resources

Parameters describing resource use were evaluated with the Cumulated Energy Demand method version 1.09 (Frischknecht et al. 2007) except for the indicator of use of net fresh water that was evaluated with Recipe 2016 Midpoint (H) version 1.00 (Huijbregts et al. 2017). The detailed description of the use of resources is provided in Table 7.

Table 9. Resource indicators per metric ton of wire rod

Parameter	Unit	Total	A1) Raw materials supply	A2) Transport	A3) Manufacturing
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	659	622	5	32
Use of renewable primary energy as raw materials	MJ	0	0	0	0
Total use of renewable primary energy resources	MJ	659	622	5	32
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	13 255	12 385	301	568
Use of non-renewable primary energy used as raw materials	MJ	0	0	0	0
Total use of non-renewable primary energy resources	MJ	13 255	12 385	301	568
Use of secondary material	kg	926	0	0	926
Use of renewable secondary fuels	MJ	0	0	0	0
Use of non-renewable secondary fuels	MJ	0	0	0	0
Use of net fresh water	m^3	172	82	1	89

Table 10. Resource indicators per metric ton of galvanized wire

Parameter	Unit	Total	A1) Raw materials supply	A2) Transport	A3) Manufacturing
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	1 348	1 330	1	18
Use of renewable primary energy as raw materials	MJ	0	0	0	0
Total use of renewable primary energy resources	MJ	1 348	1 330	1	18
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	22 717	22 439	50	228
Use of non-renewable primary energy used as raw materials	MJ	0	0	0	0
Total use of non-renewable primary energy resources	MJ	22 717	22 439	50	228
Use of secondary material	kg	926	926	0	0
Use of renewable secondary fuels	MJ	0	0	0	0
Use of non-renewable secondary fuels	MJ	0	0	0	0
Use of net fresh water	m^3	8	7.1	0	0.4

6.2 Potential environmental impact

Parameters describing environmental potential impacts were calculated using CML-IA method version 3.04 (Guinee et al. 2001; Huijbregts et al. 2003; Wegener et al. 2008) as implemented in SimaPro 8.4. Water scarcity potential was calculated using AWARE method (Boulay et al. 2018).

Table 11 below shows the LCA results per the declared units and Figure 2 depicts the impact contribution per module per metric ton of wire rod.

Table 11. Potential environmental impact indicators per metric ton of wire rod

Impact category	Unit	A1) Raw materials supply	A2) Transportation	A3) Manufacturing	Total (A1 - A3)	A4-A5, B1-B2, CI-C4, D
Abiotic resource depletion (minerals)	kg Sb eq	1.86E-04	3.35E-05	6.04E-06	2.25E-04	Módulos no declarados
	%	82.4%	14.9%	2.7%	100.0%	
Abiotic resource depletion (fossil)	MJ	11 584	295	530	12 410	
	%	93.3%	2.4%	4.3%	100.0%	
Global warming (100y)	kg CO2 eq	582	19	328	929	
	%	62.6%	2.1%	35.3%	100.0%	
Ozone layer depletion potential	kg CFC-11 eq	7.27E-05	3.25E-06	3.60E-06	7.95E-05	
	%	91.4%	4.1%	4.5%	100.0%	
Photochemical oxidant formation	kg C2H4 eq	0.59	0.00	0.05	0.65	
	%	90.7%	0.7%	8.5%	100.0%	
Acidification	kg SO2 eq	5.1	0.1	0.4	5.7	
	%	90.4%	1.8%	7.8%	100.0%	
Eutrophication	kg PO4--- eq	0.6	0.0	0.0	0.7	
	%	91.1%	3.5%	5.4%	100.0%	
Water scarcity	m^3 eq	82.0	1.3	88.6	172.0	
	%	47.6%	0.8%	51.5%	100.0%	

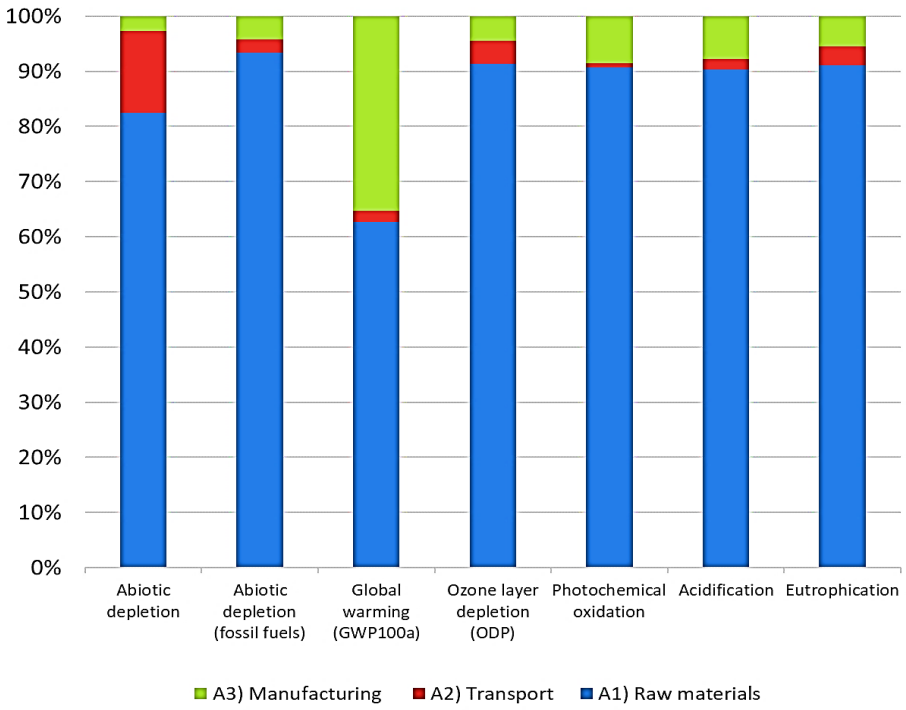

Figure 2. Potential environmental impact contribution per metric ton of wire rod

Table 12 below shows the LCA results per the declared units and Figure 3 depicts the impact contribution per module per metric ton of galvanized wire.

Table 12. Potential environmental impact indicators per metric ton of galvanized wire

Impact category	Unit	A1) Raw materials supply	A2) Transportation	A3) Manufacturing	Total (A1 - A3)	A4-A5, B1-B2, CI-C4, D
Agotamiento de recursos abióticos (minerales)	kg Sb eq	4.31E-01	6.11E-06	6.89E-05	4.32E-01	Modulos no declarados
	%	100.0%	0.0%	0.0%	100.0%	
Agotamiento de recursos abióticos (fósiles)	MJ	21 096	49	211	21 357	
	%	98.8%	0.2%	1.0%	100.0%	
Cambio climático	kg CO2 eq	1 479	3	35	1 518	
	%	97.5%	0.2%	2.3%	100.0%	
Agotamiento de la capa de ozono	kg CFC-11 eq	1.30E-04	5.64E-07	2.74E-06	1.33E-04	
	%	97.5%	0.4%	2.1%	100.0%	
Formación de oxidantes fotoquímicos	kg C2H4 eq	1.23	0.00	0.02	1.25	
	%	98.7%	0.0%	1.2%	100.0%	
Acidificación	kg SO2 eq	12.1	0.0	0.3	12.4	
	%	97.9%	0.1%	2.0%	100.0%	
Eutrofización	kg PO4--- eq	1.9	0.0	0.1	2.0	
	%	97.3%	0.1%	2.5%	100.0%	
Water scarcity	m^3 eq	466.9	0.2	34.9	502.0	
	%	93.0%	0.04%	6.9%	100.0%	

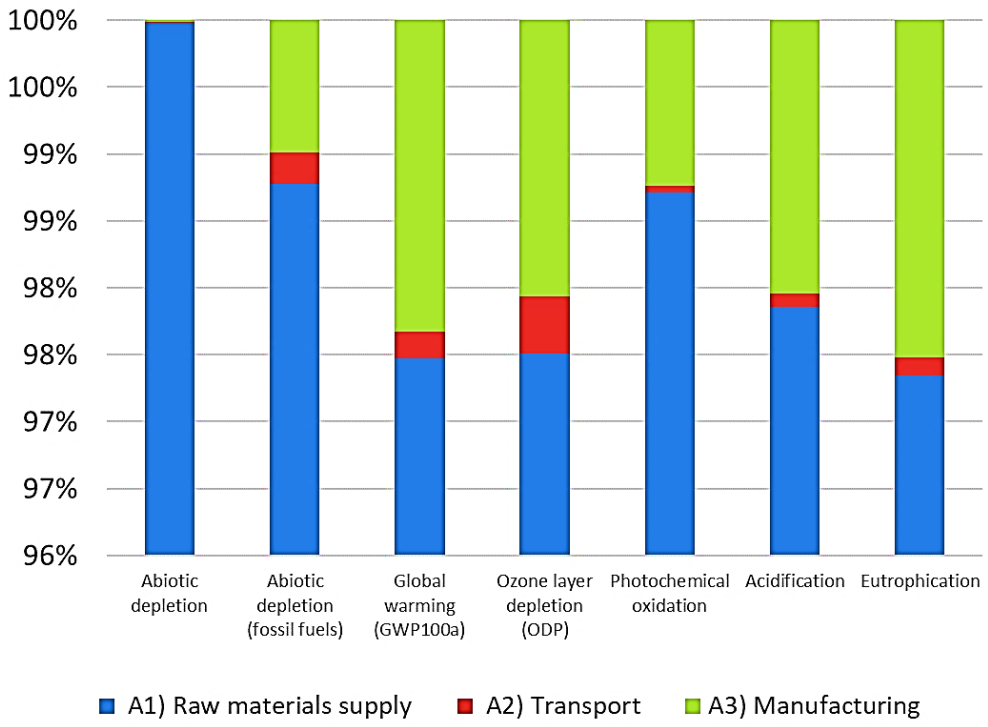

Figure 3. Potential environmental impact contribution per metric ton of galvanized wire

6.3 Waste production

Environmental indicators describing waste generation were obtained from LCI except for background information which has been calculated using EDIP 2003 method (Hauschild and Potting, 2005). Table 13 and shows waste and other outputs generated during each information module per module per metric ton of wire rod.

Table 13. Waste and other outputs per metric ton of wire rod

Parameter	Unit	Total	A1) Raw materials supply	A2) Transportation	A3) Manufacturing	Parameter
Hazardous waste	kg	0.1956	0.0090	0.0002	0.1862	0.0003
Non hazardous waste	kg	47.4644	32.5335	14.6960	0.0000	0.2350
Radioactive waste*	kg	0.0207	0.0181	0.0018	0.0000	0.0008
Components for reuse	kg	0.0000	0.0000	0.0000	0.0000	0.0000
Materials for recycling	kg	15.4054	0.0000	0.0000	15.4054	0.0000
Materials for energy recovery	kg	0.0000	0.0000	0.0000	0.0000	0.0000
Exported electricity	MJ	0.0000	0.0000	0.0000	0.0000	0.0000
Exported heat	MJ	0.0000	0.0000	0.0000	0.0000	0.0000

Table 14 and shows waste and other outputs generated during each information module per module per metric ton of galvanized wire.

Table 14. Waste and other outputs per metric ton of galvanized wire

Parameter	Unit	Total	A1) Raw materials supply	A2) Transportation	A3) Manufacturing	Parameter
Hazardous waste	kg	4.2797	0.3909	0.0000	3.8888	0.0000
Non hazardous waste	kg	64.8571	60.0777	3.6518	0.0000	1.1276
Radioactive waste*	kg	0.0363	0.0355	0.0003	0.0000	0.0005
Components for reuse	kg	0.0000	0.0000	0.0000	40.2546	0.0000
Materials for recycling	kg	0.0000	0.0000	0.0000	0.0000	0.0000
Materials for energy recovery	kg	0.0000	0.0000	0.0000	0.0000	0.0000
Exported electricity	MJ	0.0000	0.0000	0.0000	0.0000	0.0000
Exported heat	MJ	0.0000	0.0000	0.0000	0.0000	0.0000

7. Verification and registration

CEN standard EN 15804 served as the core PCR	
Programme	International EPD® System www.environdec.com EPD registered through the fully aligned regional programme/hub: EPD Latin America www.epdlatinamerica.com
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Independent verification of the declaration data,	☐ EPD process certification (Internal) ■ EPD verification (External)

according to ISO 14025:2006.	
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