Environmental Product Declaration

as per ISO 14025 and EN 15804

Owner of the declaration:	LI DA METAL TECHNOLOGY LLC
Publisher:	Kiwa-Ecobility Experts
Programme operator:	Kiwa-Ecobility Experts
Registration number:	EPD-Kiwa-EE-313-EN
Issue date:	12.09.2023
Valid to:	12.09.2028

Weldable hot rolled reinforcing steel bars

Reinforcing steel bars A500 class (B500B) diameters from 12 mm to 25 mm

1. General information

LI DA METAL TECHNOLOGY LLC

Program operator
Kiwa-Ecobility Experts
Voltastr. 5
13355 Berlin
Germany

Registration number
EPD-Kiwa-EE-313-EN

This declaration is based on the Product Category Rules
PCR B for construction steel products (construction steel products; draft; 2020-03-13).

Issue date
12.09.2023

Valid to
12.09.2028

Frank Huppertz
(Head of Kiwa – Ecobility Experts)

Prof. Dr. Frank Heimbecher
(Chairman of the independent expert committee Kiwa-Ecobility Experts)

Reinforcing steel bars

Owner of the declaration
LI DA METAL TECHNOLOGY LLC
Industry zone, Ohangaron city
Tashkent region
Republic of Uzbekistan

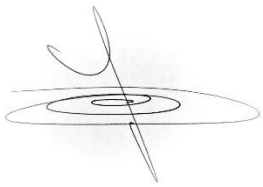
Declared product / declared unit
1 kg reinforcing steel bars

Scope
This EPD is based on the LCA of the reinforcing steel bars produced by LI DA METAL TECHNOLOGY LLC at the steel mill of the plant location in Ohangaron city.
The type of the EPD is “cradle to gate with modules C1-C4 and module D”.
The owner of the declaration shall be liable for the underlying information and evidence. Kiwa-Ecobility Experts shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

Verification
The European standard EN15804:2012+A2:2019 serves as the core PCR.

Independent verification of the declaration and data according to ISO 14025:2006

☐internal ☒external



Verification
Anne Kees Jeeninga - Advieslab V.o.f.
(Third party verifier)

2. Product

2.1 Product description

The product to be declared is an average of weldable reinforcing steel bars. A range of reinforcing steel bars A500 class (B500B) diameters from 12 mm to 25 mm. The product to be declared is reinforcing steel bars from LI DA METAL TECHNOLOGY LLC which is produced in the steel mill of the plant located at Industry zone, Ohangaron city, Tashkent region, Republic of Uzbekistan.

2.2 Application

The Reinforcing steel bars are used for the reinforcement of concrete.

2.3 Technical data

The following technical data was provided by LI DA METAL TECHNOLOGY LLC.

Table 1: Technical data

Parameter	Value
Steel Grade	B500B
Yield strength	≥ 500 MPa
Ratio R_m/R_e	≥ 1.08
Elongation	≥ 5 %
Durability:	C ≤ 0,240 %; S ≤ 0,055 %; P ≤ 0,055 %; N ≤ 0,014 %; Cu ≤ 0,850 %; C_{eq} ≤ 0,520 %
Way of production	EAF
Standard/Norm	EN 10080 + all national standards for each European country, GOST 34028
Range of diameters	12 mm to 25 mm

2.4 Manufacturing

The production process consists of next stages:
- Acceptance of scrap and waste of ferrous metals,
- Steel melting,
- Steel rolling.

The warehouse of scrap and waste of ferrous metals are near by the steel melting shop. All warehouse raw materials are placing into a blast furnace and melting. The melting process consists of several stages, during which additives are added to obtain the required composition of steel.

Steel rolling process starts from steel billets, witch are steel melting products with a square cross-section and rounded edges produced by continuous casting, forming. They serve as starting material for the hot rolling process.

2.5 Raw materials

Table 2 lists the raw materials for the reinforcing bars. To respect the commercial secrets, the values are given in intervals that represents the distribution of the shares of the raw materials.

Table 2: Raw materials and shares in mass percent

Material	Share in %
Ferrosilicon	0-1
Coke	0-1
Manganese for Siliconmanganese	0-1
Technological scrap	90-91
Hot-bracketed metal	6-7

There is no biogenic carbon in the products. The product does not contain substances from the “Candidate list of substances of very high concern for authorisation” (SVHC).

2.6 Reference service life

Since the service life of reinforcing bars is not considered, there is no need to specify a reference service life.

3. LCA: Calculation rules

3.1 Declared unit

According to PCR B for construction steel products (draft; 2020-03-13), the declared unit is 1 kg reinforcing steel bar.

Table 3: Declared unit

Parameter	Value	Unit
Declared unit	1	kg

For the calculation of potential environmental impacts, process-specific data were collected for the product under consideration. All the energy and materials required for the production process were determined, as were the data for calculating the auxiliary materials and co-products.

This is an EPD for reinforcing bars, which were produced at the plant location in Ohangaron city. The range of diamters is from 12 mm to 25 mm.

3.2 System boundary

In this life cycle assessment according to EN 15804+A2, 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 Manufacturing

A3: Manufacturing

C1: Demolition

C2: Transport to waste treatment

C3: Waste treatment for reuse, recovery and/or recycling

C4: Disposal

D: Reuse-, Recovery-, Recycling- potentials, indicated as net flows and benefits

Therefore, the type of this average EPD is “cradle to gate with modules C1-C4 and module D”.

For the declared life cycle phases, all inputs (raw materials, precursors, energy and auxiliary materials) as well as the waste generated were considered.

Figure 1 shows the simplified process flow diagram for the regarded steel product Reinforcing steel bars which are produced at the plant location LI DA METAL TECHNOLOGY LLC.

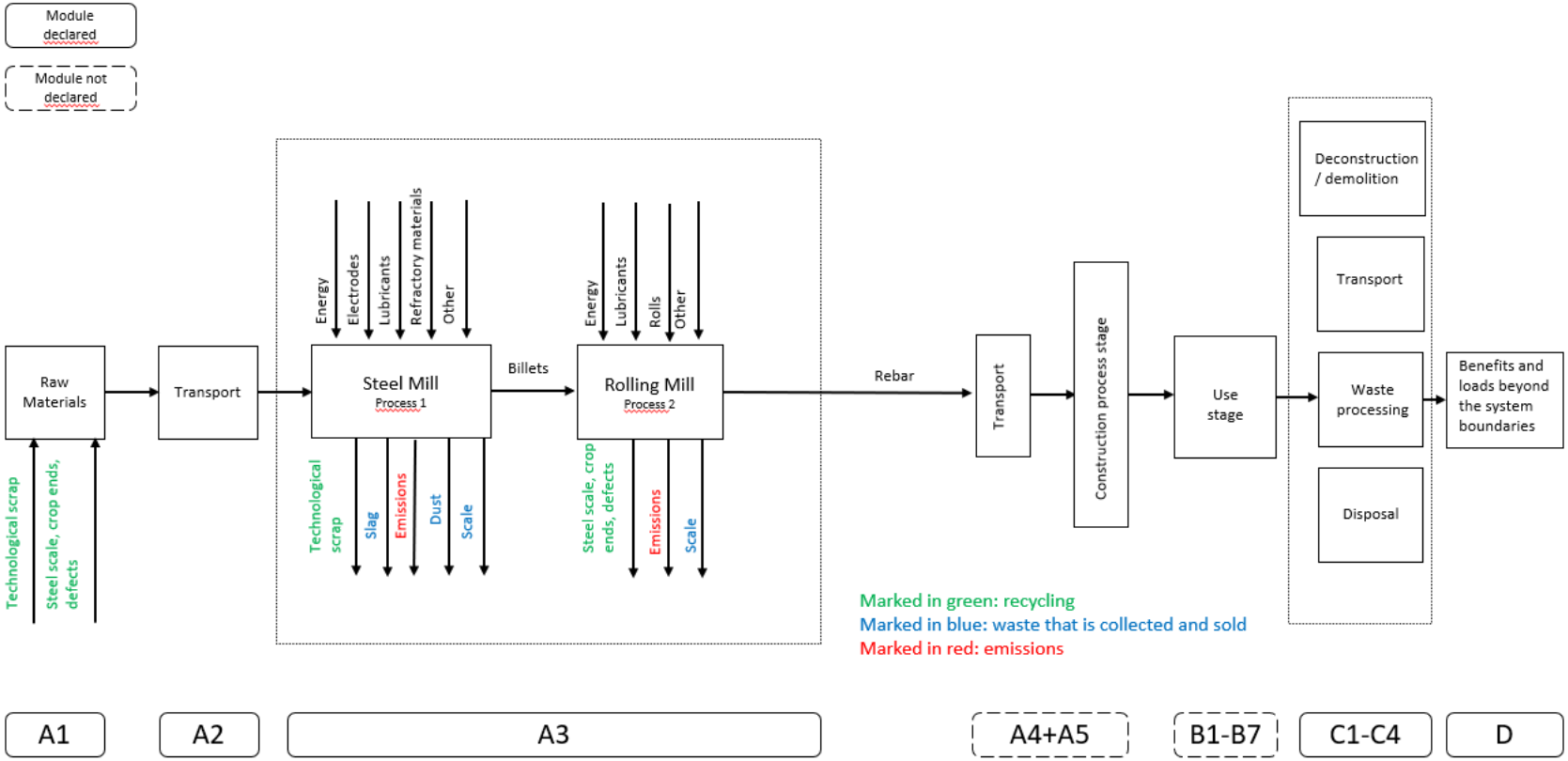


Figure 1: Simplified process flow diagram

3.3 Estimates and assumptions

The waste scenarios for production and the waste scenarios for the end-of-life phase were created on the basis of a detailed query. The background data for modelling the fall scenarios were provided by LI DA METAL TECHNOLOGY LLC and are explained and presented in the background report.

3.4 Period under review

All product- and process-specific data were collected for the 2022 operating year and are thus up-to-date.

3.5 Cut-off criteria

For the process modules A1 to A3, all process-specific data were collected. Potential environmental impacts were assigned to the material flows based on the Ecoinvent database V3.6 of 2019. All flows contributing to more than 1 percent of the total mass, energy, or environmental impacts of the system were considered in the LCA. It can be assumed that the neglected processes would have contributed less than 5 percent to the considered impact categories.

The following inputs have been placed under cut-off criteria (<1% of the total mass):

Production emissions: iron oxide, manganese oxides.

3.6 Data quality

To ensure the comparability of the results, only consistent background data from the Ecoinvent database V3.6 of 2019 were used in the LCA (e.g. data sets on energy, transports, auxiliary and operating materials). The database is regularly checked and thus complies with the requirements of EN 15804 (background data not older than 10 years). Almost all consistent data sets contained in the Ecoinvent database V3.6 of 2019 are documented and can be viewed in the online documentation.The data refer to the annual average of inputs (energy, inputs, etc.) consumed during the operating phase 01/2022 - 12/2022 and were converted to reference flows (input / output per declared unit).

The general rule was followed that specific data from specific production processes or average data derived from specific processes must have priority in the calculation of an LCA. Data for processes over which the manufacturer has no control were assigned generic data.

The calculation of the LCA was performed using the online EPD tool "R<THiNK" from Nibe.

3.7 Allocation

The allocation regarding production waste is explained in the project report of this EPD. There are no multi-functional processes to be considered. Specific information on allocations within the background data can be found in the Ecoinvent database V3.6 document of 2019.

3.8 Comparability

In principle, a comparison or assessment of the environmental impacts of different products is only possible if they have been prepared in accordance with EN 15804. For the evaluation of the comparability, the following aspects have to be considered in particular: 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 use and disposal phases, and the life cycle inventory (data collection, calculation methods, allocations, validity period). PCRs and general program instructions of different EPDs programs may differ. A comparability needs to be evaluated. For further guidance see EN 15804+A2 (5.3 Comparability of EPD for construction products) and ISO 14025 (6.7.2 Requirements for comparability). Reference Service Life (RSL)

The lifetime of monopiles will be limited by the service life of the construction. Under these circumstances, no RSL according to the relevant ISO standards and EN 15804 can be declared.

3.9 Data collection

For the data collection, ISO 14044 section 4.3.2 was considered.

The data collection was implemented by using an Excel data collection template provided by Kiwa GmbH. The data collected was checked by Kiwa GmbH, for example by checking the extent to which the data for the different production processes matched to each other. In this way, some errors (e.g. unit errors, language barriors) could still be corrected in cooperation with RIVA Thy Marcinelle S.A.. The annual input and output values (raw materials and energy, auxiliary materials, components of waste etc.) were related to the declared unit of one kilogram of steel product with the aid of corresponding calculations.

3.10 Calculation methods

The calculation procedures described in ISO 14044 Section 4.3.3 were used for the life cycle assessment. The evaluation is based on the phases according to the system boundaries and the processes contained.

4. LCA: Scenarios and additional technical information

The assigned waste scenarios are based on the "Natio-nale Milieudatabase" (NMD), the national environmental database of the Netherlands. This is due to the fact that the used online EPD tool "R<THiNK" was developed by Nibe in the Netherlands. The waste scenario used for reinforcing steel has the NMD ID 72. Further informarmation about the waste scenarios are presented in the backround report.

Table 4: C2 – Transport End of Life

Waste Scenario	Waste Treatment	Transport Profile	Transport ditance in km
Steel, reinforcement (NMD ID 74)	Landfill	Lorry (Truck), unspecified (default)	100
	Incineration	Lorry (Truck), unspecified (default)	150
	Recycling	Lorry (Truck), unspecified (default)	50

Table 5: C– Shares of waste treatment

Waste Scenario	Shares of waste treatment [%]		
	Landfill	Recycling	Incineration
Steel, reinforcement (NMD ID 74)	5	95	-

Table 6: D – Used Environmental Profile for benefits

Waste Scenario	Used Environmental Profile for benefits		
	Landfill	Recycling	Incineration
Steel, reinforcement (NMD ID 74)	–	Benefits module D | World Steel method (Steel production, electric, low-alloyed - Steel production, converter, unalloyed)	-

5. LCA: Results

The following tables show the results of the life cycle assessment, more precisely for the environmental impact indicators, resource consumption, output flows and waste categories. The results presented refer to the declared unit of 1 kg of reinforcing steel bars.

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 as there is limited experience with the indicator.

Disclaimer on IR: This impact category mainly addresses the potential effect of low dose ionizing radiation on human health in the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents and occupational exposures, nor does it consider radioactive waste disposal in underground facilities. Potential ionizing radiation from soil, radon, and some building materials is also not measured by this indicator.

Table 7: Overview of the considered information modules showing all phases of the building life cycle according to DIN EN 15804 (X = module declared)

Description of the system boundary (X = module declared; MND = module not declared)														
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 manufacturer to place of use	Construction-installation process	Use	Maintenance	Repair	Replacement	Refurbishmen	De-construction / demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**C1**	**C2**	**C3**	**C4**	**D**
X	**X**	**X**	**MND**	**MND**	**MND**	**MND**	**MND**	**MND**	**MND**	**X**	**X**	**X**	**X**	**X**

Table 8: Results of the LCA – Environmental impact categories and parameters

Results										
Environmental effects	**Unit**	**A1**	**A2**	**A3**	**C1**	**C2**	**C3**	**C4**	**D**	**Total**
Acidification (AP)	mol H+ eqv.	1,08E-03	9,49E-05	2,06E-03	0,00E+00	4,12E-05	0,00E+00	2,74E-06	-1,72E-04	3,11E-03
Global warming potential (GWP-total)	kg CO2 eqv.	2,22E-01	1,64E-02	6,50E-01	0,00E+00	7,11E-03	0,00E+00	2,91E-04	-4,41E-02	8,51E-01
Global warming potential - Biogenic (GWP-b)	kg CO2 eqv.	-3,35E-04	7,55E-06	-5,61E-04	0,00E+00	3,28E-06	0,00E+00	6,53E-07	4,64E-04	-4,20E-04
Global warming potential - Fossil (GWP-f)	kg CO2 eqv.	2,22E-01	1,64E-02	6,50E-01	0,00E+00	7,11E-03	0,00E+00	2,90E-04	-4,46E-02	8,51E-01
Global warming potential - Land use and land use change	kg CO2 eqv.	2,84E-04	5,99E-06	8,53E-05	0,00E+00	2,60E-06	0,00E+00	8,25E-08	3,29E-05	4,11E-04
Ecotoxicity, freshwater (ETP-fw)	CTUe	8,49E+00	2,20E-01	7,12E+00	0,00E+00	9,56E-02	0,00E+00	2,85E-02	-1,50E+00	1,45E+01
Particulate Matter (PM)	disease incidence	8,30E-08	1,47E-09	2,53E-08	0,00E+00	6,39E-10	0,00E+00	5,26E-11	-2,58E-09	1,08E-07
Eutrophication marine (EP-m)	kg N eqv.	2,97E-04	3,34E-05	4,94E-04	0,00E+00	1,45E-05	0,00E+00	9,32E-07	-3,19E-05	8,08E-04
Eutrophication, freshwater (EP-fw)	kg P eqv.	1,59E-05	1,65E-07	1,51E-05	0,00E+00	7,17E-08	0,00E+00	5,10E-09	-1,57E-06	2,96E-05
Eutrophication, terrestrial (EP-T)	mol N eqv.	2,61E-03	3,69E-04	5,35E-03	0,00E+00	1,60E-04	0,00E+00	1,03E-05	-3,72E-04	8,13E-03
Human toxicity, cancer (HTP-c)	CTUh	1,43E-09	7,14E-12	4,20E-09	0,00E+00	3,10E-12	0,00E+00	2,15E-10	-5,77E-12	5,85E-09
Human toxicity, non-cancer (HTP-nc)	CTUh	3,66E-09	2,41E-10	3,04E-09	0,00E+00	1,05E-10	0,00E+00	4,37E-12	8,64E-09	1,57E-08
Ionising radiation, human health (IR)	kBq U235 eqv.	8,66E-03	1,03E-03	5,12E-03	0,00E+00	4,49E-04	0,00E+00	3,36E-05	7,62E-04	1,61E-02
Land use (SQP)	Pt	1,28E+00	2,14E-01	1,04E+00	0,00E+00	9,30E-02	0,00E+00	1,87E-02	-6,89E-02	2,57E+00
Ozone depletion (ODP)	kg CFC 11 eqv.	1,15E-08	3,61E-09	4,47E-08	0,00E+00	1,57E-09	0,00E+00	1,20E-10	-1,09E-09	6,04E-08
Photochemical ozone formation - human health (POCP)	kg NMVOC eqv.	8,24E-04	1,05E-04	1,54E-03	0,00E+00	4,57E-05	0,00E+00	3,00E-06	-2,53E-04	2,26E-03
Resource use, fossils (ADP-f)	MJ	2,63E+00	2,47E-01	9,29E+00	0,00E+00	1,07E-01	0,00E+00	8,21E-03	-3,11E-01	1,20E+01
Resource use, minerals and metals (ADP-mm)	kg Sb-eqv.	2,83E-06	4,14E-07	1,62E-06	0,00E+00	1,80E-07	0,00E+00	2,71E-09	-3,01E-08	5,02E-06
Water use (WDP)	m3 world eqv.	2,00E-02	8,83E-04	2,36E-01	0,00E+00	3,83E-04	0,00E+00	3,71E-04	-8,50E-03	2,49E-01
renewable primary energy ex. raw materials	MJ	2,74E-01	3,09E-03	5,64E-01	0,00E+00	1,34E-03	0,00E+00	6,74E-05	9,05E-03	8,51E-01
renewable primary energy used as raw materials	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
renewable primary energy total	MJ	2,74E-01	3,09E-03	5,64E-01	0,00E+00	1,34E-03	0,00E+00	6,74E-05	9,05E-03	8,51E-01
non-renewable primary energy ex. raw materials	MJ	2,68E+00	2,62E-01	1,02E+01	0,00E+00	1,14E-01	0,00E+00	8,72E-03	-3,23E-01	1,29E+01
non-renewable primary energy used as raw materials	MJ	1,01E-01	0,00E+00	1,61E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,17E-01
non-renewable primary energy total	MJ	2,78E+00	2,62E-01	1,02E+01	0,00E+00	1,14E-01	0,00E+00	8,72E-03	-3,23E-01	1,30E+01
use of secondary material	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
use of renewable secondary fuels	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
use of non-renewable secondary fuels	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
use of net fresh water	M3	2,54E-03	3,01E-05	6,14E-03	0,00E+00	1,31E-05	0,00E+00	8,85E-06	-1,61E-04	8,57E-03
hazardous waste disposed	Kg	2,77E-06	6,25E-07	1,07E-05	0,00E+00	2,72E-07	0,00E+00	1,21E-08	-5,35E-06	9,07E-06
non hazardous waste disposed	Kg	1,02E-01	1,56E-02	1,36E-01	0,00E+00	6,80E-03	0,00E+00	5,32E-02	-4,37E-03	3,08E-01
radioactive waste disposed	Kg	7,30E-06	1,62E-06	6,44E-06	0,00E+00	7,04E-07	0,00E+00	5,37E-08	2,64E-07	1,64E-05
Components for re-use	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
Materials for recycling	Kg	0,00E+00	0,00E+00	1,44E-01	0,00E+00	0,00E+00	9,47E-01	0,00E+00	0,00E+00	1,09E+00
Materials for energy recovery	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
Exported Energy Thermic	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
Exported Energy Electric	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

6. LCA: Interpretation

For an easier understanding, the results are processed graphically, in order to recognize relationships and connections between the data more clearly.

The following figure shows the percentage of the product phases in the environmental impact categories.

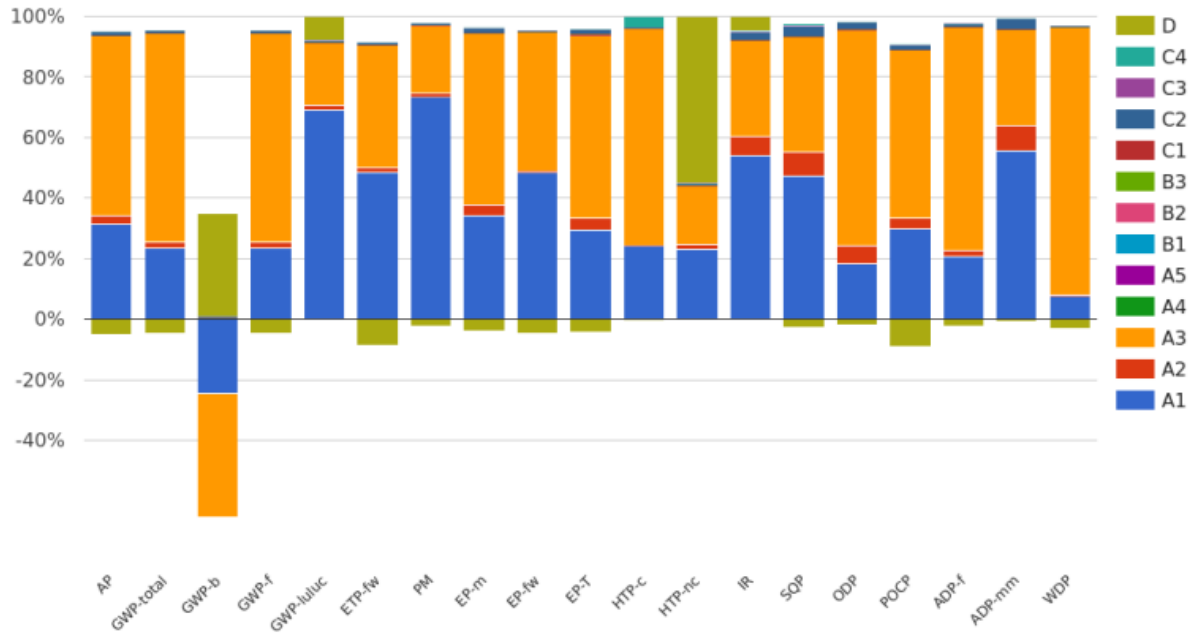


Figure 1: Percentage of the product phases in the environmental impact categories

The figure shows that for the environmental impact categories raw material supply A1 and the manufacturing A3 during the production phase have the highest percentages. The high share of production phase A3 is related to the high electricity consumption in steelmaking with an electric arc furnace (EAF). The high value for the impact categorie HTP-nc is related to the high share of nuclear energy in electricity production.

7. References

Ecoinvent, 2019	Ecoinvent Datenbank Version 3.6 (2019)
EN 15804	EN 15804:2012+A2:2019: 2020: 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
NMD 2019	NMD STICHTING NATIONAL ENVIRONMENTAL DATABASE: Environmental Performance Assessment Method for Construction; 1.1 (March 2022); Rijswijk
PCR A	General Program Category Rules for Construction Products from the EPD program Kiwa-Ecobility Experts, R.0_2021-07-16
PCR B	Requirements on the Environmental Product Declarations for construction steel products (Edition 2020-03-13 (draft))
R<THiNK, 2023	R<THiNK; Online-EPD-Tool by NIBE B.V.
SimaPro Software	Industry data LCA library; website: https://simapro.com/databases/industry-data-lca-library/

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