

Environmental Product Declaration

In accordance with ISO 14025 and EN 15804:2012+A2:2019/AC:2021

High DRI Content Rebar

DRI - EAF Routed Steel

from

Tosyali Algeria

Programme	The International EPD [®] System
Programme operator	EPD International, EPD MENA
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Company Information

Owner of the EPD

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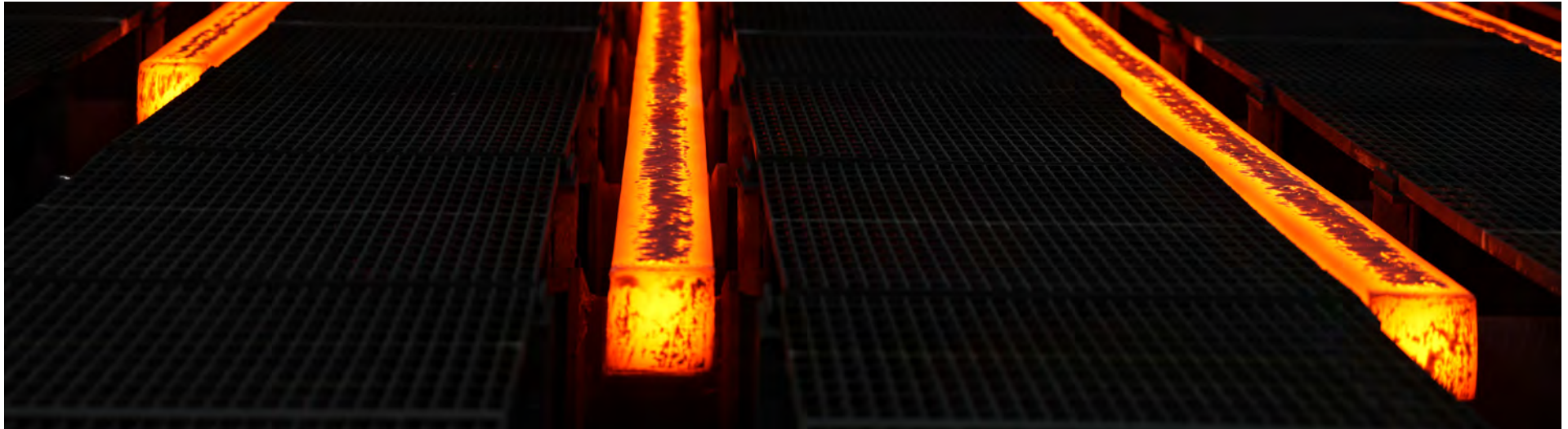
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Tosyali Algeria Fer at Acier is an integrated iron and steel facility located in Algeria. Tosyali Algeria complex was established in 2007 and boasts cutting-edge facilities like rolling mills, wire rod production units, beneficiation and pelletization plants, DRI plant and steel melting shop and rolling mills enabling the complete manufacturing process from iron ore to finished products. With a focus on quality, efficiency, and technological advancement, Tosyali Algeria stands out as a cornerstone of the Algerian steel industry, playing a vital role in the nation's industrial development and economic progress.

TOSYALI Algeria started to produce steel products by the second half of 2013, meeting Algeria's rapidly increasing construction needs and making a significant contribution to reducing imports to the country. Nowadays, TOSYALI Algeria stands as the largest integrated facility on the continent, providing direct employment opportunities for nearly 6000 individuals. The facility produces a wide array of steel products including DRI, pellets, billets/ blooms, reinforced bars, reinforcing steel bar in coils, wire rods, and spiral pipes catering to sectors such as construction, hydrocarbon transportation, automobile manufacturing, and shipbuilding.

Moreover, TOSYALI Algeria is among the facilities producing green and environmentally friendly steel in the world, thanks to its (DRI) technology. TOSYALI Algeria, which has the world's largest DRI production facilities with an annual capacity of 2.5 million tons and the world's largest arc furnace working with DRI, will be the company with the world's largest twin DRI facility with a total capacity of 5 million tons when the new DRI investment is completed.





Product Name:

High DRI Content Rebar

The production process commences with the treatment of iron ores to produce iron ore pellets, which serve as the raw material for producing Direct Reduced Iron (DRI). Following this, the DRI undergoes melting in the Electric Arc Furnace (EAF) to form liquid metal, which is subsequently refined in the ladle furnace to eliminate impurities and chemical composition.

Additionally, specific alloy additions are incorporated to impart specific properties to the steel. Liquid steel is then cast into steel billets, which are later transported to the rolling mill where they undergo shaping and rolling to achieve the necessary dimensions for the final reinforcing steel bars.

The products then are packed with steel wires to bind the products. Reinforcing steel products including the steel ties do not include any biogenic materials.

Intended Use of Product

Reinforcing steel bars are vital components in construction and industrial sectors, providing strength, support, and flexibility. They are extensively used in various applications, including concrete structures, foundations, roads and highways, tunnels and underground structures and industrial facilities.

Technical Specifications

Product	Standards	Description
High DRI Content Rebar	BS 4449:2005 + A3: 2016	Steel for the reinforcement of concrete – Weldable reinforcing steel – Bar, coil and decoiled product – Specification
	CS 2: 2012	Steel Reinforcing Bars for the Reinforcement of Concrete
	SS 560: 2016	Specification for steel for the reinforcement of concrete – Weldable reinforcing steel – Bar, coil and decoiled product
	NA ISO 6935-2 NA 8634: 2015	Steel for the reinforcement of concrete
	DIN 488-2: 2009	Reinforcing steels – Reinforcing steel bars
	DIN 488-3: 2009	Reinforcing steels – Reinforcing steel in coils – steel wire
	NBN A 24 301-304	Produits Siderurgiques Aciers Pour Beton Arme Barres Lisses et Barres a Nervures, Fils Machine Lisses et Fils Machine A Nervures
	NEN 6008: 2008 +A1: 2020	Steel for the reinforcement of concrete
	BRL 0501	National Assessment Guideline – Reinforcing steel
	ST 009:2011	2011 Technical specifications for steel products used as reinforcements: performance requirements and criteria
	BDS 9252:2007	Steel for the reinforcement of concrete – Weldable reinforcing steel B500
ASTM A 615/A615M-22	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement	



Technical Specifications

Product	Standards	Description
High DRI Content Rebar	ASTM A706/A706M-22	Standard Specification for Deformed and Plain Low – Alloy Steel Bars for Concrete Reinforcement
	CSA G30.18-21	Carbon steel bars for concrete reinforcement
	NF A35-080-1	Aciers pour béton armé – Aciers soudables – Partie 1: barres et couronnes
	SS 212540: 2014	Product Specification for SS-EN 10080: 2005: Steel for the reinforcement of concrete – Weldable reinforcing steel – Technical delivery conditions for bars, coils, welded fabric and lattice girders
	NF EN 10080: 2005	Steel for the reinforcement of concrete – Weldable reinforcing steel – General
	NA ISO 6935-2 NA 8634: 2015	Steel for the reinforcement of concrete
	SFS 1300	Reinforcing steels. Minimum requirement for weldable reinforcing steels and welded fabrics
	NF EN 10080: 2005	Steel for the reinforcement of concrete — Weldable reinforcing steel
	ISO 15630-1: 2019	Steel for the reinforcement and prestressing of concrete – Test methods – Part 1: Reinforcing bars, wire rod and wire (ISO 15630-1:2019)
	ISO 6935-2: 2019	Steel for the reinforcement of concrete
	EN 10080: 2005	EN 10080:2005 Steel for the reinforcement of concrete. Weldable reinforcing steel. General
NBR 7480: 2007	Steel for The Reinforcement of Concrete Structures – Specification	



Technical Specifications

Product	Standards	Description
High DRI Content Rebar	UNE 36068: 2011	Ribbed bars of weldable steel for the reinforcement of concrete
	MS 146: 2014	Steel for the reinforcement of concrete – Weldable reinforcing steel – Bar, coil and decoiled product – Specification (Fourth revision)
	LNEC E450: 2017	A500 NR Steel bars for reinforced concrete
	LNEC E449: 2017	A400 NR Steel bars for reinforced concrete
	TS 708: 2016	Steel for the reinforcement of concrete – Reinforcing steel
	NT 26-05: 2004	Production Details of Rebars For Tunisia
	GOST R 52544: 2006	Weldable deformed reinforcing rolled products of A500C and B500C classes for reinforcement of concrete constructions. Specifications
	DSTU 3760: 2006	Rolled Products for Reinforcement of Ferroconcrete Structures. General Specification
	NCh 204: 2006	Hot Rolled Bars for Reinforced Concrete
	ABNT NBR 7480: 2007	Steel for The Reinforcement of Concrete Structures
	NTC 2289: 2015	Barras corrugadas y lisas de acero de baja aleación, para refuerzo de concreto
	RTD 458: 2011	Materiales de construcción – Barra de acero corrugadas y lisas para el refuerzo del hormigón – Especificaciones
	ES 262	Hot rolled steel bars for concrete reinforcement
	ELOT 1421-3: 2007	Steel for the Reinforcement of Concrete—Weldable Reinforcing Steel—Part 3: Technical class
AS NZS 4671: 2019	Steel for the reinforcement of concrete	



UN CPC Code: 4124 - Bars and rods, hot-rolled, of iron or steel.

Content Declaration

Content Declaration of 1000kg of High DRI Content Rebar

Product	Steel Scrap, %	DRI, %	Additives, %	Renewable material weight, %	Biogenic carbon weight, %
High DRI Content Rebar	0-10	80-90	10-20	0	0



LCA Information

Declared unit

1 tonne (1000kg) of High DRI Content Rebar manufactured in Algeria facility (DZ).

Reference service life

Not applicable

Time representativeness

The production data in this LCA study represents the period of 1st January 2023 and 31st December 2023.

Database(s) and LCA software used

SimaPro v9.5.0.2 and ecoinvent 3.9.1

Description of system boundaries

Cradle to gate (A1-3) with options, modules C1-C4, module D

Data quality and data collection

Data collection for this LCA study has been carried out in accordance with data requirement stated in ISO 14040-44, ISO 14025, ISO 14020, and the requirements given in the General Program Instructions v3.01; PCR Construction products 2019:14, version 1.3.2 by The International EPD® System and EN 15804:2012+A2:2019.

There are two different data classifications has been used as primary (specific) and secondary (selected generic) data. All primary data has been collected from the manufacturing plant. For secondary data Ecoinvent v3.9.1 database has been used. Upstream data, raw materials production, transportation, fossil fuels and electricity mix data have been obtained from Ecoinvent v3.9.1 as secondary data. All manufacturing data in core processes has been gathered from the manufacturing plant. The manufacturing data are collected based on a mass balance. The high DRI content rebar data in this LCA study represents the period of 1st January 2023 and 31th December 2023.

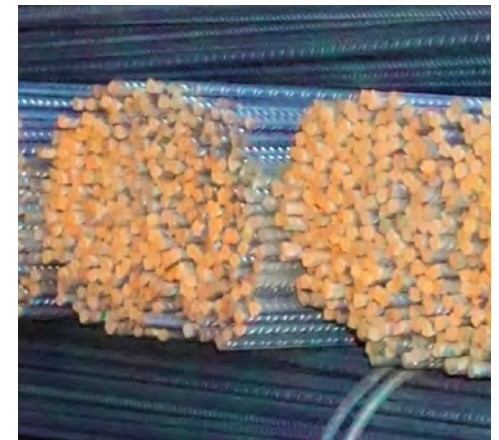
Mileage and tonnage figures for transport data to the core processes were provided by Tosyali's other plant procurement department specifically per origin of departures, however roadway and seaway upstream data per ton per kilometres were taken from Ecoinvent v3.9.1.

Allocation

The total values for raw material, energy consumption and water consumption over a one-year period have been divided by the annual output of each product to provide a value per kg of high DRI content rebar.

Cut-off rules

Life Cycle Inventory data for a minimum of 99 % of total inflows to the three life cycle stages have been included and a cut-off rule of 1% regarding energy, mass, and environmental relevance was applied.

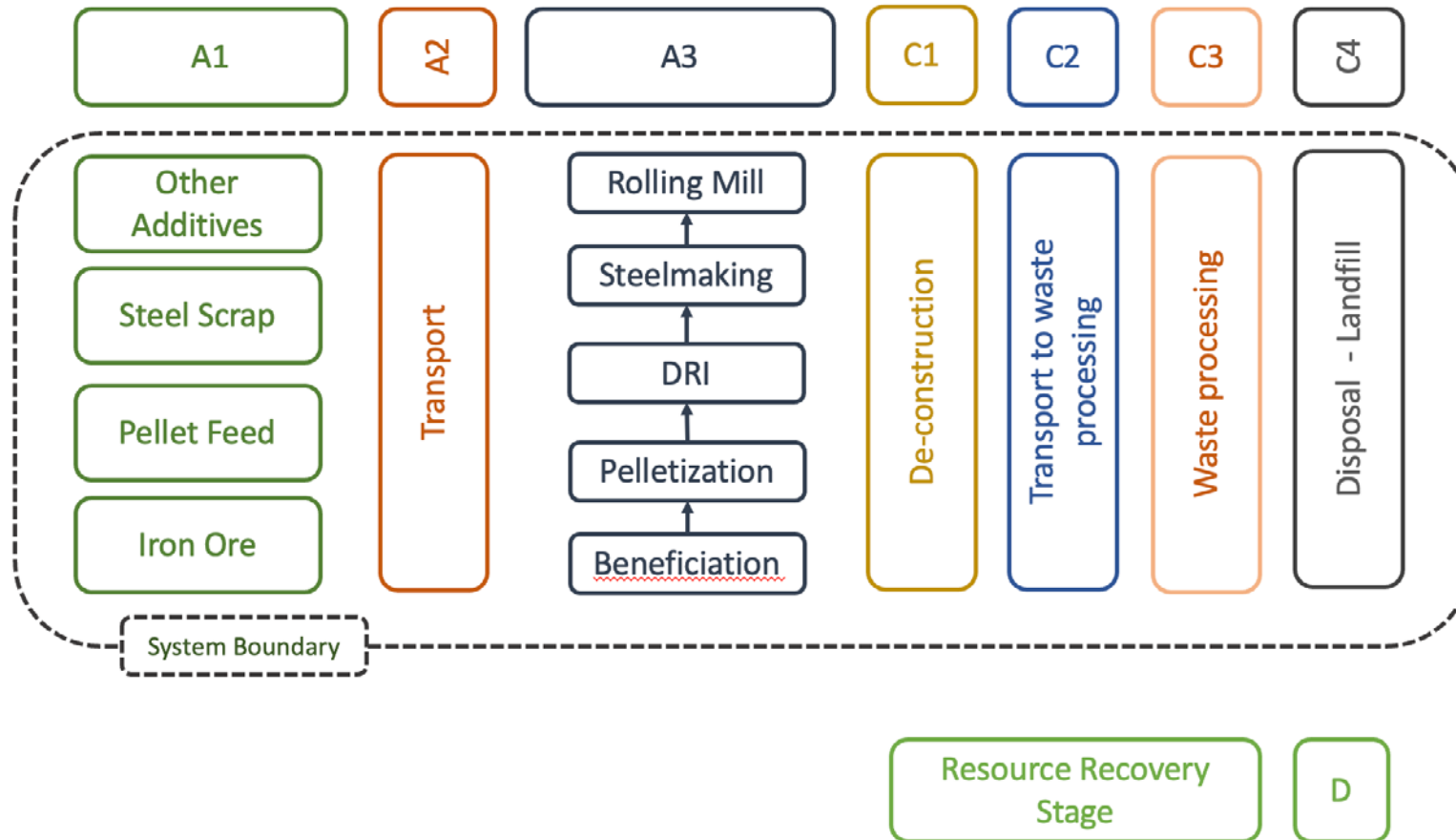


Modules declared, geographical scope, share of specific data (in GWP-GHG indicator) and data variation:

	Product Stage			Construction Process Stage		Use Stage							End Of Life Stage				Resource Recovery Stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Recycling potential
MODULE	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules declared	X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	GLO	GLO	DZ	-	-	-	-	-	-	-	-	-	GLO	GLO	GLO	GLO	GLO
Specific data used	>99.5%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation-products	Not Relevant			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation-sites	Not Relevant			-	-	-	-	-	-	-	-	-	-	-	-	-	-

X: Declared; ND: Not Declared

System Diagram



Description of declared modules

A1 - Raw Material Supply

This module takes into account raw material extraction, processing and energy used in the production process.

A2 - Transport to the Manufacturer

This module includes transportation of the raw materials from supplier to factory gate. Transportation types are considered as roadway and seaway.

A3 - Manufacturing

This stage includes energy and water consumption during the manufacturing process. Additionally, packaging materials are covered in this module. The processing of any waste arising from this stage is also included.

C1 - De-construction

In this module, the energy required for de-construction and demolition of the steel structure is assumed to be approximately 0.239 MJ/kg at the end of their life cycle.

C2 - Transport to Waste Processing

An average distance of 100 km has been assumed for the transport to sorting facility. Transport is calculated on the basis of a scenario with the parameters described in the attached table.

C3 - Waste processing for reuse, recovery and/or recycling

During the pre-recycling process of recycling materials, they are separated so that they can then be effectively recycled. As a result of this processing stage, there are negligible impacts.

Parameters C2 Module	
Transport by road*	Lorry >32 metric ton
Distance (km)	100
Database	Ecoinvent v3.9.1

*Technology is Euro 5

C4 - Final disposal

100% of end-of-life products will be collected and recycled into the production system. Rebar products are recycled. A total of 95% of end-of-life products are recycled and reused in construction projects or construction material production processes. 5% of the products are sent to the landfill.

D - Reuse, Recovery or Recycling Potential

Rebar inputs to the production stage are subtracted from the construction to be recycled at end-of-life in order to obtain the rebar from the product system. This remaining net rebar is then sent to recycling. Module D reports the environmental aspects of recycled scrap generated at the end of life minus that used at the production stage.

Information on which life cycle stages are not considered

This EPD only cover the Cradle to Gate with options A1-3 and C1-4 and D stages because other stages are very dependent on particular scenarios and are better developed for specific building or construction works.

Environmental Performance

Potential Environmental Impact

Mandatory Indicators According to EN 15804: 2012+A2:2019/AC:2021

Results for 1000 kg of High DRI Content Rebar							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
GWP-fossil	kg CO ₂ eq.	1,54E+03	23,8	10,2	0	0,31	-1,32E+03
GWP-biogenic	kg CO ₂ eq.	1,00	9,03E-03	1,05E-02	0	6,51E-04	-4,18
GWP-luluc	kg CO ₂ eq.	0,26	2,68E-03	5,25E-03	0	1,86E-04	-1,25
GWP-total	kg CO ₂ eq.	1,54E+03	23,8	10,20	0	0,31	-1,33E+03
ODP	kg CFC 11 eq.	1,96E-05	3,77E-07	1,72E-07	0	8,79E-09	-1,34E-05
AP	mol H+ eq.	2,91	0,22	2,78E-02	0	2,29E-03	-6,02
EP-freshwater	kg P eq.	0,01	8,56E-05	9,82E-05	0	2,96E-06	-0,17
EP-Marine	kg N eq.	0,80	0,10	7,16E-03	0	8,74E-04	-1,42
EP-Terrestrial	kg N eq.	8,86	1,11	7,58E-02	0	9,42E-03	-13,0
POCP	kg NMVOC eq.	4,63	0,33	4,01E-02	0	3,28E-03	-5,10
ADP-minerals & metals*	kg Sb eq.	1,56E-03	8,28E-06	2,85E-05	0	4,22E-07	-4,33E-03
ADP-fossil*	MJ	2,43E+04	311	153	0	7,57	-1,42E+04
WDP	m ³	63,8	0,69	0,79	0	0,33	915

Acronyms

GWP-fossil = Global Warming Potential fossil fuels;
 GWP-biogenic = Global Warming Potential biogenic;
 GWP-luluc = Global Warming Potential land use and land use change;
 ODP = Depletion potential of the stratospheric ozone layer;
 AP = Acidification potential, Accumulated Exceedance;
 EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment;
 EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment;
 EP-terrestrial = Eutrophication potential, Accumulated Exceedance;
 POCP = Formation potential of tropospheric ozone;
 ADP-minerals&metals = Abiotic depletion potential for non-fossil resources;
 ADP-fossil = Abiotic depletion for fossil resources potential;
 WDP = Water (user) deprivation potential, deprivation-weighted water consumption

* Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.

Potential Environmental Impact

Additional Mandatory and Voluntary Indicators

Results according to PCR2019:14 for 1000 kg of High DRI Content Rebar							
Indicator	Unit	A1:A3	C1	C2	C3	C4	D
GWP-GHG ¹	kg CO ₂ eq	1,54E+03	23,8	10,2	0	0,31	-1,33E+03
Results according to EN 15804:2012+A2 for 1000 kg High DRI Content Rebar							
PM	[disease inc.]	3,97E-05	0	7,59E-07	0	4,87E-08	-1,24E-04
IRP	[kBq U235 eq]	3,19	0	0,06	0	2,00E-03	-23,2
ETP-fw	[CTUe]	3,62E+03	158	88,7	0	3,71	-5,82E+04
HT-C	[CTUh]	2,73E-06	0	4,51E-09	0	1,29E-10	-2,08E-05
HT-nc	[CTUh]	7,59E-06	0	1,45E-07	0	3,74E-09	-1,66E-04
SQP	[pt]	3,28E+03	20,7	155	0	15,0	-3,90E+03

Acronyms

GWP-GHG = Global Warming Potential total excl. biogenic carbon following IPCC AR5 methodology;

PM = Potential incidence of disease due to PM emissions;

IRP = Potential Human exposure efficiency relative to U235;

ETP-fw = Potential Comparative Toxic Unit for ecosystems;

HT-C = Potential Comparative Toxic Unit for humans;

HT-nc = Potential Comparative Toxic Unit for humans;

SQP = Potential soil quality index (SQP)

¹ The indicator includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. This indicator is thus equal to the GWP indicator originally defined in EN 15804:2012+A1:2013.

*Disclaimer: The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks. The use of the results of modules A1-A3 without considering results of module C is not encouraged.

Resource use indicators

Results for 1000 kg of High DRI Content Rebar							
Indicator	Unit	A1:A3	C1	C2	C3	C4	D
PERE	MJ	195	1,77	1,94	0	0,06	-995
PERM	MJ	0	0	0	0	0	0
PERT	MJ	195	1,77	1,94	0	0,06	-995
PENRE	MJ	2,67E+04	330	163	0	8,05	-15085,23
PENRM	MJ	0	0	0	0	0	0
PENRT	MJ	2,67E+04	330	163	0	8,05	-1,51E+04
SM	kg	14,3	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0
FW	m ³	54,6	0	0	0	1,19E-02	-92,4

Acronyms

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 re-sources;
 SM = Use of secondary material;
 RSF = Use of renewable secondary fuels;
 NRSF = Use of non-renewable secondary fuels;
 FW = Use of net fresh water

Waste indicators

Results for 1000 kg of High DRI Content Rebar							
Indicator	Unit	A1:A3	C1	C2	C3	C4	D
Hazardous waste disposed	kg	0	0	0	0	0	0
Non-hazardous waste disposed	kg	188	0	0	0	50,0	0
Radioactive waste disposed	kg	0	0	0	0	0	0

Output flow indicators

Results for 1000 kg of High DRI Content Rebar							
Indicator	Unit	A1:A3	C1	C2	C3	C4	D
Components for re-use	kg	0	0	0	0	0	0
Materials for recycling	kg	0	0	0	0	0	950
Materials for energy recycling	kg	0	0	0	0	0	0
Exported energy, electricity	MJ	0	0	0	0	0	0
Radioactive waste disposed	MJ	0	0	0	0	0	0

Carbon Emission Factor of Electricity

Electricity	Data source	Amount	Unit
Electricity grid mix, DZ	Ecoinvent	0.69	kg CO ₂ eq./kWh

References

ISO 14040

2006 Environmental management
Life cycle assessment
Principles and framework

ISO 14044

2006 Environmental management
Life cycle assessment
Requirements and guidelines

ISO 14025

2006 Environmental labels and declarations
Type III environmental declarations
Principles and procedures

EN 15804:2012+A2:2019/AC:2021

Sustainability of construction works
Environmental product declarations
Core rules for the product category of
construction products

The International EPD® System

www.environdec.com

The International EPD® System

The General Programme Instructions v3.01

EN 15804 reference package based on EF 3.1

eplca.jrc.ec.europa.eu

The International EPD® System

PCR 2019:14 Construction products v1.3.2
(EN 15804:A2)

Ecoinvent 3.9.1

www.ecoinvent.org

SimaPro LCA Software

www.simapro.com

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