ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A2*

Owner of the Declaration	Tenaris S.A.
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-TEN-20250561-IBI1-EN
Issue date	30/01/2026
Valid to	29/01/2031

Epoxy-coated seamless steel tubes

Tenaris SA

Institut Bauen und Umwelt e.V.

ECO PLATFORM EPD VERIFIED

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1. General Information

Tenaris SA

Programme holder

IBU – Institut Bauen und Umwelt e.V.
Hegelplatz 1
10117 Berlin
Germany

Declaration number

EPD-TEN-20250561-IBI1-EN

This declaration is based on the product category rules:

Steel pipes for pressure applications, 01/08/2021
(PCR checked and approved by the SVR)

Issue date

30/01/2026

Valid to

29/01/2031

Dipl.-Ing. Hans Peters
(Chairman of Institut Bauen und Umwelt e.V.)

Florian Pronold
(Managing Director Institut Bauen und Umwelt e.V.)

Epoxy-coated seamless steel tubes

Owner of the declaration

Tenaris S.A.
Boulevard Royal 26
L2449 Luxembourg
Luxembourg

Declared product / declared unit

1 metric tonne of epoxy-coated seamless steel tube

Scope:

This EPD is based on a declared unit of 1 metric ton of Tenaris epoxy-coated seamless steel tubes.
The Life Cycle Assessment is based on data from the Tenaris Piombino (LI), Italy.
Production has been modeled using annual production data in 2023. The results are presented for the worst-case product (product with the greatest environmental impacts), selected and declared representative of the overall production of Tenaris's epoxy-coated seamless steel pipes.
The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

The EPD was created according to the specifications of EN 15804+A2. In the following, the standard will be simplified as *EN 15804*.

Verification

The standard EN 15804 serves as the core PCR
Independent verification of the declaration and data according to ISO 14025:2011
☐ internally ☒ externally

Dr. Matthew Fishwick,
(Independent verifier)

2. Product

2.1 Product description/Product definition

This declaration covers a range of epoxy-coated seamless steel pipe products. The main product variants included within the declared scope are summarized as follows:

- Internal pipe diameter (mm): from 21,3 to 406,4
- Steel wall thickness (mm): from 2,3 to 15,1
- Epoxy coating thickness (µm): 100
- Linear mass density (kg/m): from 1,1 to 95,7

When referring epoxy-coated seamless pipes applied for industrial and civil application, for the placing on the market of the product in the European Union/European Free Trade Association (EU/EFTA) (except for Switzerland), the product complies with the requirements coming from EN standards and CE marking. Compliance is directly marked or present in the certification.

2.2 Application

Tenaris's epoxy-coated seamless steel tubes and pipes, under the scope of application of this EPD, are are primarily intended for onshore applications across both industrial and civil sectors.

Industrial applications

- Transportation of fluids (chemicals, oil and other corrosive fluids) in low- and high-pressure systems.
- Piping systems in manufacturing and power plants.
- Gas distribution networks.
- Cooling and water circulation systems in power plants.

Civil applications

- Water distribution systems in residential and commercial buildings and urban infrastructure.
- Sewage and wastewater pipelines.

2.3 Technical Data

This EPD applies to all epoxy-coated seamless steel pipes of Tenaris S.A. produced at Tenaris Piombino, in different steel grades, dimensions, designs and delivery conditions

Constructional data

Name	Value	Unit
Yield strength (Minimum) - EN 10255 norm	195	N/mm^2
Tensile strength EN 10255 norm	320 - 520	N/mm^2
Elongation (Minimum) - EN 10255 norm	0.2	1

Depending on the application/steel grade, density varies in the range 7500-8000 kg/m3.
Tenaris production follows the most recognized manufacturing standards such as:

- API Specification 5L 'Line Pipe'
- ISO 3183
- ASTM/ASME A/SA 53, 106, 333,
- EN 10216/1/2/3
- EN 10255

2.4 Delivery status

Tenaris products are supplied according to customer specifications, either packed or unpacked, within the range of available variants, featuring steel wall thicknesses from 2,3 mm to 15,1 mm and internal diameters from 21,3 mm to 406,4 mm.

2.5 Base materials/Ancillary materials

The Tenaris epoxy-caoated pipe is composed of steel and epoxy powder adhered to the outer pipe surface.
Seamless steel pipes are sourced internally from Tenaris Silcotub (Romania) and Dalmine (Italy), where the steel is manufactured primarily using ferrous scrap. In 2022, the average recycled content of Tenaris seamless steel pipes was approximately 97 % and 95 %, calculated in accordance with *ISO 14021*, for Silcotub and Dalmine, respectively. Additional raw materials used in the steel production process include pig iron and ferroalloys. The exact steel composition is customized to meet the specific application and grade requirements of each customer.
A thin layer of epoxy powder is applied to both the internal and external surfaces of the seamless steel pipes. Solvents are used as auxiliary materials—hence not present in the final product—to dissolve the epoxy resin and facilitate its application.
Raw materials used for the production (reported as average composition) are:

- Epoxy powder: 0,5 %
- Seamless steel pipe: 99,5 %, of which:
  - Steel scrap 97,0 %
  - Pig iron 1,0 %
  - Ferroalloys 2,0 %

Materials not incorporated into the final product are lost as water emissions, air emissions, and waste.

This product/article/at least one partial article contains substances listed in the *candidate list* (date 23 January 2024) exceeding 0.1 percentage by mass: **No**.

This product/article/at least one partial article contains other carcinogenic, mutagenic, retro-toxic (CMR) substances in categories 1A or 1B which are not on the candidate list, exceeding 0.1 percentage by mass: **No (not applicable)**.
Biocide products were added to this construction product, or it has been treated with biocide products (this then concerns a treated product as defined by the *(EU) Ordinance on Biocide Products No. 528/2012*): **No.**

2.6 Manufacture

The production process of epoxy-coated steel seamless pipes at the Tenaris Piombino facility begins with the supply of steel seamless tubes from Tenaris Silcotub and Dalmine.
Seamless pipes from Silcotub originate exclusively from its 'Finishing' production line, where they are manufactured via the EAF route at the Călărași steel plant (RO), and subsequently hot rolled at the Zalău facility (RO). These pipes are not subjected to thermal treatment and are either finished at Silcotub or shipped unfinished to Piombino, where they undergo the adjustment process. Pipes from Dalmine are solely supplied from the 'FINISHING 1' production line of the Dalmine facility. They are also produced using the EAF route and hot rolled on-site. Unlike Silcotub pipes, all Dalmine pipes are fully finished at the Dalmine facility and do not require further adjustment upon arrival in Piombino.
Upon arrival at the Piombino facility, the pipes, if necessary, undergo the adjusting process, which involves several operations including, straightening, cutting to length, polishing, cleaning and preparing the metal by removing impurities such as rust and oil. This step ensures the steel surface is properly prepared for the coating application.
Following the adjusting process, the pipes are coated with a layer of epoxy powder, which is applied to the surface to enhance corrosion resistance and provide a smooth, durable finish. The coating is applied both on the inner and outer surface of the pipe through a process of spraying, dipping, or electrostatic application, depending on the specific requirements. Once the coating is applied, the pipes are cured

in an oven at a controlled temperature to ensure the epoxy resin bonds effectively to the steel surface, forming a strong protective layer.

2.7 Environment and health during manufacturing

Tenaris Health, Safety and Environment, and Quality Management systems are designed according to the latest versions of the *ISO 14001, ISO 45001* standards. Today, 86 % of Tenaris production sites are working under management systems certified according to these standards.

2.8 Product processing/Installation

The use of Tenaris products takes place directly at the installation site as well as in processing plants in the region of the future place of use. Installation is carried out by the customer in accordance with the valid standards and guidelines of the respective place of use.

2.9 Packaging

The majority of Tenaris products are delivered to the customer unpacked.
Plastic protectors can be added at the ends of the pipes to protect them. In the present EPD, a packaging consisting of HDPE protector caps was considered for all pipes and included in the calculations.

Name	Value	Unit
Packaging material	HDPE	-
Packaging recycled content	0	%
Packaging weight per DU	23,20	kg / DU

At the end of its life cycle, the discarded packaging is fully disposed of through landfilling. The removal of the packaging does not involve any energy or material consumption.

2.10 Condition of use

Environmental effects of usage stage are not considered in the scope of this study. During the use of the epoxy-coated steel pipe products, no changes in the material quality are to be expected if used as intended. Maintenance and inspection requirements depend on the design of the material as well as its place of use.

2.11 Environment and health during use

During the use of the steel pipe products, no effects on human and animal health and no harmful emissions to air, soil and water is expected.

2.12 Reference service life

Due to the diverse applications, varying stress conditions, and environmental factors affecting epoxy-coated seamless steel pipes (oil and gas industry, industrial piping, pressure applications, harsh environments, etc.) a standardized reference service life is not declared. Instead, the lifespan of these pipes is determined by their operational service life, which is contingent upon the specific conditions and service requirements of their intended use.
Description of the influences on the ageing of the product when applied in accordance with the rules of technology.

2.13 Extraordinary effects

Fire

Epoxy-coated steel pipes are not flammable. No flammable gases or vapors escape from the pipe.

Fire protection

Name	Value
Building material class	n.a.
Burning droplets	n.a.
Smoke gas development	n.a.

Water

No negative consequences for the environment are expected under the influence of water (e.g. floods).

Mechanical destruction

Unpredictable mechanical impacts on the declared product have no consequences on the environment due to the plastic deformability of steel.

2.14 Re-use phase

The declared products consist of almost 100 % steel and can therefore either be reused or recycled in the steel and metal industry as a valuable secondary raw material.
Depending on the pipe application, the share of product that is dismantled and reused/recycled may vary.
Steel is a permanent material that can be recycled as often as required.

2.15 Disposal

The declared product can be fully used as a recycling raw material. The waste code according to the *European Waste Catalogue* is 17 04 05 (iron and steel).

2.16 Further information

Further information on the product is available on the website at www.tenaris.com.

3. LCA: Calculation rules

3.1 Declared Unit

This environmental product declaration refers to a declared unit of 1 ton of epoxy-coated seamless steel tube.

Declared unit and mass reference

Name	Value	Unit
Declared unit	1	t
Density	7850	kg/m^3

Other declared units are allowed if the conversion is shown transparently.

The results are presented for the worst-case product (product with the greatest environmental impacts), selected and declared representative of the overall production of Tenaris's epoxy-coated seamless steel pipes produced at Piombino. The reference worst-case product was selected based on its geometric characteristics (pipe with the smallest diameter and thinnest steel wall) and production volumes.

The geometrical characteristics of the representative product are:
- External diameter 60,3 mm
- Steel thickness 3,6 mm
- Epoxy layer thickness 100 µm
- Pipe weight per meter 5,49 kg/m

For the calculation of the representative product, input and production quantities for the entire calendar year 2023 were considered.

3.2 System boundary

The life cycle assessment of epoxy-coated seamless steel tube refers to a **Cradle to gate with modules C1–C4 and module D (A1–A4 + C + D)**. Subsequent life cycle phases are part of

the analysis.

Module A1-A3 | Production stage
The production stage includes the burdens of the production of epoxy-coated seamless steel tubes of Tenaris Piombino, based on the defined representative product.
A1 – Raw materials:
- Production and supply of seamless pipes made of carbon low-alloy steel and produced in Silcotub's and Dalmine's plants via the EAF route
- Extraction, production and processing of raw materials for coatings (i.e. epoxy powder)
A2 – Upstream Transport
- Supplying transport: raw materials like epoxy powder and tubes coming from internal supplier.
A3 – Manufacturing
- Coating application
- Ancillaries (i.e. oxygen, chemical additives, etc.) and auxiliary materials production (i.e. lubricant, grease, etc.)
- Water consumption
- Electricity consumption
- Emissions into air and water
- Waste treatment generated during the process

Seamless steel pipes are sourced from an internal supplier (Tenaris Silcotub). The upstream environmental impact of the steel supplied is represented by primary data of the respective production site.
The 2022 electricity datasets have been utilized, with a specific focus on the residual mix for Italy.
Module A1-A3 include the production of the packaging of seamless steel tubes.

Module A4 | Downstream delivery to final customer
This LCA study considered the transportation of the finished product from the plant to a customer. A default distance of 3500 km has been used for intracontinental transport with Euro 4 >32 t freight lorry.

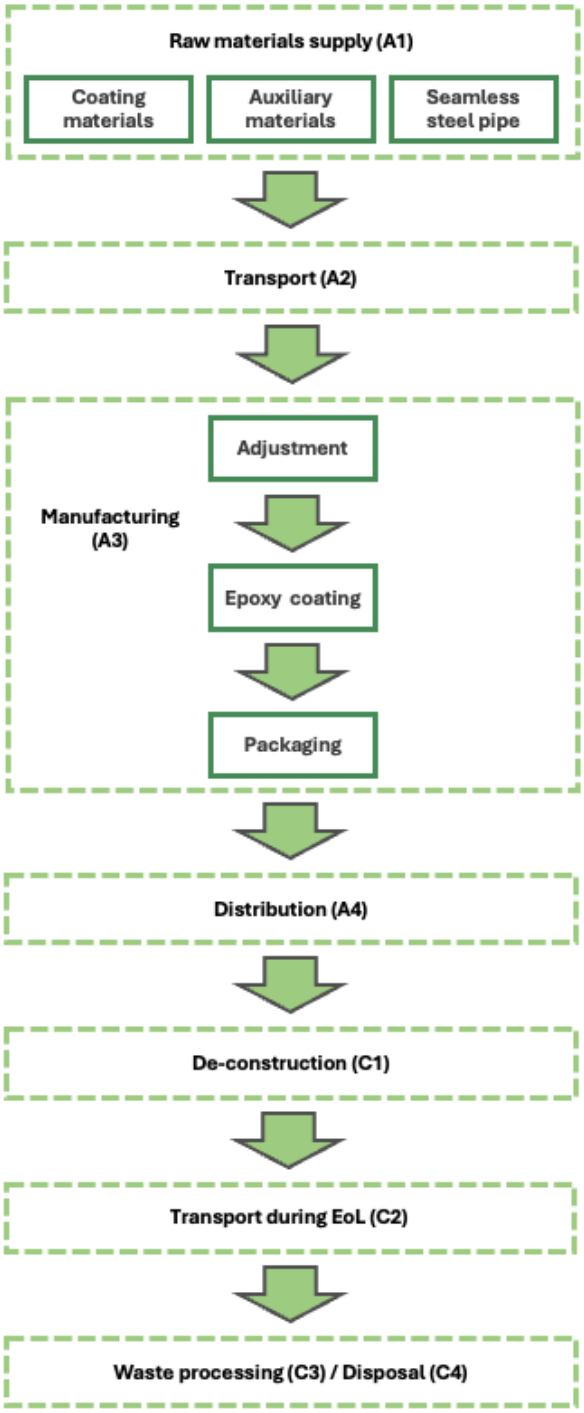
Module C1 | Deconstruction and demolition
Homogeneous dismantling is assumed as an end-of-life scenario. Associated efforts are negligible, no environmental impacts from the deconstruction of the products are declared. The specific energy demand for dismantling depends on the application of the seamless steel tubes.

Module C2 | Transport
The transport to the disposal of the material is estimated declaring a 250 km radius to the waste processing or recovery.

Module C3 | Waste processing
Product flows that reach Module D for recycling leave the product system in C3 (85 % of the product based on World Steel statistics). Environmental impacts resulting from the grinding and sorting of steel scrap are included.

Module C4 | Landfilling
Module C4 declares the environmental impacts incurred by landfilling (15 % of the product).

Module D | Credits and loads beyond system boundary
The potential for substituting primary steel with a recycling scenario (85 % of the product) is outlined in Module D. The recycled content of the products is 97 %.



3.3 Estimates and assumptions
All assumptions are verified through detailed documentation and correspond to the best possible representation of reality based on the available data. Regional applicability of the used background data refers to average data under European conditions taken from the *Ecoinvent* database.

3.4 Cut-off criteria
All inputs and outputs for which data are available are included in the LCA model. Data gaps are filled with conservative assumptions from average data (when available) or with generic data and are documented accordingly. Only data with a contribution of less than 1 % were cut off. Ignoring such data is justified based on the irrelevance of the expected effect.

Processes, materials, or emissions known to make a significant contribution to the environmental effects of the products under examination have not been neglected. All relevant data were collected comprehensively. It is assumed that the data have been completely recorded, and the overall total of ignored input flows do not amount to more than 5 % of total energy and mass flows. Environmental impacts of machines, plant and infrastructure were not included.

3.5 Background data

This study employs generic background data to evaluate upstream environmental impacts, sourced from the *ecoinvent* database version 3.10, using the cut-off by classification (100:0) method. The modelling was performed in SimaPro version 9.6. All *ecoinvent* background datasets implemented in this study are less than ten years old, with reference years ranging from 2018 to 2023. Background data for uncoated seamless steel pipes supplied to Piombino were sourced from the IBU-verified "EPD-TEN-20240485-IBD1-EN", which is representative of the global average production of seamless steel tubes by Tenaris. For the specific production sites (Dalmine and Silcotub), site-specific results reported in the verified EPD were used instead of the EPD's global average values. The modelling approach is described in detail within the referenced "EPD-TEN-20240485-IBD1-EN".

3.6 Data quality

The foreground data collected at Tenaris are based on the quantities used and volumes produced annually. All process data were collected by Tenaris during periodic reporting. Data on material and energy use originate from material-specific throughput measurements of various processes as well as from controlling. Data were collected in compliance with *Worldsteel* 2023 provisions and were subjected to a supplementary plausibility check using material flow analyses of individual process steps. The technological, geographical and time-related representativeness of the data base was kept in mind when selecting background data. Whenever specific data were missing, either generic datasets or representative average data were used instead. The implemented *ecoinvent* background datasets are not more than ten years old.

3.7 Period under review

Foreground data were collected in the 2023 production year, and the data are based on the volumes produced on an annual basis.

3.8 Geographic Representativeness

Land or region, in which the declared product system is manufactured, used or handled at the end of the product´s lifespan: Global

3.9 Allocation

The upstream EPD for steel pipe includes allocation and other modelling approaches. Aside from this, no allocation methods are applied in the calculation of the impacts of the epoxy-coated product: all by-products are considered waste, and all production process impacts are attributed to the net steel output.

3.10 Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to *EN 15804* and the building context, respectively the product-specific characteristics of performance, are taken into account. Whenever specific data were missing, either generic datasets or representative average data were used instead.

4. LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon

The declared product does not contain any biogenic carbon.

Information on describing the biogenic carbon content at factory gate

Name	Value	Unit
Biogenic carbon content in product	-	kg C
Biogenic carbon content in accompanying packaging	-	kg C

Note: 1 kg of biogenic carbon is equivalent to 44/12 kg of CO_2.

Transport from the gate to the site (A4)

This LCA study considered the transportation of the finished product from the plant to a customer. Specific distances have been used for national and international transport with Euro 4 >32 t freight lorry.

Name	Value	Unit
Freight lorry	3500	km
Freight train	0	km
Container ship	0	km

End of life (C1-C4)

This end-of-life scenario refers to the recycling of the epoxy-coated seamless steel tubes as the most likely case after the dismantling of the tubes. The actual proportion of recycling is not quantifiable, as it varies by application and country. Therefore, the end-of-life scenario might have to be adapted to the respective application context.
The end-of-life scenario used in this LCA study is based on the following assumptions, aligned with the specifications published for global steel recovery rate from World Steel and OECD. Waste allocation at end of life follows the cut-off approach, and transportation of waste materials is assumed to occur by truck (Euro 5, >32 t).

Name	Value	Unit
Collected separately waste type waste type	1000	kg
Collected as mixed construction waste	-	kg
Reuse	-	kg
Recycling - Steel	846	kg
Recycling - Epoxy coating	0	kg
Recycling - Total	846	kg
Energy recovery	-	kg
Landfilling - Steel	149	kg
Landfilling - Epoxy coating	5	kg
Landfilling - Total	154	kg
Distance to landfill	250	km
Distance to sorting plant (materials for recycling)	250	km

Reuse, recovery and/or recycling potentials (D), relevant scenario information

The potential for substituting primary steel and the associated avoid impact is outlined in Module D

Name	Value	Unit
Output net flow of recyclable steel scrap	846	kg
Input net flow of recycled steel scrap	961	kg
Quality ratio	1	-

This scenario accounts for a recycling rate of 85 % and an average recycled content of 97 %, with a production process yield of 0,89.

5. LCA: Results

The following table contains the LCA results for a declared unit of 1 ton of epoxy-coated seamless steel tube.
Reported scientific notation, i.e., 1,59E+03, is intended to be read as 1590,0 as well as 7,26E+1 is to be read as 72,6, both referred to the corresponding unit.
Product end-of-life scenario as outlined at paragraph '4. LCA: Scenarios and additional technical information', sub-paragraph 'End of life (C1 - C4)'.

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE OR INDICATOR NOT DECLARED; MNR = MODULE NOT RELEVANT)

Product stage			Construction process stage		Use stage							End of life stage				Benefits and loads beyond the system boundaries
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	MND	MND	MND	MNR	MNR	MNR	MND	MND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 ton Declared unit

Parameter	Unit	A1-A3	A4	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq	1.21E+03	2.86E+02	5.88E+00	2.01E+01	3.36E+00	1.01E+00	1.68E+02
GWP-fossil	kg CO_2 eq	1.2E+03	2.86E+02	5.88E+00	2.01E+01	3.36E+00	1.01E+00	1.68E+02
GWP-biogenic	kg CO_2 eq	2.79E+00	9.7E-03	2.29E-04	6.78E-04	2.59E-03	5.19E-05	2.47E-03
GWP-luluc	kg CO_2 eq	3.88E-01	6.98E-03	2.02E-04	4.88E-04	1.1E-04	3.21E-05	-4.41E-03
ODP	kg CFC11 eq	2.78E-05	5.8E-06	9.25E-08	4.05E-07	7.11E-08	1.87E-08	5.17E-07
AP	mol H^+ eq	4.85E+00	9.75E-01	5.49E-02	4.84E-02	4.59E-03	4.51E-03	6.32E-01
EP-freshwater	kg P eq	2.69E-02	2.38E-04	5.55E-06	1.66E-05	3.31E-06	2.02E-06	7.22E-03
EP-marine	kg N eq	1.17E+00	4.12E-01	2.58E-02	1.84E-02	1.17E-03	1.88E-03	1.28E-01
EP-terrestrial	mol N eq	1.28E+01	4.51E+00	2.83E-01	2.01E-01	1.28E-02	2.06E-02	1.51E+00
POCP	kg NMVOC eq	4.81E+00	1.59E+00	8.42E-02	8.47E-02	9.49E-03	7.26E-03	5.2E-01
ADPE	kg Sb eq	2.15E-02	9.39E-06	2.46E-07	6.56E-07	1.4E-07	3.68E-08	1.48E-03
ADPF	MJ	2.01E+04	3.75E+03	7.74E+01	2.62E+02	5.41E+01	1.35E+01	1.5E+03
WDP	m^3 world eq deprived	3.77E+02	1.59E+00	6.11E-02	1.11E-01	8.14E-02	8.3E-03	1.31E+01

GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential)

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 ton Declared unit

Parameter	Unit	A1-A3	A4	C1	C2	C3	C4	D
PERE	MJ	1.76E+03	1.3E+01	1.7E-01	9.1E-01	1.05E+01	5.17E-02	8.43E+01
PERM	MJ	0	0	0	0	0	0	0
PERT	MJ	1.76E+03	1.3E+01	1.7E-01	9.1E-01	1.05E+01	5.17E-02	8.43E+01
PENRE	MJ	1.91E+04	3.75E+03	7.74E+01	2.62E+02	5.41E+01	1.35E+01	1.5E+03
PENRM	MJ	1.04E+03	0	0	0	0	0	0
PENRT	MJ	2.01E+04	3.75E+03	7.74E+01	2.62E+02	5.41E+01	1.35E+01	1.5E+03
SM	kg	1.22E+03	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0
FW	m^3	1.5E+01	9.63E-02	2.42E-03	6.73E-03	3.51E-02	3.93E-04	3.3E-01

PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 ton Declared unit

Parameter	Unit	A1-A3	A4	C1	C2	C3	C4	D
HWD	kg	6.85E+01	7.73E-02	4.08E-03	5.4E-03	2.89E-03	9.38E-04	4.34E+01
NHWD	kg	5.52E+02	5.43E+00	7.74E-02	3.8E-01	1.19E-01	1.54E+02	1.49E+02
RWD	kg	7.72E-02	3.52E-04	3.95E-06	2.46E-05	1.23E-04	1.09E-06	-1.81E-03
CRU	kg	1.56E+02	0	0	0	0	0	0

MFR	kg	1.61E+02	0	0	0	8.46E+02	0	0
MER	kg	0	0	0	0	0	0	0
EEE	MJ	0	0	0	0	0	0	0
EET	MJ	0	0	0	0	0	0	0

HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1 ton Declared unit

Parameter	Unit	A1-A3	A4	C1	C2	C3	C4	D
PM	Disease incidence	ND	ND	ND	ND	ND	ND	ND
IR	kBq U235 eq	ND	ND	ND	ND	ND	ND	ND
ETP-fw	CTUe	ND	ND	ND	ND	ND	ND	ND
HTP-c	CTUh	ND	ND	ND	ND	ND	ND	ND
HTP-nc	CTUh	ND	ND	ND	ND	ND	ND	ND
SQP	SQP	ND	ND	ND	ND	ND	ND	ND

PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index

The additional and optional impact categories according to EN 15804+A2 are not declared, as not required according to PCR Part A.

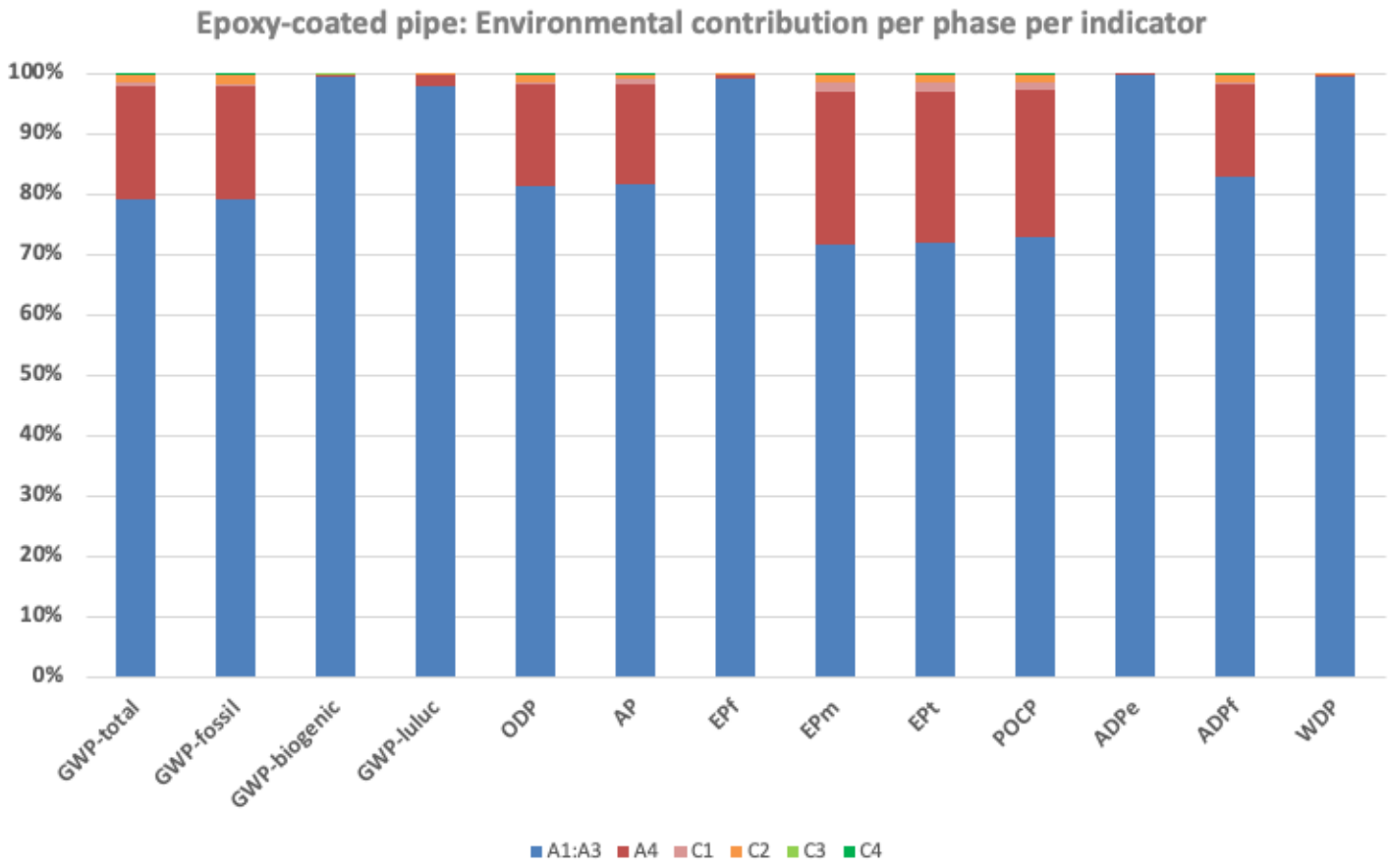
Disclaimer 1 – for the indicator 'Potential Human exposure efficiency relative to U235'. This impact category deals mainly with the eventual impact of low-dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure or radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – for the indicators 'abiotic depletion potential for non-fossil resources', 'abiotic depletion potential for fossil resources', 'water (user) deprivation potential, deprivation-weighted water consumption', 'potential comparative toxic unit for ecosystems', 'potential comparative toxic unit for humans – cancerogenic', 'Potential comparative toxic unit for humans - not cancerogenic', 'potential soil quality index'.

The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high as there is limited experience with the indicator. This EPD was created using a software tool.

6. LCA: Interpretation

The following interpretation contains a summary of the LCA results referenced to a declared unit of 1 ton of epoxy-coated seamless steel tube.
The following chart summarizes the contribution analysis done for the environmental impact indicator for the specific modules studied. As the aggregated modules A1:A3 contributes for more than 70 % to all indicators, to allow for a clear visual interpretation of the chart, only the residual 30 %, to which all modules contribute, is shown in the graph per each indicator. The environmental impact of the transport of the products to recycling (C2) as well as landfilling of the losses at the end of life (C4) represents a minor contribution to the overall environmental impact of the product.



A linear correlation of the environmental impacts with the product weight is to be expected. Therefore, the conversion from the declared unit to a specific product is possible using a mass -specific scaling factor.

6.1 Variability analysis
A variability assessment was carried out to evaluate the range variation of environmental impacts within the same product family. The percentage deviation from the representative product across all environmental impact indicators ranged from -2,0 % to 0,0 %, indicating a low degree of variability.

7. Requisite evidence

Not relevant for this EPD.

8. References

Standards:

DIN EN ISO 14044:2006-10
Umweltmanagement - Ökobilanz - Anforderun¬gen und Anleitungen (ISO 14044:2006); Deutsche und Englische Fassung EN ISO 14044:2006.

DIN EN ISO 14025:2011
Environmental labels and declarations - Type III environmental declarations - Principles and procedures (ISO 14025:2006); German and English version EN ISO 14025:2011

DIN EN ISO 14040:2006-10
Umweltmanagement - Ökobilanz - Grundsätze und Rahmenbedingungen (EN ISO 14040:2006); Deutsche und Englische Fassung EN ISO 14040:2006

ISO 3183:2019
Petroleum and natural gas industries — Steel pipe for pipeline transportation systems

UNI EN 10240:1999
Internal and/or external protective coatings for steel tubes – Specification for hot-dip galvanized coatings

EN 10225-1
Weldable Structural Steels for Fixed Offshore Structures – Part 1: Technical Delivery Conditions

ASTM/ASME A/SA 53
Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

ASTM/ASME A/SA 106
Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service

ASTM/ASME A/SA 333
Standard Specification for Seamless and Welded Steel Pipe for Low-Temperature Service and Other Applications with Required Notch Toughness

EN 10216-1
Seamless steel tubes for pressure purposes – Part 1: Non-alloy steel tubes with specified room temperature properties

EN 10216-2
Seamless steel tubes for pressure purposes – Part 2: Non-alloy and alloy steel tubes with specified elevated temperature properties

EN 10216-3
Seamless steel tubes for pressure purposes – Part 3: Alloy fine grain steel tubes

ISO 14021:2016
Environmental labels and declarations — Self-declared environmental claims (Type II environmental labelling)

ISO 14001:2015
Environmental management systems — Requirements with guidance for use

ISO 45001:2018
Occupational health and safety management systems — Requirements with guidance for use

Other references:

PCR Part A+A2
Product category rules for building-related products and services. Part A: Calculation rules for life cycle assessment and project report requirements according to EN 15804+A2:2019. version 1.4. Berlin: Institut Bauen und Umwelt e.V.. (ed.), 15.04.2024.

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API Specification 5L - Specification for Line Pipe

Worldsteel, 2014
World Steel Association, February 14, 2014: A methodology to determine the LCI of steel industry co- products.

Worldsteel, 2022
World Steel Association, 2022: Life cycle inventory methodology report

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Candidate List of Substances of Very High Concern for Authorisation (www.echa.europa.eu/candidate-list-table)

European Parliament and Council of the European Union, 2012
Regulation (EU) No 528/2012 of 22 May 2012 concerning the making available on the market and use of biocidal products. Official Journal of the European Union, L 167, pp. 1–123.

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Commission Decision 2000/532/EC of 3 May 2000 establishing the European Waste Catalogue (EWC). Official Journal of the European Communities, L 226, pp. 3–24.

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ecoinvent database version 3.10. Zurich, Switzerland: ecoinvent Association

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