Environmental Product Declaration

as per ISO 14025 and EN 15804

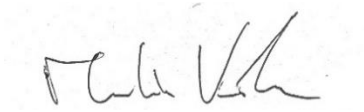
Owner of the declaration:	Stahlwerk Annahütte Max Aicher GmbH & Co. KG
Publisher:	Kiwa-Ecobility Experts
Programme operator:	Kiwa- Ecobility Experts
Registration number:	EPD-Kiwa-EE-363-EN
Issue date:	11.12.2023
Valid to:	11.12.2028

SAS thread bar

SAS 500/550, SAS 500/600 ULTS, SAS 500/700, SAS 550/620, SAS 555/700, SAS 670/800, SAS 800/950 FL, SAS 900/1050 FC, SAS 900/1050 SN

Average product SAS thread bar in the diameter range 12 mm to 75 mm.

1. General information

Stahlwerk Annahütte Max Aicher GmbH & Co. KG	SAS thread bar
Programme operator: Kiwa - Ecobility Experts Kiwa GmbH, Ecobility Experts Wattstraße 11-13 13355 Berlin Germany	**Owner of the declaration:** Stahlwerk Annahütte Max Aicher GmbH & Co. KG Max-Aicher-Allee 1+2 83404 Hammerau Germany
Registration number: EPD-Kiwa-EE-363-EN	**Declared product / declared unit:** 1 kg SAS thread bar
Issue date: 11.12.2023	**Valid to:** 11.12.2028
Scope of validity: This EPD is based on the life cycle assessment of SAS thread bar from Stahlwerk Annahütte Max Aicher GmbH & Co KG. The SAS thread bar is manufactured at the production site from the intermediate product steel billet in the rolling mill in 83404 Hammerau. EPD type: from cradle to gate with options, with modules C1 to C4 and module D. The owner of the declaration is liable for the underlying information and evidence. Kiwa - Ecobility Experts is not liable for manufacturer information, life cycle assessment data and evidence.	**Product category rules:** Product Category Rules (PCR) B construction steel products 2020-03-13 (draft) **Verification:** The EN 15804:2012+A2:2019 standard serves as the core PCR. Independent verification of the EPD by an independent third party according to ISO 14025:2010 ☐internal ☒external
	
on behalf of Raoul Mancke (Head of the Kiwa-Ecobility Experts programme operations)	Anne Kees Jeeninga - Adviselab V.o.f (Independent third party auditor)
	
on behalf of Martin Koehrer (Verification body, Kiwa-Ecobility Experts)	

2. Product details

2.1 Product description

The declared product is the average product SAS thread bar in the diameter range from 12 mm to 75 mm. The declared product is manufactured in the rolling mill of Stahlwerk Annahütte Max Aicher GmbH & Co KG in 83404 Hammerau.

2.2 Application

SAS thread bar products are used in the construction industry, e.g. in the fields of reinforcement systems, geotechnical systems, post tensioning systems, anchor systems in mining and tunnelling and formwork systems.

2.3 Technical data

The following technical data was provided by Stahlwerk Annahütte Max Aicher GmbH & Co. KG.

Table 1: Technical specifications for the SAS thread bar product group

Parameters	Value								
Steel grade	SAS 500/550	SAS 500/600 ULTS	SAS 500/700	SAS 555/700	SAS 550/620	SAS 670/800	SAS 800/950 FL	SAS 900/1050 FC	SAS 900/1050 SN
Yield strength	500 MPa	500 MPa	500 MPa	555 MPa	550 MPA	670 MPa	900 MPa	900 MPa	900 MPa
Ratio R_m/R_e	1,10	1,20	1,4	1,26	1,12	1,19	1,19	1,17	1,17
Production route	EAF	EAF	EAF	EAF	EAF	EAF	EAF	EAF	EAF
Standard/Norm	DIN 488-1 to 6 DIN EN 10080	DIN 488-1 to 6 DIN EN 10080 DIN EN 14620-3	DIN 488-1 to 6 DIN EN 10080	DIN 488-1 to 6 DIN EN 10080	DIN 488-1 to 6 DIN EN 10080 STANDARD ÖNORM B4707 - 06/2017	DIN 488-1 to 6 DIN EN 10080	-	DIN 18216	-
Diameter range	12 mm to 75 mm					18 mm to 63,5 mm	12 mm to 75 mm		

2.4 Manufacturing

Hot-rolled SAS thread bar with continuous screwable coarse thread in the diameter range from 12 mm to 75 mm. Certain grades are heat-treated from the rolling heat. The SAS thread bar product is customised and supplied in various lengths to meet customer requirements.

2.5 Raw materials

Table 2 lists the raw materials for the billets from which the SAS thread bar is produced, with the average proportions in percent by mass. In order to protect sensible data, the values are given in intervals that represent the distribution of the proportions of raw materials and additives. The billets are delivered to Stahlwerk Annahütte Max Aicher GmbH & Co KG as an intermediate product. The billets are produced in the electric steelworks at the production site of Lech-Stahlwerke GmbH, which, like Stahlwerk Annahütte, belongs to the Max Aicher Foundation.

Table 2 : Raw materials and aggregates in mass percent for the reference year 2020

Raw material/ aggregates	Share in m%
Scrap	92-94
Lime, dolomite, coal, silicon manganese (SiMn), ferromanganese (FeMn), Ferrosilicon (FeSi), alumina, aluminium	6-8

There is no biogenic carbon in the products.

There is biogenic carbon in the packaging (wood) and shown in section 5.

The product does not contain any substances from the "Candidate List of Substances of Very High Concern for Authorisation" (SVHC).

2.6 Reference service life (RSL)

As the utilisation phase of SAS thread bar is not taken into account, no reference service life needs to be specified.

2.7 Placing on the market

SAS thread bars are packaged using steel strapping or wire (the number of ties varies depending on the length). Corrosion protection can also be applied on request. Each bundle is labelled with the steel grade, nominal diameter, length and batch number. Further information is noted on the mill certificate.

3. LCA: Calculation rules

3.1 Declared unit

The declared unit according to PCR B for construction steel products (construction steel products; draft; 2020-03-13) is 1 kg SAS thread bar in the diameter range 12 mm to 75 mm.

Parameters	Value	Unit
Declared unit	1	kg

3.2 System boundaries

The EPD was created in accordance with DIN EN 15804+A2 and takes into account the manufacturing phase and parts of the disposal phase as well as the benefits and loads outside the system boundaries. According to DIN EN 15804, this corresponds to product phases A1-A3, C1-C4 and D. The type of EPD is therefore "from cradle to gate with options".

In this life cycle assessment in accordance with ISO 14025, the following phases of the product life cycle are considered:

- A1: Extraction and processing of raw materials and processing of secondary materials used as input (e.g. recycling processes)
- A2: Transport to the manufacturer
- A3: Production
- C1: Deconstruction / demolition
- C2: Transport to waste treatment
- C3: Waste treatment for reuse, recovery and/or recycling
- C4: Disposal
- D: Reuse, recovery and/or recycling potentials, expressed as net flows and benefits

All inputs (raw materials, preliminary products, energy and auxiliary materials) and the waste generated were analysed for the declared life cycle phases.

Figure 1 shows the simplified process flow diagram at the production site of Stahlwerk Annahütte Max Aicher GmbH & Co. KG for the SAS thread bar product group. The intermediate product steel billet is produced in the electric steel mill at the production site of Lech-Stahlwerke GmbH and delivered to the site of Stahlwerk Annahütte Max Aicher GmbH & Co.

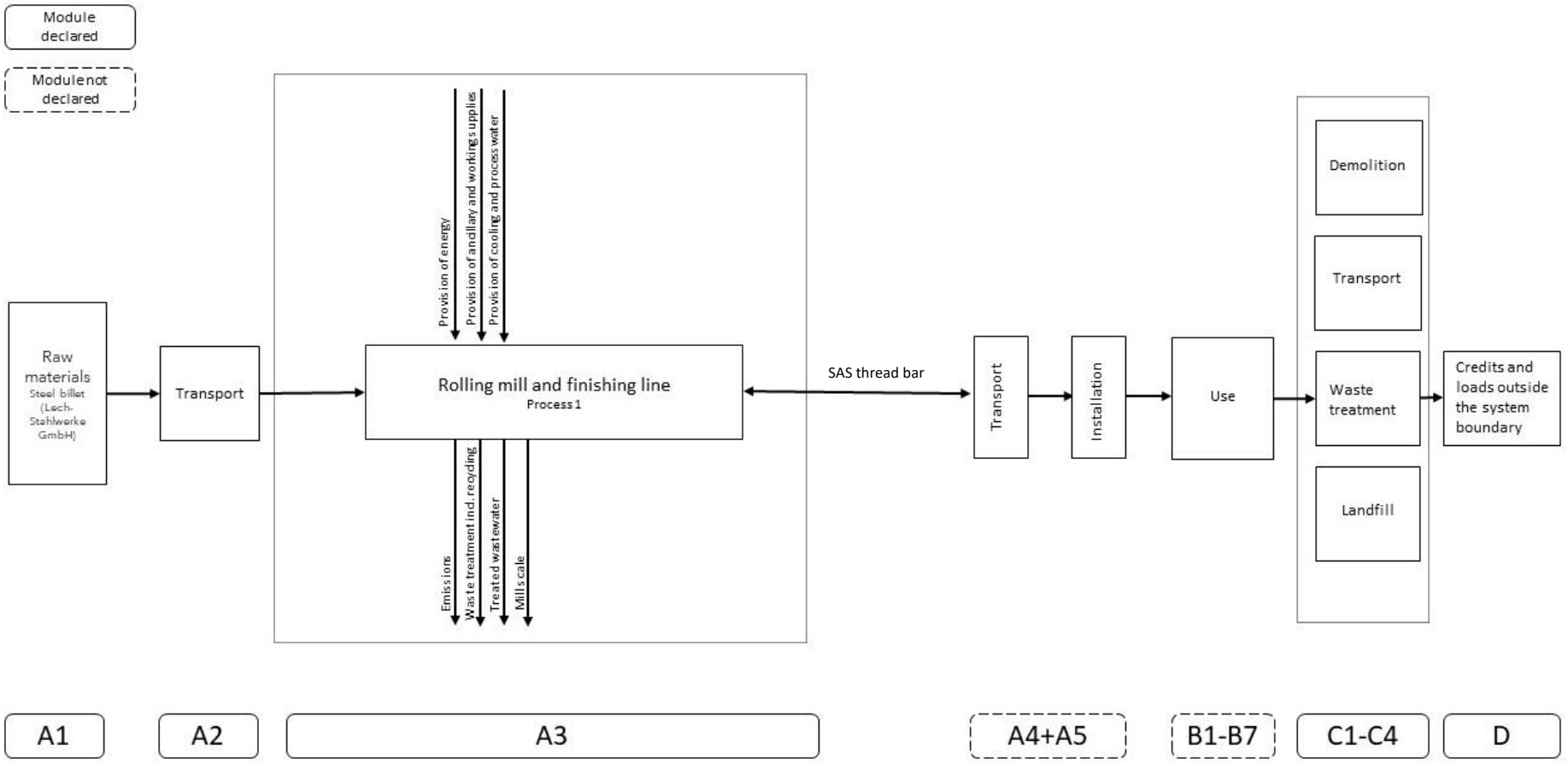


Figure 1 : Simplified process flow diagram

3.3 Assumptions and estimates

It is not possible to provide a more precise breakdown of the manufacturer's specifications for the heat treatment of different steel grades and for the manufacturer's specifications for the different diameter ranges, so that an average product was considered in this LCA.

3.4 Period under review

All product and process-specific data was collected for the 2020 operating year and is therefore up to date.

3.5 Cut-off criteria

All process-specific data was collected for process modules A1 to A3. Potential environmental impacts were assigned to the material flows based on the Ecoinvent database V3.6 from 2019. The requirements of EN 15804 specify a total sum of neglected input flows of no more than 5 % of the energy and mass input. All flows that contribute to more than 1 % of the total mass, energy or environmental impacts of the system were taken into account in the LCA. The neglected processes and capital goods contribute less than 5 % to the impact categories taken into account and were not considered in this LCA.

3.6 Data quality requirements

To ensure the comparability of the results, only consistent background data from the Ecoinvent database V3.6 from 2019 was used in the LCA (e.g. data records on energy, transport, auxiliary and operating materials). The database is checked regularly and therefore fulfils the requirements of EN 15804 (background data not older than 10 years).

Almost all consistent data records contained in the Ecoinvent database V3.6 from 2019 are documented and can be viewed in the online documentation.

The data relates to the annual average of inputs (energy, operating resources, etc.) consumed during the operating phase 01/2020 - 12/2020 and was converted into reference flows (input / output per declared unit).

The general rule that specific data from specific production processes or average data derived from specific processes must be prioritised when calculating an LCA was observed. Data for processes over which the manufacturer has no influence was assigned generic data.

The LCA was calculated using the online EPD tool "R<THiNK" from Nibe.

3.7 Allocations

Allocations regarding production waste were avoided. Specific information on allocations within the background data can be found in the documentation of the Ecoinvent database V3.6 from 2019.

3.8 Comparability

In principle, it is only possible to compare or assess the environmental impact of different products if they have been prepared in accordance with EN 15804+A2. The following aspects in particular must be taken into account when assessing comparability: PCR used, functional or declared unit, geographical reference, definition of the system boundary, declared modules, data selection (primary or secondary data, background database, data quality), scenarios used for the use and disposal phases and the life cycle inventory (data collection, calculation methods, allocations, validity period). PCRs and general programme instructions of different EPD programmes may differ. Comparability must be

checked. Further information can be found in EN 15804+A2 (5.3 Comparability of EPDs for construction products) and ISO 14025 (6.7.2 Requirements for comparability).

3.9 Data collection

ISO 14044 section 4.3.2 was taken into account when collecting the data.

To calculate the potential environmental impact, process-specific data was collected for the product in question. All energy and material costs required for production, data for the calculation of auxiliary materials and by-products were determined.

The goal and scope of the study were defined in consultation with Stahlwerk Annahütte Max Aicher GmbH & Co. The data was collected using a data collection template provided by Kiwa GmbH. The collected data was reviewed by Kiwa GmbH, for example by checking the extent to which the material balance was adhered to. In cooperation with Stahlwerk Annahütte Max Aicher GmbH & Co. KG, some adjustments were made. The annual values were then related to the declared unit of one kilogramme of SAS thread bar using appropriate calculations.

3.10 Calculation method

The calculation methods described in ISO 14044 section 4.3.3 were used for the life cycle assessment. The evaluation is based on the phases within the system boundaries and the processes contained therein.

4. LCA: Scenarios and further technical information

The assigned waste scenarios are based on the "Nationale Milieudatabase" (NMD), the national environmental database of the Netherlands. The waste scenario is based on the predefined scenario NMD-ID 74 of the "Nationale Milieudatabase". The main descriptions of the scenario can be found in Table 3 to Table 5.

The environmental impacts outside the system (Module D) relate to the recycling of the product under consideration and were determined on the basis of the document "Life cycle inventory methodology report for steel products" of the World Steel Association (2017).

Table 3 C2 - Transport to waste processing

Waste scenario	Type of waste treatment	Transport profile (Ecoinvent version 3.6)	Transport distance [km]
Steel, reinforcement (NMD ID 74)	Landfill	Lorry (truck), unspecified (default)	100
	Combustion	Lorry (truck), unspecified (default)	150
	Recycling	Lorry (truck), unspecified (default)	50

Table 4: Proportion of waste treatment types

Waste scenario	Proportion of waste treatment types [%]		
	Landfill	Recycling	Combustion
Steel, reinforcement (NMD ID 74)	5	95	-

Table 5 C3-C4 - Environmental profiles used for loads

Waste scenario	Environmental profile used for loads (Ecoinvent version 3.6)		
	Landfill	Recycling	Combustion
Steel, reinforcement (NMD ID 74)	Scrap steel {Europe without Switzerland} | treatment of scrap steel, inert material landfill | Cut-off	Materials for recycling, no waste processing taken into account	-

5. LCA: Results

The following tables show the results of the life cycle assessment, specifically for the environmental impact indicators, resource consumption, output flows and waste categories. The results shown here relate to the declared unit of 1 kg of SAS thread bar.

The results of the environmental impact indicators ETP-fw, HTP-c, HTP-nc, SQP, ADP-f, ADP-mm and WDP must be used with caution, as the uncertainties in these results are high or because there is only limited experience with the indicator.

The impact category IRP mainly deals with the possible effect of low-dose ionising radiation on human health in the nuclear fuel cycle. It does not take into account effects due to possible nuclear accidents and occupational exposure, nor the disposal of radioactive waste in underground facilities. Potential ionising radiation from soil, radon and some building materials is also not measured by this indicator.

Specification of the system boundaries (X = module declared; MND = module not declared)																
PRODUCTION PHASE			**CONSTRUCTION PHASE**		**USE PHASE**							**DISPOSAL PHASE**				**Credits and loads outside the system boundaries**
Raw material supply	Transport	Manufacturing	Transport	Construction / Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction / Demolition	Transport	Waste treatment	Landfilling	Reuse-, Recovery, Recycling potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	X

Results of the life cycle assessment - environmental impact indicators: 1 kg SAS thread bar (12 mm to 75 mm)										
Indicator	**Unit**	**A1**	**A2**	**A3**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
AP	mol H+ -eq.	1,66E-03	1,08E-04	3,13E-04	2,08E-03	0,00E+00	4,12E-05	0,00E+00	2,51E-06	-4,40E-04
GWP-total	kg CO2 -eq.	5,06E-01	1,27E-02	1,60E-01	6,79E-01	0,00E+00	7,12E-03	0,00E+00	2,65E-04	-1,13E-01
GWP-b	kg CO2 -eq.	2,40E-03	7,22E-05	2,60E-04	2,73E-03	0,00E+00	3,28E-06	0,00E+00	5,24E-07	1,19E-03
GWP-f	kg CO2 -eq.	5,04E-01	1,26E-02	1,60E-01	6,77E-01	0,00E+00	7,11E-03	0,00E+00	2,64E-04	-1,14E-01
GWP-luluc	kg CO2 -eq.	1,42E-04	1,50E-05	3,55E-05	1,93E-04	0,00E+00	2,61E-06	0,00E+00	7,37E-08	8,42E-05
ETP-fw	CTUe	8,74E+00	1,98E-01	1,28E+00	1,02E+01	0,00E+00	9,56E-02	0,00E+00	4,79E-03	-3,82E+00
PM	Occurrence of diseases	2,84E-08	9,42E-10	3,37E-09	3,27E-08	0,00E+00	6,40E-10	0,00E+00	4,88E-11	-6,60E-09
EP-m	kg N-eq.	3,82E-04	3,78E-05	7,95E-05	4,99E-04	0,00E+00	1,45E-05	0,00E+00	8,63E-07	-8,16E-05
EP-fw	kg PO4 -eq.	2,00E-05	5,33E-07	3,09E-06	2,36E-05	0,00E+00	7,17E-08	0,00E+00	2,96E-09	-4,02E-06
EP-t	mol N-eq.	4,36E-03	4,19E-04	8,93E-04	5,67E-03	0,00E+00	1,60E-04	0,00E+00	9,51E-06	-9,52E-04
HTP-c	CTUh	3,54E-09	1,21E-11	3,45E-10	3,90E-09	0,00E+00	3,10E-12	0,00E+00	1,11E-13	-1,47E-11
HTP-nc	CTUh	8,72E-09	2,22E-10	2,04E-09	1,10E-08	0,00E+00	1,05E-10	0,00E+00	3,41E-12	2,21E-08
IRP	kBq U235-eq.	4,87E-02	1,04E-03	6,86E-03	5,66E-02	0,00E+00	4,49E-04	0,00E+00	3,03E-05	1,95E-03
SQP	-	1,20E+00	1,28E-01	1,06E+00	2,39E+00	0,00E+00	9,30E-02	0,00E+00	1,55E-02	-1,76E-01
ODP	kg CFC11-eq.	4,95E-08	1,73E-09	1,97E-08	7,09E-08	0,00E+00	1,57E-09	0,00E+00	1,09E-10	-2,78E-09
POCP	kg NMVOC-eq.	1,41E-03	1,14E-04	5,53E-04	2,08E-03	0,00E+00	4,57E-05	0,00E+00	2,76E-06	-6,48E-04
ADP-f	MJ	9,51E+00	1,85E-01	2,75E+00	1,24E+01	0,00E+00	1,07E-01	0,00E+00	7,39E-03	-7,96E-01
ADP-mm	kg Sb-eq.	1,15E-06	1,01E-07	5,85E-07	1,84E-06	0,00E+00	1,80E-07	0,00E+00	2,42E-09	-7,70E-08
WDP	m3 world eq. withdrawn	2,53E-02	1,64E-03	4,49E-03	3,14E-02	0,00E+00	3,84E-04	0,00E+00	3,31E-04	-2,17E-02

AP = Acidification potential, accumulated exceedance;
GWP-total = Global warming potential, total;
GWP-b = Global warming potential, biogenic;
GWP-f = Global warming potential, fossil;
GWP-luluc = Global warming potential, land use and land use change;
ETP-fw = Ecotoxicity potential, freshwater;
PM = Particulate matter emissions;
EP-m = Eutrophication potential, fraction of nutrients reaching marine saltwater end compartment;
EP-fw = Eutrophication potential, fraction of nutrients reaching freshwater end compartment;
EP-t = Eutrophication potential, accumulated potential;
HTP-c = Human toxicity potential, cancer-effects;
HTP-nc = Human toxicity potential, non-cancer effects;
IRP = Ionising radiation potential, human health;
SQP = Soil quality potential;
ODP = Depletion potential of the stratospheric ozone layer;
POCP = Formation potential of tropospheric ozone;
ADP-f = Abiotic depletion potential for fossil resources;
ADP-mm = Abiotic depletion potential for non-fossil resources, minerals and metals;
WDP = Water deprivation potential, deprivation-weighted water consumption

Life cycle assessment results - resource consumption, output flows & waste categories: 1 kg SAS thread bar (12 mm to 75 mm)										
Parameters	**Unit**	**A1**	**A2**	**A3**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	2,64E-01	1,60E-02	3,35E-01	6,15E-01	0,00E+00	1,34E-03	0,00E+00	5,97E-05	2,31E-02
PERM	MJ	1,67E-02	0,00E+00	5,25E-02	6,92E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	MJ	2,81E-01	1,60E-02	3,88E-01	6,85E-01	0,00E+00	1,34E-03	0,00E+00	5,97E-05	2,31E-02
PENRE	MJ	9,52E+00	1,96E-01	2,93E+00	1,26E+01	0,00E+00	1,14E-01	0,00E+00	7,85E-03	-8,26E-01
PENRM	MJ	3,98E-01	0,00E+00	3,94E-02	4,37E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	MJ	9,91E+00	1,96E-01	2,97E+00	1,31E+01	0,00E+00	1,14E-01	0,00E+00	7,85E-03	-8,26E-01
SM	kg	1,07E+00	0,00E+00	9,16E-02	1,16E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	m3	2,26E-03	8,70E-05	3,61E-04	2,71E-03	0,00E+00	1,31E-05	0,00E+00	7,89E-06	-4,12E-04
HWD	kg	7,12E-06	3,60E-07	3,61E-06	1,11E-05	0,00E+00	2,72E-07	0,00E+00	1,10E-08	-1,37E-05
NHWD	kg	9,32E-02	2,50E-03	1,61E-02	1,12E-01	0,00E+00	6,80E-03	0,00E+00	5,02E-02	-1,12E-02
RWD	kg	6,25E-05	1,14E-06	8,88E-06	7,25E-05	0,00E+00	7,04E-07	0,00E+00	4,85E-08	6,75E-07
CRU	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	kg	1,75E-01	0,00E+00	9,29E-02	2,68E-01	0,00E+00	0,00E+00	9,53E-01	0,00E+00	0,00E+00
MER	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EET	MJ	4,66E-03	0,00E+00	1,39E-02	1,86E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EEE	MJ	2,70E-03	0,00E+00	8,05E-03	1,08E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

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;
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;
EET = Exported energy, thermic;
EEE = Exported energy, electric

Information on biogenic carbon content: 1 kg SAS thread bar (12 mm to 75 mm)		
Parameters	**Unit**	**Value**
Biogenic carbon content in the product	kg C	0,00
Biogenic carbon content in the associated packaging	kg C	0,002202523
NOTE 1 kg of biogenic carbon corresponds to 44/12 kg of CO2.		

6. LCA: Interpretation

For easier understanding, the results are presented graphically so that correlations and connections between the data can be recognised more clearly.

Figure 2 shows the percentage share of the product phases in the environmental impact categories for the EPD calculation of 1 kg of SAS thread bar.

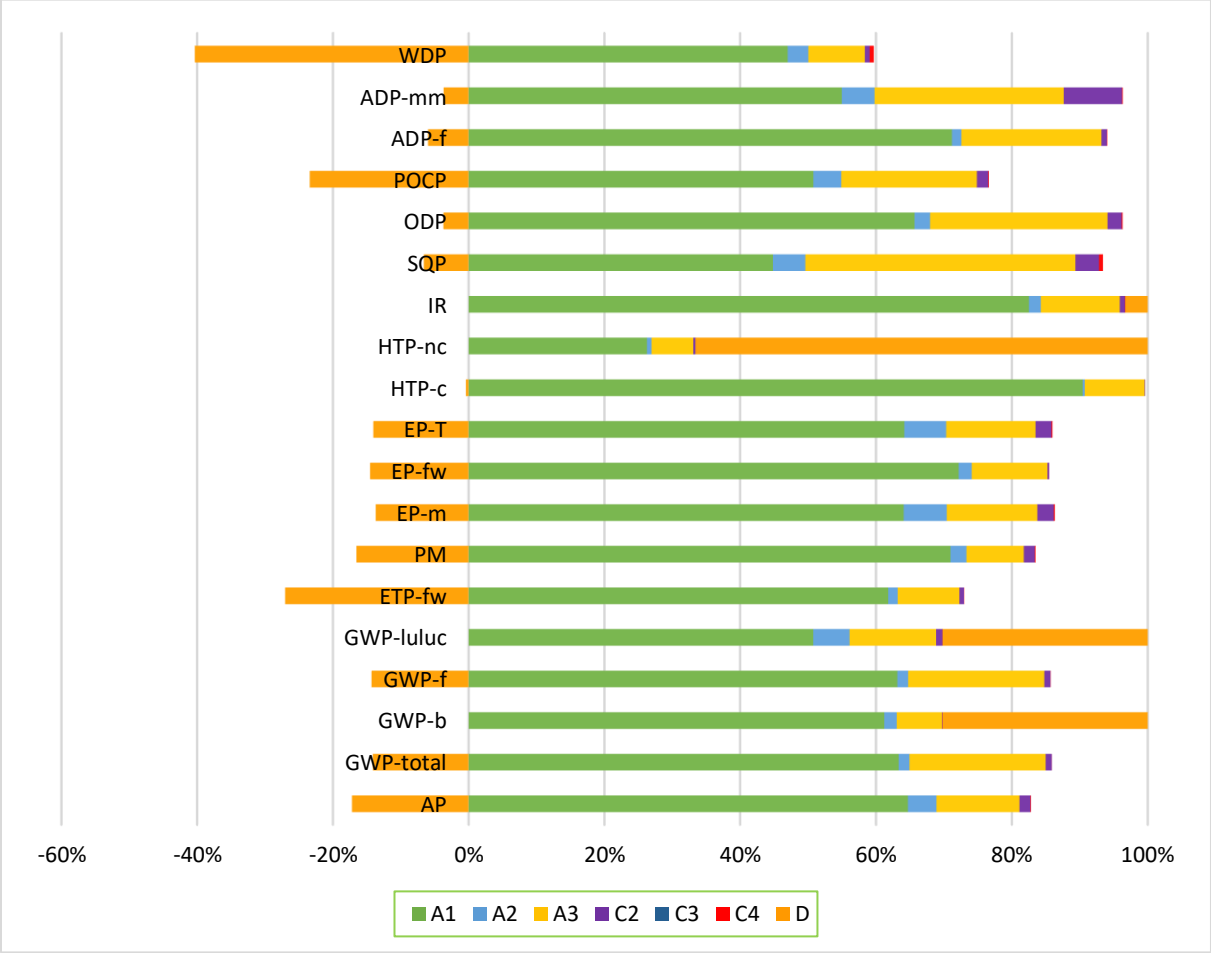


Figure 2 : Shares of the product life cycle phases in the environmental impact categories for SAS thread bar

Figure 2 clearly shows that in almost all environmental impact categories, the provision of raw materials in A1 accounts for the largest share, followed by production in A3. The large proportion of raw material provision in A1 is due to the high electricity consumption in the production of the intermediate product steel billet using an electric arc furnace (EAF).

7. Literature

Ecoinvent, 2019	Ecoinvent database version 3.6 (2019)
EN 15804	EN 15804:2012+A2:2019: Sustainability of construction works - Environmental Product Declarations - Core rules for the product category of construction products
ISO 14025	DIN EN ISO 14025:2011-10: Environmental labels and declarations - Type III environmental declarations - Principles and procedures
ISO 14040	DIN EN ISO 14040:2006-10, Environmental management - Life cycle assessment - Principles and framework; EN ISO 14040:2006
ISO 14044	DIN EN ISO 14044:2006-10, Environmental management - Life cycle assessment - Requirements and guidelines; EN ISO 14040:2006
PCR A	Kiwa-Ecobility Experts, Berlin, 2022: PCR A - General Programme Category Rules for Construction Products from the EPD programme of Kiwa-Ecobility Experts; Version 2.1
PCR B	Kiwa-Ecobility Experts, Berlin, 2020: PCR B - Product Category Rules for steel construction products, Requirements on the Environmental Product Declarations for steel construction products; Version 2020-03-13 (draft)
R<THiNK, 2023	R<THiNK; online EPD tool from Nibe; 2023
SBK, 2019	SBK-verification protocol - inclusion data in the Dutch environmental database, Final Version 3.0, January 2019, SBK
Worldsteel, 2017	World Steel Association, Brussels, 2017: Life cycle inventory methodology report for steel products; ISBN 978-2-930069-89-0.

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Appendix: Modelling of green electricity production

The results of the simulation calculation for modelling green electricity production for the declared product SAS thread bar are shown below.

For the simulation calculation, all values from the life cycle assessment of the document with the registration number EPD-Kiwa-EE-363-EN for the declared product SAS thread bar are adopted with the only change in the electricity mix for the production of the raw materials (Module A1) and for the manufacturing phase (Module A3).

Instead of the electricity mix from the Lech-Stahlwerke GmbH production site, the simulation calculation uses 100% hydropower for Germany as an example.

Instead of the electricity mix from the production site of Stahlwerk Annahütte Max Aicher GmbH & Co. KG, the simulation calculation uses 100% hydropower for Germany as an example.

The following table shows the results for the Global Warming Potential for the simulation calculation for modelling green electricity production and the results for the Global Warming Potential from the document with the registration number EPD-Kiwa-EE-363-EN.

The results for the Global Warming Potentials are given in the unit kg. CO2-eq. and refer to one tonne of the declared product SAS thread bar. The data set for 100% hydropower for Germany from the Ecoinvent database version 3.6 is used for the simulation calculation for modelling green electricity production.

Type of observation	Electricity mix	Global Warming Potential in kg CO2-eq. (sum A1-A3)
Life cycle assessment of the document with the registration number EPD-Kiwa-EE-363-EN	Electricity mix from the production site of Lech-Stahlwerke GmbH, electricity mix from the production site of Stahlwerk Annahütte Max Aicher GmbH & Co. KG	**678.7 kg CO2-eq.**
Simulation calculation modelling of a green electricity production	100% hydropower for the country of Germany	**327.7 kg CO2-eq.**

The simulation calculation for modelling green electricity production results in an improvement in the global warming potential of 351.0 kg CO2-eq. after the only change in the electricity mix for the production of raw materials (Module A1) and for the production phase (Module A3).

The results of the simulation calculation modelling of green electricity production may not be used as a substitute for the present EPD data set with the registration number EPD-Kiwa-EE-363-EN.