



ENVIRONMENTAL PRODUCT DECLARATION

GREENSTONE INDUSTRIAL
CONSTRUCTION AGGREGATE



Based on:

PCR ICMQ-001/15 v3

EN:15804:2012+A2:2019

ISO 14025

Certification N°:

EPDITALY0078

CPC: 37

Date of issue:

2019-10-17

Date of revision:

2022-10-14

Valid until:

2026-01-22

Declaration N°:

FA_EPD_03

GENERAL INFORMATION

EPD REFERENCES

EPD OWNER: FERALPI SIDERURGICA SPA - FERALPI GROUP, VIA NICOLA PASINI 11, 25017 LONATO, BRESCIA - ITALY
MANUFACTURING PLANT IS LOCATED IN THE SAME SITE

PROGRAM OPERATOR: EPDITALY, VIA GAETANO DE CASTILLIA 10, 20124 MILANO - ITALY

INDEPENDENT VERIFICATION

This declaration has been developed referring to the EPDItaly, following the "Regolamento di EPDItaly"; further information and the document itself are available at: www.epditaly.it. EPD document valid within the following geographical area: Italy and other countries worldwide according to sales market conditions.

CEN standard EN 15804 served as the core PCR (PCR ICMQ-001/15 v3)
PCR review was conducted by Daniele Pace, contact via info@epditaly.it

Independent verification of the declaration and data, according to EN ISO 14025 : 2018

- EPD process certification (Internal)
- EPD verification (External)

Third party verifier: ICMQ SpA, via De Castillia, 10 20124 Milano (www.icmq.it)

Accredited by: Accredia

Environmental declarations published within the same product category, though originating from different programs, may not be comparable. In particular, EPDs of construction products may not be comparable if they do not comply with EN 15804.

CONTACTS

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Technical support to Feralpi Group was provided by Life Cycle Engineering, Italy.
(info@lcengineering.eu, www.lcengineering.eu).



COMPANY PROFILE



The Feralpi Group is one of Europe’s leading manufacturers of steels for use in building construction. The parent company Feralpi Siderurgica, which was set up in 1968 in Lonato del Garda, near Brescia, has developed steadily over the years to form a group of industries that currently more than two million tonnes of steel and rolled products a year, and has a workforce of 1500 permanent employees in Italy, Europe and North Africa.

In over fifty years of business, the company has branched out to foreign markets and have been able to face the challenge of an increasingly globalized steel industry. Starting from its lengthy tradition in steel manufacturing, the Group has developed according to a strategy of diversification into new products and markets, which has involved not only the internal organisation but also external transactions thanks to the acquisition of numerous enterprises operating in this industry. The Feralpi Group also operates in the field of special steels, cold working, structural steelwork, the environment and fish farming, not to mention financial activities and investments.

Since its very origins, Feralpi has focused not only on producing the best steel grades for building construction but also on doing it in the most sustainable possible way, which has involved reducing energy consumption and emissions by using the latest technology available or developing in-house new solutions covered by patents as a result of intensive innovation and research.

Feralpi, an international diversified group (2021)

	2.62 million tons	Steel production
	2.47 million tons	Hot rolled production
	1.37 million tons	Cold rolled products and derivatives
	1 900 million euros	Turnover
	59%	Turnover abroad
	1 749	Employees (2021)
	58 million euros	Technical investments

SCOPE AND TYPE OF EPD

THE APPROACH USED IN THIS EPD IS “CRADLE TO GATE WITH OPTIONS” ONE

TABLE OF MODULES																
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	MND	MND	MND	MND	MND	X	X	X	X	X

SOFTWARE: SimaPro ver. 9.4.0.2

MAIN DATABASE: Ecoinvent 3.8

REPORT LCA: Life Cycle Assessment (LCA) applied to steel mill products and derivatives for EPD® purposes - final report

GEOGRAPHICAL SCOPE OF THE EPD: World according to sales market conditions

TYPE OF EPD: specific for Greenstone recycled construction aggregate

THE PRODUCT

Greenstone is an industrial construction aggregate. Black slag arising from the Electric Arc Furnace process represents the core material of the aggregate. This residue is a ternary blend of oxides which is 100% inert thanks to a customized process patented in collaboration with Politecnico di Milano.

Once produced and transformed, the black slag becomes Greenstone; the product has several granulometries certified via 2+ system and according to UNI EN 13242.

The aggregate is sold to external companies to be used in road pavements, cement aggregates and bituminous conglomerates. The adoption of the Greenstone aggregate allows to avoid the depletion of inert natural materials such as gravel, with savings in terms of land use.

Declared unit for the study is **one tonne of Greenstone construction aggregate**.



INFORMATION	DESCRIPTION
PRODUCT IDENTIFICATION	Greenstone recycled construction aggregate coming from black slag
PRODUCT FEATURES	<p>CE mark using 2+ scheme according to the following standards:</p> <ul style="list-style-type: none"> - GREENSTONE 0-90: UNI EN 13242 - GREENSTONE 0-120: UNI EN 13242 - GREENSTONE 0-200: UNI EN 13242 - GREENSTONE 20-120: UNI EN 13242
PRODUCT PROPERTIES (UNDER EN 13242)	<p>Granulometry [d/D]:</p> <ul style="list-style-type: none"> - GREENSTONE 0-90: 0/90 - GREENSTONE 0-120: 0/100 - GREENSTONE 0-200: 0/150 - GREENSTONE 20-120: 16/125 <p>Volumic mass [t/m³]:</p> <ul style="list-style-type: none"> - GREENSTONE 0-90: 3.48 - GREENSTONE 0-120: 3.58 - GREENSTONE 0-200: 3.56 - GREENSTONE 20-120: 3.48 <p>Water absorption [%]:</p> <ul style="list-style-type: none"> - GREENSTONE 0-90: 1.90 - GREENSTONE 0-120: 1.90 - GREENSTONE 0-200: 1.30 - GREENSTONE 20-120: 1.60 <p>Chemical evaluation and release of substances within the thresholds included in DM 186/06 for the whole Greenstone spectrum</p>
PLANT FEATURES	<p>Total amount of products covered by this EPD, year 2021: 40 613 t</p> <p>Total production, for selling purpose, year 2021: 40 613 t</p> <p>On-site air emission control system</p> <p>On-site system to recycle process water</p> <p>On-site system to recycle water used in process</p> <p>In/out materials/products and melting process monitored to prevent nuclear radiation</p> <p>In house photovoltaic plant of 625 kW peak capacity operating since 2011</p>

ENVIRONMENTAL PERFORMANCE

The detailed environmental performance (in terms of use of resources, pollutant emissions and waste generation) is presented for the three phases, Upstream, Core and Downstream and related sub-phases (A1-A2-A3-A4-C1-C2-C3-C4-D). The numbers reported in the following tables are the outcome of rounding. For this reason total results could slightly differ from the sum of contributions of the different phases. The energy sources behind the electricity grid used in manufacturing is the Italian residual mix 0,457 kg CO₂ eq./kWh (AIB report May 2022) with Life Cycle Engineering post-elaborations.

TABLE OF MODULES

POTENTIAL ENVIRONMENTAL IMPACTS	UNITS / D.U.	UPSTREAM		CORE PROCESS				DOWNSTREAM				TOTAL	D
		A1 	A2 	A3 	A4 	C1 	C2 	C3 	C4 				
GWP	kg CO ₂ eq	1.41E+01	3.63E+00	9.96E+00	3.99E+00	5.38E+01	3.44E+01	0.00E+00	2.52E+00	1.23E+02	0.00E+00		
GWP,f	kg CO ₂ eq	1.41E+01	3.63E+00	9.95E+00	3.99E+00	5.38E+01	3.44E+01	0.00E+00	2.52E+00	1.22E+02	0.00E+00		
GWP,b	kg CO ₂ eq	5.95E-03	2.53E-03	6.77E-03	2.35E-04	3.78E-03	2.03E-03	0.00E+00	3.40E-04	2.16E-02	0.00E+00		
GWP,luluc	kg CO ₂ eq	2.45E-03	4.03E-05	2.03E-03	3.25E-05	1.33E-03	2.81E-04	0.00E+00	8.59E-05	6.25E-03	0.00E+00		
ODP	kg CFC11 eq	3.55E-06	8.54E-07	2.10E-07	9.55E-07	1.21E-05	8.24E-06	0.00E+00	5.24E-07	2.64E-05	0.00E+00		
AP	mol H+ eq	6.02E-02	2.11E-02	8.76E-02	2.22E-02	5.80E-01	2.00E-01	0.00E+00	2.60E-02	9.97E-01	0.00E+00		
EP,f	kg P eq	2.60E-04	5.88E-06	1.20E-04	2.06E-06	3.79E-05	1.78E-05	0.00E+00	8.96E-06	4.53E-04	0.00E+00		
EP,m	kg N eq	1.07E-02	8.32E-03	3.97E-02	8.80E-03	2.60E-01	8.02E-02	0.00E+00	1.13E-02	4.19E-01	0.00E+00		
EP,t	mol N eq	1.20E-01	9.14E-02	4.36E-01	9.66E-02	2.86E+00	8.80E-01	0.00E+00	1.24E-01	4.60E+00	0.00E+00		
POCP	kg NMVOC eq	3.72E-02	2.38E-02	1.05E-01	2.52E-02	7.81E-01	2.29E-01	0.00E+00	3.45E-02	1.24E+00	0.00E+00		
ADPE*	kg Sb eq	2.12E-06	1.54E-07	2.50E-06	1.75E-07	2.78E-06	1.51E-06	0.00E+00	1.22E-07	9.35E-06	0.00E+00		
ADPF*	MJ	3.00E+02	5.21E+01	3.47E+01	5.70E+01	7.45E+02	4.92E+02	0.00E+00	3.36E+01	1.71E+03	0.00E+00		
WDP*	m ³	1.22E+00	9.84E-02	4.66E+00	-9.53E-03	1.92E-01	-8.23E-02	0.00E+00	1.36E-02	6.09E+00	0.00E+00		

GWP Global warming potential, total

GWP,f Global warming potential, fossil

GWP,b Global warming potential, biogenic

GWP,luluc Global warming potential, land use & land use change

ODP Ozone depletion potential

AP Acidification potential

EP,f Eutrophication potential, freshwater

EP,m Eutrophication potential, marine

EP,t Eutrophication potential, terrestrial

POCP Photochemical ozone creation potential

ADPE Abiotic depletion potential minerals & metals

ADPF Abiotic depletion potential fossil fuels

WDP Water use deprivation potential

Additional environmental impact indicators are computed in the LCA report but not reported in the EPD.

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

RESOURCE USE PER DECLARED UNIT

USE OF RENEWABLE MATERIAL RESOURCES	UNITS / D.U.	UPSTREAM	CORE PROCESS				DOWNSTREAM				TOTAL	D
		A1 	A2 	A3 	A4 	C1 	C2 	C3 	C4 			
PERE	[MJ]	1.22E+01	7.06E-01	4.18E+00	8.73E-02	1.20E+00	7.54E-01	0.00E+00	1.41E-01	1.93E+01	0.00E+00	
PERM	[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	0.00E+00	
PERT	[MJ]	1.22E+01	7.06E-01	4.18E+00	8.73E-02	1.20E+00	7.54E-01	0.00E+00	1.41E-01	1.93E+01	0.00E+00	
PENRE	[MJ]	3.30E+02	5.13E+01	3.69E+01	5.56E+01	7.28E+02	4.80E+02	0.00E+00	3.35E+01	1.72E+03	0.00E+00	
PENRM	[MJ]	0.00E+00	0.00E+00	4.49E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.49E+00	0.00E+00	
PENRT	[MJ]	3.30E+02	5.13E+01	4.14E+01	5.56E+01	7.28E+02	4.80E+02	0.00E+00	3.35E+01	1.72E+03	0.00E+00	
SM	[kg]	9.87E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.87E+02	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	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	0.00E+00	
FW	[m ³]	3.62E-02	2.88E-03	1.22E-01	1.56E-04	1.26E-02	1.35E-03	0.00E+00	7.19E-04	1.76E-01	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 raw materials

RSF Use of renewable secondary fuels

NRSF Use of non-renewable secondary fuels

FW Use of net fresh water

OUTPUT FLOWS AND WASTE CATEGORIES PER DECLARED UNIT

WASTE GENERATION AND TREATMENT	UNITS / D.U.	UPSTREAM	CORE PROCESS				DOWNSTREAM				TOTAL	D
		A1 	A2 	A3 	A4 	C1 	C2 	C3 	C4 			
HWD	[kg]	0.00E+00	0.00E+00	5.93E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.93E-02	0.00E+00	
NHWD	[kg]	0.00E+00	0.00E+00	4.80E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.80E-01	0.00E+00	
RWD	[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	0.00E+00	
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	0.00E+00	
MFR	[kg]	0.00E+00	0.00E+00	4.50E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.50E+01	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	0.00E+00	
EE	[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	0.00E+00	

- 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
- EE** Exported energy



CALCULATION RULES



The environmental burden of the product has been calculated according to EN 15804:2012+A2:2019 and PCR ICMQ-001/15 v3.

This declaration is a cradle to gate with options EPD type, based on the application of Life Cycle Assessment (LCA) methodology to the whole life-cycle system.

In the whole LCA model, infrastructures and production equipments are not taken into account. Greenstone production at plant level were described by using specific data from manufacturing facility (Lonato del Garda, BS, Italy) for year 2021.

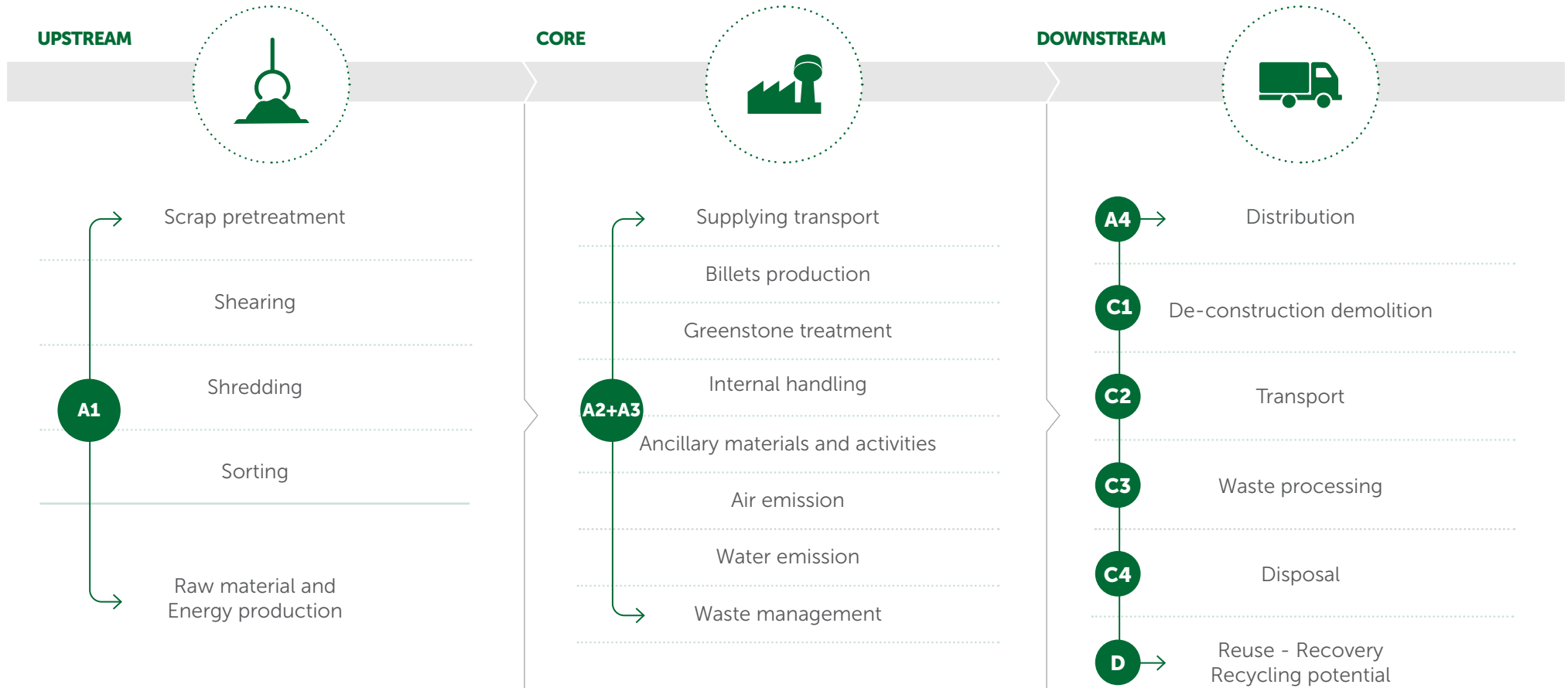
Customized LCA questionnaires were used to gather in-depth information about all aspects of the production system (for example, raw materials contents and specifications, pre treatments, process efficiencies, air and water emissions, waste management), in order to provide a complete picture of the environmental burden of the system from raw materials supply (A1) to Transport (A2) and Manufacturing (A3).

The use phase was not considered according to EN:15804 and PCR ICMQ-001/15 v 3, while transport to final destination (A4) and end of life (C1-C2-C3-C4-D) were considered. Greenstone product is certified as inert according to multiple laboratory tests performed by Feralpi Group; therefore no emissions to air nor to water occur during operation. According to ISO 14040 and 14044, allocation is avoided whenever possible by dividing the system into sub-systems. When allocation cannot be avoided physical properties are used to drive flow analysis.

Data quality has been assessed and validated during data collection process.

According to EN:15804 the applied cut-off criterion for mass and energy flows is 1%.

SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION



Broad scheme of Greenstone construction aggregate production, in which the main activities included in the system boundaries, are listed and divided in the three subsystems: **UPSTREAM Process, CORE Module and DOWNSTREAM Process.**

UPSTREAM PROCESS



CORE PROCESS



A2 - Transportation



Raw materials transportation from production or collection facilities to the production plant



Greenstone production, including utilities

Scheme of the considered system boundaries (core processes)



Internal transportation

Steel mill production, including utilities



A3 - Manufacturing

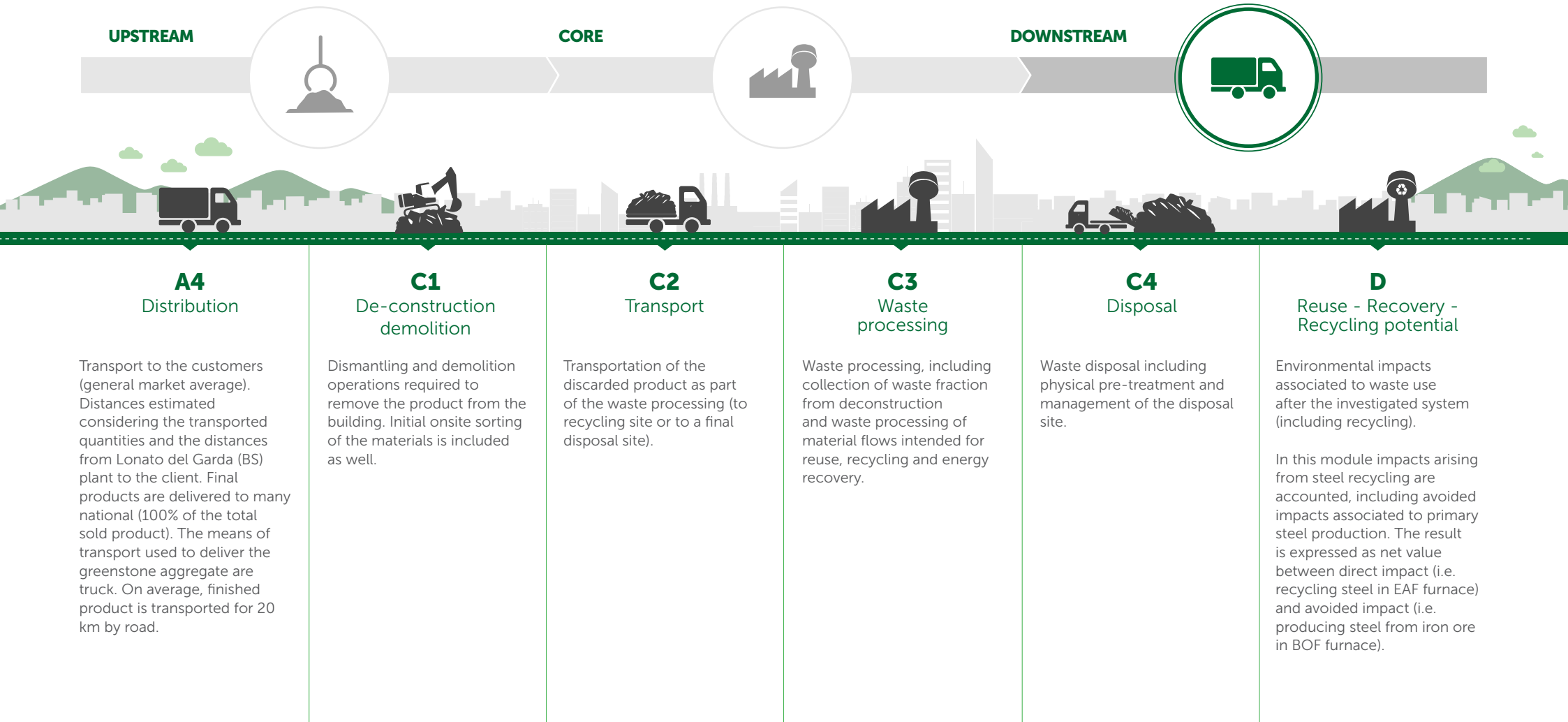


Steel mill production, including utilities



Treatment of waste generated from the manufacturing processes

DOWNSTREAM PROCESS



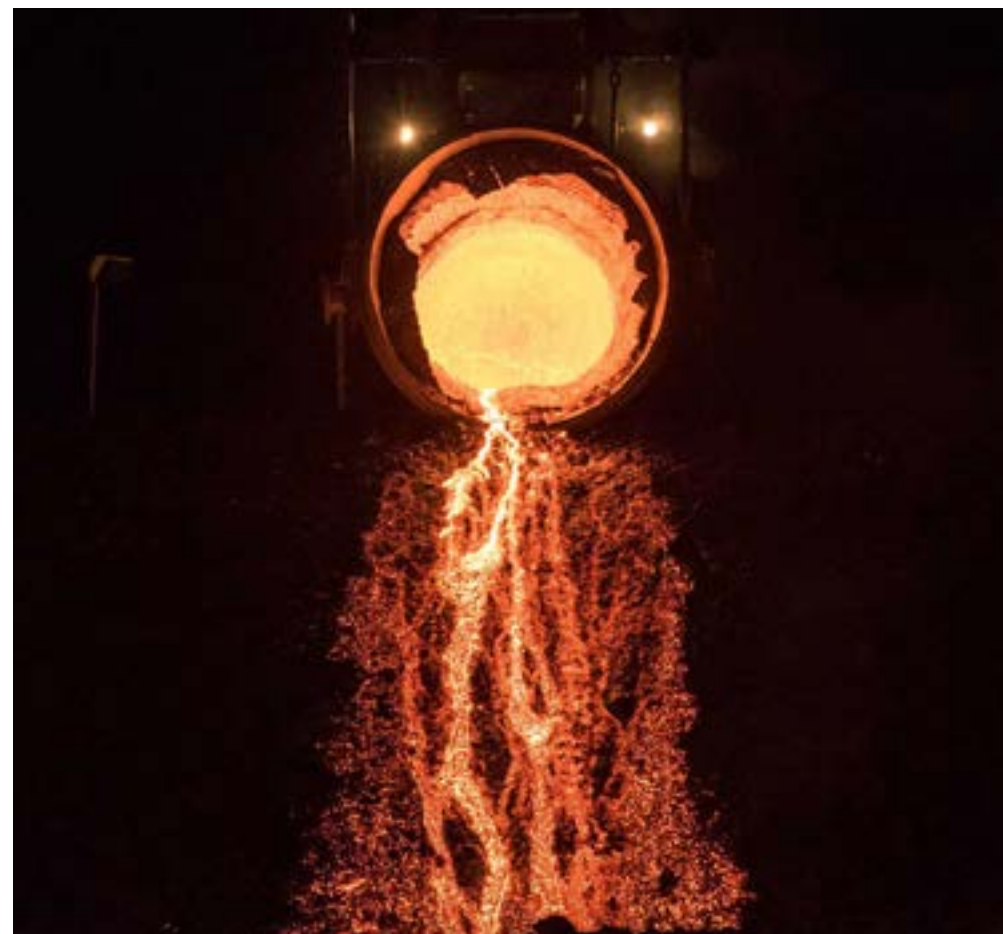
OTHER OPTIONAL ADDITIONAL ENVIRONMENTAL INFORMATION

Feralpi plant in Lonato del Garda (BS) is equipped with prevention and reduction systems for air emissions, a recirculating loop cooling to minimize water consumption and a waste management plan to prevent and reduce waste generation,

In accordance with general EPD® requirements the LCA study used specific, generic and proxy data. These last data are contributing to the environmental indicators less than 10%.

OTHER ENVIRONMENTAL INDICATORS		UNIT	UP	CORE	DOWN	TOTAL
AIR EMISSIONS	Dust from core process	[g]	-	0.15	-	0.15
	CO ₂ from core process	[kg]	-	3.00	-	3.00
WATER EMISSIONS	Total Suspended Solids	[g]	-	0.09	-	0.09

Other environmental indicators per 1 t of Greenstone construction aggregate



REFERENCES

- EN 15804:2012+A2:2019
- ISO 14040
- ISO 14044
- Life Cycle Assessment (LCA) applied to steel mill products and derivatives for EPD® purposes - final report
- EPDI Italy General Programme Information, v5.2
- PCR ICMQ-001/15 v 3

