Environmental Product Declaration

according to ISO 14025 and EN 15804+A2

Owner oft he declaration:	RIVA ACIER S.A.S.
Publisher:	Kiwa – Ecobility Experts
Program operator:	Kiwa – Ecobility Experts
Declaration number:	EPD-RIVA ACIER-198-EN
Issue date:	27.01.2022
Valid to:	27.01.2027

Welded Mesh

This average EPD is based on the LCA of welded mesh from RIVA ACIER S.A.S., which is produced in the welding workshops of Acor Creil, Acor St. Just, Acor Vauvert, SAM Montereau and SAM Neuves Maisons.

1. Genereal information

RIVA ACIER S.A.S.

Program operator:
Kiwa – Ecobility Experts
Voltastr. 5
13355 Berlin
Deutschland

Declaration number:
EPD-RIVA ACIER-198-EN

Issue date:
27.01.2022

Scope:
This average EPD is based on the LCA of welded mesh from RIVA ACIER S.A.S., which is produced in the welding workshos of Acor Creil, Acor St. Just, Acor Vauvert, SAM Montereau and SAM Neuves Maisons. 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.

Welded Mesh

Owner of the declaration:
RIVA ACIER S.A.S.
Immeuble ALPA
ZI Limay Porcheville
78440 Gargenville
France

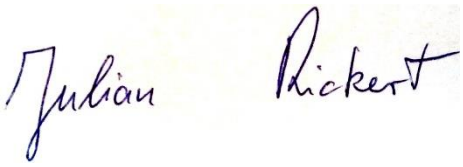
Declared product / declared unit:
1 kg welded mesh

Valid until:
27.01.2027

Product category rules:
PCR B for construction steel products (construction steel products; draft; 2020-03-13).

Verification:
The CEN Norm EN 15804+A2 serves as the core PCR.
Independent verification of the declaration and data according to ISO 14025
☐internally ☒externally

Frank Huppertz
(Head of Kiwa – Ecobility Experts)



Julian Rickert
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Prof. Dr. Frank Heimbecher
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2. Product

2.1 Product description

The product to be declared of welded mesh from RIVA ACIER S.A.S., which is produced in the welding workshos of Acor Creil, Acor St. Just, Acor Vauvert, SAM Montereau and SAM Neuves Maisons.

2.2 Application

The welded mesh is used for the reinforcement of concrete.

2.3 Technical data

The following technical data was provided by RIVA ACIER S.A.S..

Table 1: Technical data

Parameter	Value
Steel Grade	B500A, B500B
Yield strength	500 MPa
Ratio R_m/R_e	at least 1.05 to at least 1.08
Way of production	EAF
Standard/Norm	EN 10080 + all national standards for each European country
Range of diameters	4.5mm to 9mm

2.4 Manufacturing

Wire coils are produced by hot rolling steel billets on special continuous rolling mills, it is a long product formed into coils and serves as semi-finished product for the manufacturing of welded mesh.

Welded mesh panels consist of longitudinal and transverse bars of the same or different nominal diameter and length, technically at right angles to each other, which are joined at all crossing points by automatic machines in the factory by electric resistance spot welding.

2.5 Raw materials

Table 2 lists the raw materials for the steel billets from which the welded mesh is made, with the average shares in mass percent. 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 m%
Ferrosilicon	0-2
Limestone	2-4
Manganese for Siliconmanganese	0-2
Petroleum Coke/ Hard Coal	0-2
Scrap	95-98
Silicon for Silicomanganese	0-2

2.6 Reference service life

Since the service life of welded mesh 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 of welded mesh.

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 average EPD for welded mesh, which is produced in the welding workshos of Acor Creil, Acor St. Just, Acor Vauvert, SAM Montereau and SAM Neuves Maisons. The range of diamters is from 4.5mm to 9mm. The average is calculated on the basis of the 2020 production volume and the shares shown in Table 4.

Table 4: Shares of the products in the product group "Welded Mesh" based on production volume

Plant Location	Production volume 2020 in kg	Share in %
Acor St. Just	68 335 000	19.9
Acor Creil	126 393 000	36.9
Acor Vauvert	50 459 000	14.7
SAM Montereau	63 990 000	18.7
SAM Neuves Maisons	33 374 000	9.7

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

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 “from cradle to gate with options”.

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

3.3 Estimates and assumptions

The raw materials were assigned the waste scenario for reinforcing steel "Steel, reinforcement" both for waste during production and at the end of product life. The waste scenario is based on the "Nationale 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 information is listed in chapter 4. A suitable waste scenario from the NMD database was chosen and assigned for each of the auxiliary materials and listed in chapter 4.

3.4 Period under review

All product- and process-specific data were collected for the 2020 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

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 01/2020 - 12/2020 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 average 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

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 considered. The results of the LCA must be considered as average values out of different plant locations. To compare specific data for different plant locations in a direct way it is necessary to run the calculation for the LCA separately.

3.9 Data collection

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

The objective and the scope of the study were defined in consultation with RIVA ACIER S.A.S.. 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) could still be corrected in cooperation with RIVA ACIER S.A.S.. The annual values were then 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

As previously explained, the NMD waste scenario "Steel, reinforcement" with ID 72 was used for the raw material waste streams. For each of the auxiliary materials, a suitable waste scenario from the NMD database was chosen and assigned.

Table 5: C2 – Transport End of Life

Waste Scenario	Waste Treatment	Transport Profile	Transport ditance in km
concrete (i.a. elements, brickwork, reinforced concrete) (NMD ID 7)	Landfill	Lorry (Truck), unspecified (default)	100
	Incineration	Lorry (Truck), unspecified (default)	150
	Recycling	Lorry (Truck), unspecified (default)	50
Lubricating oil (landfill) ID: WDE0003-8432	Landfill	Lorry (Truck), unspecified (default)	100
	Incineration	Lorry (Truck), unspecified (default)	-
	Recycling	Lorry (Truck), unspecified (default)	-
finishes (adhered to wood, plastic, metal) (NMD ID 1)	Landfill	Lorry (Truck), unspecified (default)	100
	Incineration	Lorry (Truck), unspecified (default)	150
	Recycling	Lorry (Truck), unspecified (default)	50
Steel, reinforcement (NMD ID 72)	Landfill	Lorry (Truck), unspecified (default)	100
	Incineration	Lorry (Truck), unspecified (default)	150
	Recycling	Lorry (Truck), unspecified (default)	50
wood 'clean', via residue (NMD ID 35)	Landfill	Lorry (Truck), unspecified (default)	100
	Incineration	Lorry (Truck), unspecified (default)	150
	Recycling	Lorry (Truck), unspecified (default)	50

Table 6: C4 – Shares of waste treatment

Waste Scenario	Shares of waste treatment [%]		
	Landfill	Recycling	Incineration
concrete (i.a. elements, brickwork, reinforced concrete) (NMD ID 7)	1	99	-
Lubricating oil (landfill) ID: WDE0003-8432	100	-	-
finishes (adhered to wood, plastic, metal) (NMD ID 1)	-	-	100
Steel, reinforcement (NMD ID 72)	5	95	-
wood 'clean', via residue (NMD ID 35)	10	5	85

Table 7: D – Used Environmental Profile for loads

Material	Waste Scenario	Used Environmental Profile for loads		
		Landfill	Recycling	Incineratiom
Ferrosilicon	Steel, reinforce-ment (NMD ID 72)	Scrap steel {Europe without Switzerland} | treatment of scrap steel, inert material landfill | Cut-off	Materials for recycling, no waste pro-cessing taken into account	-
Covering Powder				
Lime				
Manganese for Siliconmangaese				
Petroleum Coke				
Scrap				
Silicon for Silicomanganese				
Cast Iron Rolls				
Argon	finishes (adhered to wood, plastic, metal) (NMD ID 1)	-	-	Waste paint {Eu-rope without Switzerland}| treatment of waste paint, mu-nicipal incinera-tion | Cut-off
Dolomite				
Electrodes				
Lime, hydrated				
Nitrogen				
Refractory				
Bauxite	concrete (i.a. ele-ments, brickwork, reinforced con-crete) (NMD ID 7)	Waste concrete {Europe without Switzerland}| treatment of waste concrete, inert material landfill | Cut-off	Crushing, per kg stoney ma-terial	-
Sodium Hydroxide for Water Treatment	Lubricating oil (landfill) ID: WDE0003-8432	Lubricating oil | production (EU)	-	-
Light Fuel Oil				
Lubricating Oil				

Wood Packaging	wood 'clean', via residue (NMD ID 35)	Waste wood, untreated {Europe without Switzerland}| treatment of waste wood, untreated, sanitary landfill | Cut-off	Wood chipping, industrial residual wood, stationary electric chipper {GLO}| market for | Cut-off	Waste wood, untreated {CH}| treatment of, municipal incineration | Cut-off

Table 8: D – Used Environmental Profile for benefits

Waste Scenario	Used Environmental Profile for benefits		
	Landfill	**Recycling**	**Incineration**
concrete (i.a. elements, brickwork, reinforced concrete) (NMD ID 7)	-	Gravel, round (RoW)	-
Lubricating oil (landfill) ID: WDE0003-8432	Lubricating oil | production (EU)	-	-
finishes (adhered to wood, plastic, metal) (NMD ID 1)	-	-	0267-avD&Vermeden energieproductie AVI, o.b.v. FOSSIELE grondstoffen, 18% elektrisch en 31% thermisch (per MJ LHV)
Steel, reinforcement (NMD ID 72)	–	Benefits module D | World Steel method (Steel production, electric, low-alloyed - Steel production, converter, unalloyed)	-
wood 'clean', via residue (NMD ID 35)	-	Wood chips, dry, measured as dry mass (EU)	Avoided energy production incinerator, based on RENEWABLE raw materials, 18% electrical and 31% thermal (per MJ LHV)

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 welded mesh. Since the installation of the product A5 is not considered, the demolition C1 is not considered either.

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.

The IRP 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 exposure, 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 9: 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 = Included in LCA)														
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 manu-facturer to place of use	Construction-instal-lation 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**	-	-	-	-	-	-	-	-	**X**	**X**	**X**	**X**

Table 10: Results of the LCA – Environmental impact categories

Results of the LCA – Environmental impact categories								
Impact category	**Unit**	**A1**	**A2**	**A3**	**C2**	**C3**	**C4**	**D**
AP	mol H+ eqv.	3,38E-04	1,64E-04	7,74E-04	4,70E-05	0,00E+00	2,86E-06	2,32E-04
GWP-total	kg CO2 eqv.	5,35E-02	2,73E-02	3,36E-01	8,11E-03	0,00E+00	3,02E-04	3,70E-02
GWP-b	kg CO2 eqv.	1,76E-03	1,76E-05	3,33E-02	3,74E-06	0,00E+00	5,97E-07	1,76E-05
GWP-f	kg CO2 eqv.	5,16E-02	2,73E-02	3,02E-01	8,11E-03	0,00E+00	3,01E-04	3,69E-02
GWP-luluc	kg CO2 eqv.	1,01E-04	1,18E-05	8,83E-05	2,97E-06	0,00E+00	8,40E-08	6,08E-05
ETP-fw	CTUe	1,57E+00	3,67E-01	3,28E+00	1,09E-01	0,00E+00	5,46E-03	1,05E+00
PM	disease incidence	1,67E-08	2,39E-09	6,13E-09	7,29E-10	0,00E+00	5,56E-11	4,77E-09
EP-m	kg N eqv.	7,03E-05	5,83E-05	1,42E-04	1,66E-05	0,00E+00	9,83E-07	3,83E-05
EP-fw	kg PO4 eqv.	3,40E-06	3,02E-07	5,67E-06	8,18E-08	0,00E+00	3,38E-09	2,40E-06
EP-T	mol N eqv.	8,04E-04	6,43E-04	2,34E-03	1,83E-04	0,00E+00	1,08E-05	4,55E-04
HTP-c	CTUh	8,81E-10	1,23E-11	2,53E-10	3,54E-12	0,00E+00	1,26E-13	5,11E-10
HTP-nc	CTUh	5,94E-10	3,98E-10	2,35E-09	1,19E-10	0,00E+00	3,88E-12	1,48E-08
IR	kBq U235 eqv.	4,16E-03	1,73E-03	8,94E-02	5,12E-04	0,00E+00	3,45E-05	1,97E-03
SQP	Pt	4,11E-01	3,52E-01	8,68E-01	1,06E-01	0,00E+00	1,77E-02	1,09E-01
ODP	kg CFC 11 eqv.	3,91E-09	5,93E-09	5,54E-08	1,79E-09	0,00E+00	1,24E-10	3,00E-09
POCP	kg NMVOC eqv.	2,56E-04	1,82E-04	5,07E-04	5,21E-05	0,00E+00	3,15E-06	1,78E-04
ADP-f	MJ	7,79E-01	4,10E-01	1,06E+01	1,22E-01	0,00E+00	8,42E-03	5,55E-01
ADP-mm	kg Sb-eqv.	5,19E-07	6,65E-07	1,68E-06	2,05E-07	0,00E+00	2,76E-09	-1,41E-08
WDP	m^3 world eqv.	1,08E-02	1,54E-03	5,41E-02	4,37E-04	0,00E+00	3,77E-04	-4,00E-03

AP = Acidification; GWP-total = Global warming potential; 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, freshwater; PM = Particulate Matter; EP-m = Eutrophication marine; EP-fw = Eutrophication, freshwater; EP-T = Eutrophication, terrestrial; HTP-c = Human toxicity, cancer; HTP-nc = Human toxicity, non-cancer; IR = Ionising radiation, human health; SQP = Land use; ODP = Ozone depletion; POCP = Photochemical ozone formation - human health; ADP-f = Resource use, fossils; ADP-mm = Resource use, minerals and metals; WDP = Water use

Table 11: Results of the LCA – Environmental parameters

Results of the LCA – Environmental parameters								
Parameter	**Unit**	**A1**	**A2**	**A3**	**C2**	**C3**	**C4**	**D**
PERE	MJ	1,67E-01	6,07E-03	1,42E+00	1,53E-03	0,00E+00	6,81E-05	3,02E-02
PERM	MJ	0,00E+00	0,00E+00	1,95E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	MJ	1,67E-01	6,07E-03	1,42E+00	1,53E-03	0,00E+00	6,81E-05	3,02E-02
PENRE	MJ	7,00E-01	4,35E-01	1,04E+01	1,30E-01	0,00E+00	8,94E-03	5,91E-01
PENRM	MJ	1,25E-01	0,00E+00	4,26E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	MJ	8,24E-01	4,35E-01	1,08E+01	1,30E-01	0,00E+00	8,94E-03	5,91E-01
SM	kg	1,10E+00	0,00E+00	1,10E-03	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
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	m^3	4,94E-04	5,45E-05	3,08E-03	1,49E-05	0,00E+00	8,99E-06	-1,75E-05
HWD	kg	4,41E-07	1,03E-06	6,02E-06	3,10E-07	0,00E+00	1,26E-08	2,67E-06
NHWD	kg	2,71E-02	2,48E-02	1,96E-02	7,75E-03	0,00E+00	5,72E-02	-1,85E-03
RWD	kg	3,40E-06	2,69E-06	1,16E-04	8,03E-07	0,00E+00	5,53E-08	1,57E-06
CRU	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	kg	0,00E+00	0,00E+00	2,40E-03	0,00E+00	1,09E+00	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
EET	MJ	0,00E+00	0,00E+00	1,21E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EEE	MJ	0,00E+00	0,00E+00	7,05E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00

PERE = Renewable primary energy ex. raw materials; PERM = Renewable primary energy used as raw materials; PERT = Renewable primary energy total; PENRE = Non-renewable primary energy ex. raw materials; PENRM = Non-renewable primary energy used as raw materials; PENRT = Non-renewable primary energy total; 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

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.

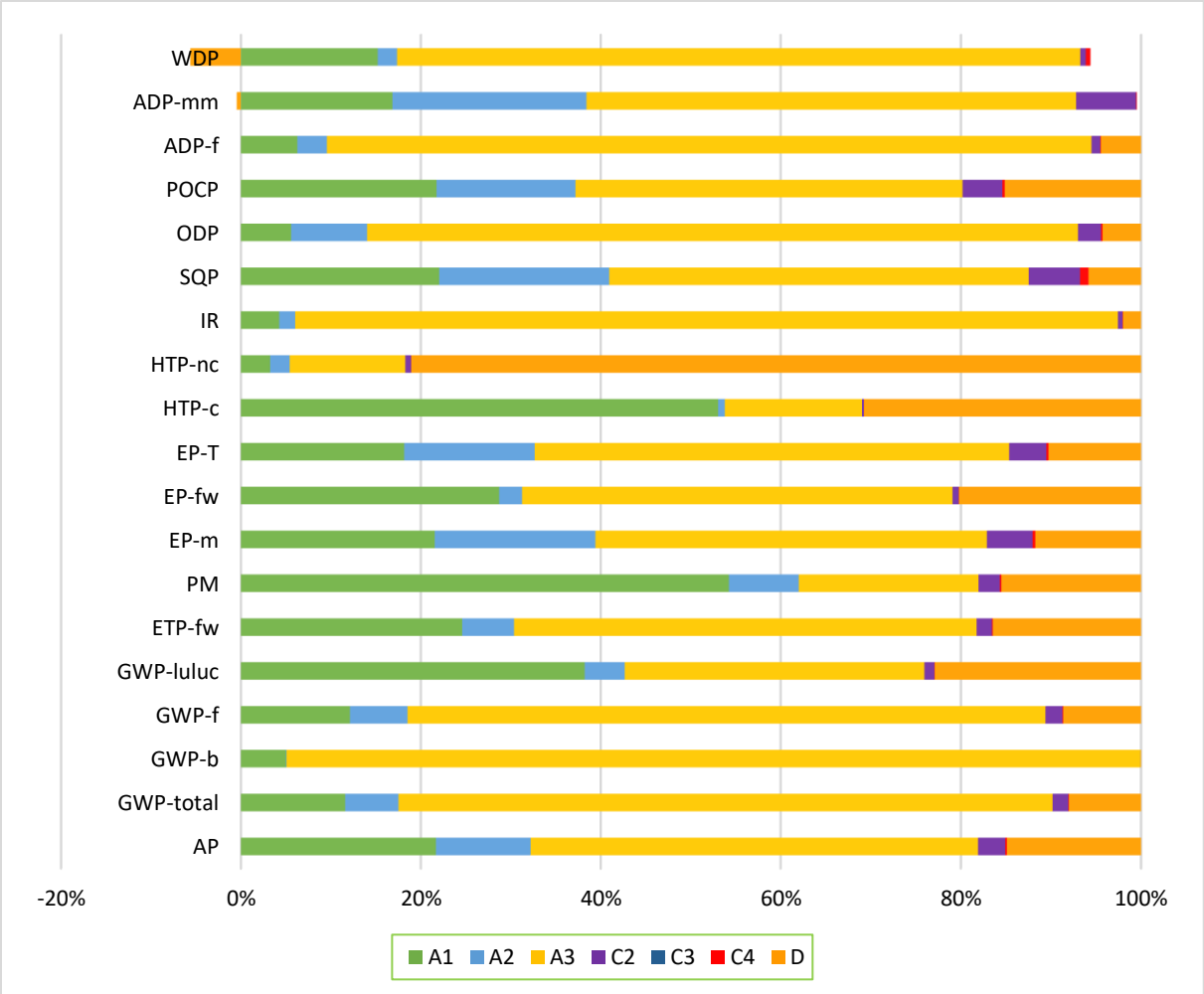

Figure 1: Percentage of the product phases in the environmental impact categories

The figure shows that for the environmental impact categories raw material supply A1 during the production phase and Reuse-Recovery-Recycling-potential module D 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
PCR A	General Program Category Rules for Construction Products from the EPD programme of Kiwa BCS Öko-Garantie GmbH - Ecobility Experts; Version 2.0
PCR B	Product Category Rules for steel construction products from the EPD programme of Kiwa BCS Öko-Garantie GmbH - Ecobility Experts; Requirements on the Environmental Product Declarations for steel construction products; Version 2020-03-13 (draft)
R<THiNK, 2021	R<THiNK; Online-EPD-Tool von Nibe; 2021

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