ArcelorMittal

Environmental
Product
Declaration

According to EN15804+A2 (+indicators A1)

This declaration is for:
Cold Formed Steel Sheet Piles

Provided by:
ArcelorMittal

MRPI® registration:
1.1.00914.2025

Program operator:
Stichting MRPI®
Publisher:
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ECO PLATFORM EPD VERIFIED

Nationale MILIEUDATABASE

MRPI milieu relevante product informatie

COMPANY INFORMATION

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MRPI® REGISTRATION

1.1.00914.2025

DATE OF THIS ISSUE

4-8-2025

EXPIRY DATE

4-8-2030

SCOPE OF DECLARATION

This MRPI®-EPD certificate is verified by Ulbert Hofstra, SGS INTRON B.V. 6136 GV Sittard The Netherlands . The LCA study has been done by Leonardo Guimarães Ribeiro and Surendraprabu Rangaraju, ArcelorMittal and Enperas NV. The certificate is based on an LCA-dossier according to EN15804+A2 (+indicators A1). It is verified according to the 'MRPI®-EPD verification protocol November 2020.v4.0'. EPDs of construction products may not be comparable if they do not comply with EN15804+A2. Declaration of SVHC that are listed on the 'Candidate list of Substances of Very High Concern for authorisation' when content exceeds the limits for registration with ECHA.

PROGRAM OPERATOR

Stichting MRPI®

Kingsfordweg 151

1043 GR

Amsterdam

PRODUCT

Cold Formed Steel Sheet Piles

DECLARED UNIT / FUNCTIONAL UNIT

1 Mass (t)

DESCRIPTION OF PRODUCT

Cold-formed steel sheet piles are thin-walled, interlocking steel sections with longitudinal clutches, manufactured from the cold forming of rolled sheets, used to create retaining walls and earth support systems.

VISUAL PRODUCT

MORE INFORMATION

https://sheetpiling.arcelormittal.com/download-center/cold-formed-steel-sheet-piles

Ing. L. L. Oosterveen MSc. MBA Managing Director MRPI	DEMONSTRATION OF VERIFICATION CEN standard EN15804 serves as the core PCR [1]
	Independent verification of the declaration an data according to EN15804+A2 (+indicators A1) Internal: External: X
	Third party verifier: Ulbert Hofstra, SGS INTRON B.V. 6136 GV Sittard The Netherlands
	[1] PCR = Product Category Rules

DETAILED PRODUCT DESCRIPTION

Description:
Cold-formed steel sheet piles (CFSSP) are steel profiles featuring longitudinal interlocking clutches on both sides, allowing them to connect and create continuous retaining walls. This Environmental Product Declaration (EPD) covers 1 metric ton of CFSSP produced at ArcelorMittal's Messempré site in France, using hot-rolled low alloyed steel sheets initially processed in Dunkirk. Final cold forming is performed in Messempré. Available steel grades include S 235 JRC, S 275 JRC, and S 355 J0C (as specified in EN 10249) or equivalent grades.

Applications:
The CFSSP can be used as a part of permanent or temporary constructions. They are essentially used in the structural protection of berms from erosion and collapse, but, given their technical properties, they are also recommended for constructing retaining walls, confinement walls reinforcing dams, and river or canal banks, sewerage and drainage works. This declaration covers the full range of sheet pile profiles—Z profiles, Omega profiles, and RC/trench profiles—manufactured at ArcelorMittal's Messempré site in France.

Condition of delivery:
These sheet piles are available in a wide variety of shapes, dimensions, steel grades, and specifications according to EN 10249-1 and EN 10249-2, and are delivered ready for installation.

Reference service life:
The reference service life of these sheet piles are taken as 50 years. In fact, these products are chosen according to the project's specificities and can last 75 years or more, depending on the design of the project. The consideration of 50 years is a conservative approach.

Composition:
In the average composition, the base material for the product is iron, with alloying elements added as ferroalloys or pure metals. In the input side, about 1,9% of secondary material is used and this considers both pre- and post-consumer scraps from outside the system boundary. Variation in carbon content and alloying elements modify the chemical and physical properties of steel such as strength, ductility and toughness. Common alloying elements include manganese, copper, chromium, etc. The specific composition varies depending on the steel grade. Such material additions make up a small percentage by mass of the final product as shown in the table.

Component (> 1%)	(kg / %)
Iron	> 974
Carbon	< 2,4
Manganese	< 17
Copper	< 6
Other alloys	< 1

SCOPE AND TYPE

The system boundary of this assessment covers the full life cycle from Cradle-to-Grave, including all the activities from the supply and transport of raw materials, production process, installation, use phase to the End-of-Life (EoL) of the material after use.

The studied product is manufactured by a single producer, and relavant for the application at the Dutch market. This declaration encompasses a group of products (Z profiles, Omega profiles, and RC/trench profiles), that are produced identically using the same production process at a single production site.

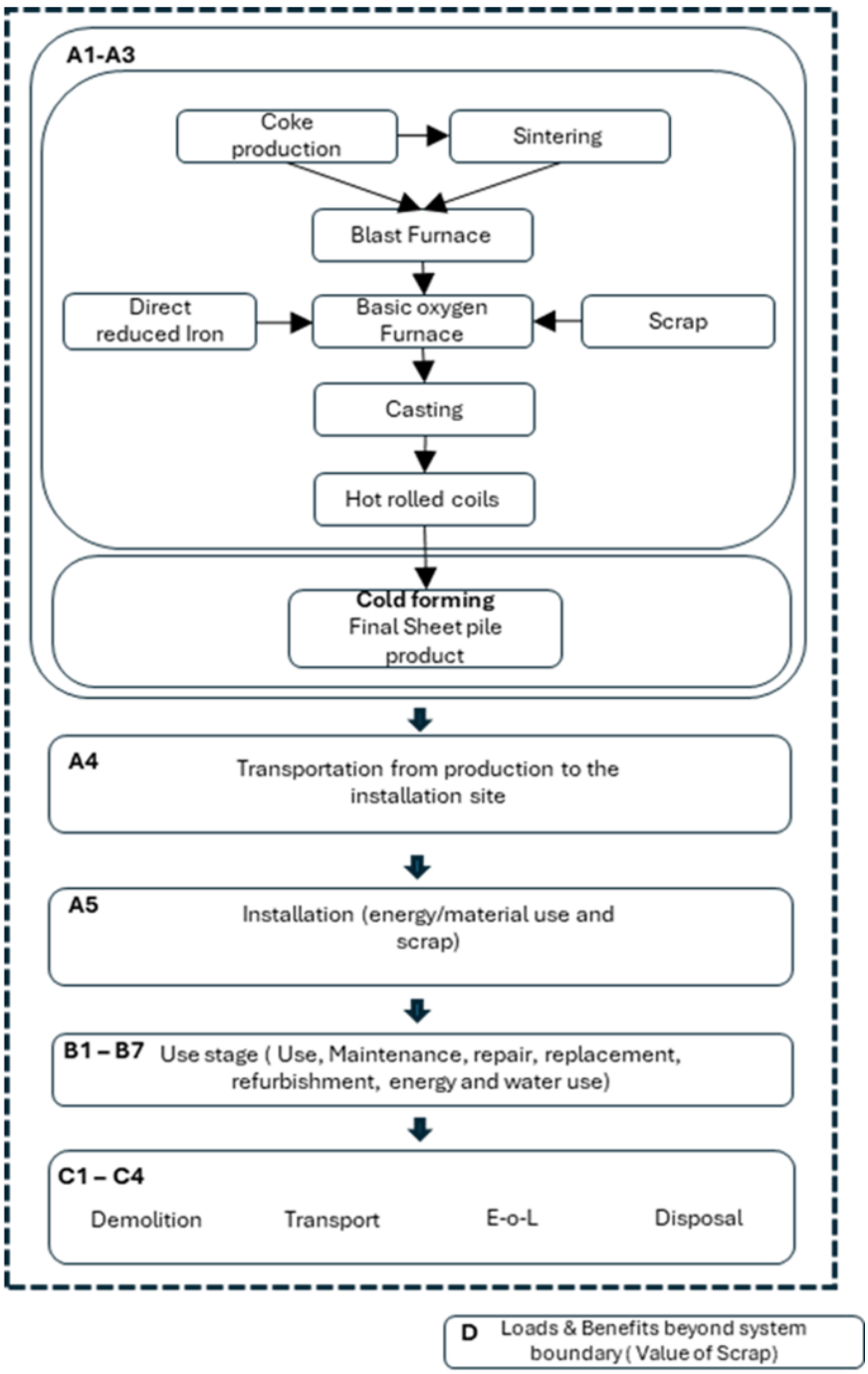
The studied product is produced in Messempré, France, and the reference year for the data collection is 2022. In fact, the production is done in two steps, 1) production of hot rolled sheets, which is the base for the cold formed sheet piles, happens in Dunkirk via blast furnace and basic oxygen furnace route and 2) the cold forming in Messempré, where the final products come out of the gate.

The LCA model for this MRPI was created using the Sphera LCA for Experts software, version 10.7.1.28, developed by Sphera. The ecoinvent 3.6 (for set 1 indicators) and 3.9.1 (for set 2 indicators) databases provide the life cycle inventory data for all the raw and process materials obtained from the background system.

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport gate to 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	X	X	X	X	X	X	X	X	X	X	X	X	X

X = Modules Assessed

ND = Not Declared



REPRESENTATIVENESS

The raw materials and production data are representative for the full range of sheet pile profiles—Z profiles, Omega profiles, and RC/Trench profiles—manufactured at ArcelorMittal's Messempré site in France. As aforementioned, the steel is produced at Dunkirk, and the forming happens at Messempré. The different profiles are produced on one production line, there is no differentiation in terms of production input, waste, output, etc. Hence, the data collection was done at each shop floor and consolidated at plant level. Considering that, the mean thickness and surface mass of the product is 6,5mm and 74 kg/m2.

ArcelorMittal

ENVIRONMENTAL IMPACT per functional unit or declared unit (indicators A1)

	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
ADPE	kg Sb eq.	1,53E-02	3,46E-04	3,77E-07	1,56E-02	6,05E-04	3,07E-04	1,01E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,19E-04	1,16E-04	1,00E-03	1,93E-06	-2,17E-03
ADPF	MJ	2,77E+04	3,13E+02	2,11E+01	2,80E+04	5,44E+02	1,62E+03	3,07E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,06E+03	1,05E+02	2,09E+02	5,85E+00	-1,62E+04
GWP	kg CO2 eq.	6,23E+02	2,03E+01	1,71E+03	2,35E+03	3,51E+01	1,21E+02	1,09E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,71E+01	6,76E+00	1,61E+01	2,07E-01	-1,27E+03
ODP	kg CFC11 eq.	7,90E-05	3,82E-06	1,77E-07	8,30E-05	6,64E-06	1,77E-05	3,61E-07	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,34E-05	1,28E-06	1,91E-06	6,89E-08	-4,66E-05
POCP	kg ethene eq.	9,85E-01	1,49E-02	8,07E-01	1,81E+00	2,52E-02	1,50E-01	1,42E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,04E-01	4,85E-03	1,79E-02	2,70E-04	-1,81E+00
AP	kg SO2 eq.	4,26E+00	7,37E-02	1,61E+00	5,94E+00	1,15E-01	7,95E-01	7,94E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,81E-01	2,22E-02	1,69E-01	1,51E-03	-4,27E+00
EP	kg (PO4) 3 eq.	9,13E-01	1,30E-02	1,20E-01	1,05E+00	2,15E-02	1,78E-01	1,54E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,32E-01	4,13E-03	2,14E-02	2,93E-04	-5,92E-01

Toxicity indicators and ECI (Dutch market)

HTP	kg DCB eq.	7,20E+02	9,50E+00	6,24E+00	7,36E+02	1,64E+01	4,04E+01	4,44E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,61E+01	3,15E+00	5,02E+01	8,46E-02	-7,68E+02
FAETP	kg DCB eq.	2,15E+01	3,51E-01	2,46E-01	2,21E+01	6,11E-01	1,06E+00	1,84E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,63E-01	1,18E-01	3,91E-01	3,51E-03	1,54E+00
MAETP	kg DCB eq.	3,11E+04	1,38E+03	3,05E+02	3,28E+04	2,41E+03	3,28E+03	6,53E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,33E+03	4,63E+02	1,69E+03	1,24E+01	-9,03E+03
TETP	kg DCB eq.	4,58E+00	9,11E-02	5,83E-01	5,25E+00	1,53E-01	3,83E-01	5,76E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,61E-01	2,95E-02	3,25E-01	1,10E-03	4,21E+01
ECI	euro	1,29E+02	2,49E+00	9,51E+01	2,27E+02	4,25E+00	1,53E+01	1,52E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,03E+01	8,17E-01	6,45E+00	2,90E-02	-1,58E+02
ADPF	kg Sb eq.	1,33E+01	1,51E-01	1,01E-02	1,35E+01	2,62E-01	7,80E-01	1,48E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,10E-01	5,03E-02	1,00E-01	2,81E-03	-7,81E+00

ADPE = Abiotic Depletion Potential for non-fossil resources
ADPF = Abiotic Depletion Potential for fossil resources
GWP = Global Warming Potential
ODP = Depletion potential of the stratospheric ozone layer
POCP = Formation potential of tropospheric ozone photochemical oxidants
AP = Acidification Potential of land and water
EP = Eutrophication Potential
HTP = Human Toxicity Potential
FAETP = Fresh water aquatic ecotoxicity potential
MAETP = Marine aquatic ecotoxicity potential
TETP = Terrestrial ecotoxicity potential
ECI = Environmental Cost Indicator
ADPF = Abiotic Depletion Potential for fossil resources

ENVIRONMENTAL IMPACT per functional unit or declared unit (core indicators A2)

	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP-total	kg CO2 eq.	6,26E+02	2,39E+01	1,71E+03	2,36E+03	4,05E+01	1,30E+02	1,28E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	8,45E+01	7,80E+00	1,70E+01	2,43E-01	-1,12E+03
GWP-fossil	kg CO2 eq.	6,25E+02	2,39E+01	1,71E+03	2,36E+03	4,05E+01	1,30E+02	1,28E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	8,44E+01	7,79E+00	1,70E+01	2,43E-01	-1,13E+03
GWP-biogenic	kg CO2 eq.	0,00E+00	1,76E-02	3,37E-04	1,80E-02	3,11E-02	1,41E-02	7,31E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,94E-02	5,99E-03	0,00E+00	1,39E-04	8,13E+00
GWP-luluc	kg CO2 eq.	7,12E-01	1,16E-02	1,18E-04	7,23E-01	1,91E-02	1,93E-02	7,71E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	9,50E-03	3,66E-03	2,04E-02	1,47E-04	1,74E-02
ODP	kg CFC11 eq.	2,00E-05	5,16E-07	6,51E-08	2,06E-05	8,86E-07	1,91E-06	3,69E-08	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,34E-06	1,70E-07	2,65E-07	7,04E-09	-2,06E-05
AP	mol H+ eq.	5,13E+00	9,82E-02	1,93E+00	7,15E+00	1,36E-01	1,06E+00	9,62E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,83E-01	2,62E-02	2,04E-01	1,83E-03	-3,74E+00
EP-fresh water	kg P eq.	9,04E-01	1,68E-03	2,39E-05	9,06E-01	2,88E-03	1,23E-02	1,06E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,59E-03	5,54E-04	1,12E-02	2,02E-05	-5,08E-01
EP-marine	kg N eq.	1,39E+00	3,19E-02	4,31E-01	1,85E+00	4,73E-02	4,78E-01	3,70E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,63E-01	9,10E-03	4,57E-02	7,04E-04	-9,55E-01
EP-terrestrial	mol N eq.	1,43E+01	3,39E-01	3,81E+00	1,85E+01	4,99E-01	5,18E+00	3,96E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,94E+00	9,59E-02	5,11E-01	7,54E-03	-1,02E+01
POCP	kg NMVOC eq.	5,05E+00	1,36E-01	2,24E+00	7,42E+00	2,12E-01	1,55E+00	1,38E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,17E+00	4,08E-02	1,51E-01	2,62E-03	-6,17E+00
ADP-minerals & metals	kg Sb eq.	4,25E-03	6,32E-05	4,50E-07	4,31E-03	1,09E-04	8,04E-05	1,77E-06	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,95E-05	2,10E-05	1,19E-03	3,38E-07	9,27E-04
ADP-fossil	MJ, net calorific value	3,05E+04	3,51E+02	2,10E+01	3,09E+04	5,99E+02	1,70E+03	3,20E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,10E+03	1,15E+02	2,48E+02	6,09E+00	-1,47E+04
WDP	m3 world eq. Deprived	3,77E+02	2,32E+00	4,99E-02	3,80E+02	3,99E+00	8,51E+00	1,45E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,73E+00	7,68E-01	5,20E+00	2,76E-01	-3,74E+01

GWP-total = Global Warming Potential total

GWP-fossil = Global Warming Potential fossil fuels

GWP-biogenic = Global Warming Potential biogenictotal

GWP-luluc = Global Warming Potential land use and land use change

ODP = Depletion potential of the stratospheric ozone layer

AP = Acidification Potential, Accumulated Exceedence

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 Exceedence

POCP = Formation potential of tropospheric ozone photochemical oxidants

ADP-minerals & metals = Abiotic Depletion Potential for non-fossil resources [1]

ADP-fossil = Abiotic Depletion for fossil resources potential [1]

WDP = Water (user) deprivation potential, deprivation-weighted water consumption [1]

Disclaimer [1]:

- 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.

ENVIRONMENTAL IMPACT per functional unit or declared unit (additional indicators A2)

	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PM	Disease inci-dence	6,43E-05	1,82E-06	1,90E-05	8,51E-05	3,15E-06	2,82E-05	2,05E-07	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,16E-05	6,05E-07	2,72E-06	3,90E-08	-6,15E-05
IRP	kBq U235 eq.	1,58E+02	4,34E-01	6,91E-03	1,58E+02	7,48E-01	2,25E+00	2,02E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,25E-01	1,44E-01	2,03E+00	3,84E-03	5,30E+01
ETP-fw	CTUe	5,35E+03	1,65E+02	5,29E+02	6,05E+03	2,81E+02	7,18E+02	1,48E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,19E+02	5,40E+01	1,81E+02	2,81E+00	-7,04E+02
HTP-c	CTUh	5,04E-06	1,11E-08	2,70E-08	5,08E-06	1,85E-08	8,49E-08	5,77E-10	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,70E-08	3,55E-09	3,27E-08	1,10E-10	9,53E-06
HTP-nc	CTUh	1,45E-05	2,14E-07	3,67E-06	1,84E-05	3,70E-07	4,18E-07	7,12E-09	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,85E-07	7,12E-08	1,31E-06	1,36E-09	4,16E-07
SQP	-	3,60E+03	3,43E+02	3,01E-01	3,95E+03	6,02E+02	1,33E+02	6,31E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,37E+01	1,16E+02	4,58E+02	1,20E+01	-1,40E+03

PM = Potential incidence of disease due to PM emissions

IRP = Potential Human exposure efficiency relative to U235 [1]

ETP-fw = Potential Comparative Toxic Unit for ecosystems [2]

HTP-c = Potential Comparative Toxic Unit for humans, cancer [2]

HTP-nc = Potential Comparative Toxic Unit for humans, non-cancer [2]

SQP = Potential soil quality index [2]

Disclaimer [1]:

- This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste.

Disclaimer [2]:

- 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.

OUTPUT FLOWS AND WASTE CATEGORIES per functional unit or declared unit (A1 en A2)

	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
HWD	kg	1,77E-02	2,05E-03	3,09E-04	2,00E-02	3,33E-03	9,63E-03	1,68E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,45E-03	6,84E-04	1,67E-03	3,21E-05	5,55E-05
NHWD	kg	1,93E+02	2,89E+01	1,01E+01	2,32E+02	4,70E+01	4,33E+00	2,10E+02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,58E+00	9,66E+00	2,63E+00	4,00E+01	5,88E-01
RWD	kg	1,55E-02	1,00E-04	0,00E+00	1,56E-02	1,63E-04	3,09E-04	4,70E-06	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,21E-04	3,35E-05	5,68E-03	8,96E-07	-7,79E-04
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	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,00E+01	0,00E+00	0,00E+00
MFR	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	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,00E+02	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	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
EEE	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	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
ETE	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	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 reuse
MFR = Materials for recycling
MER = Materials for energy recovery
EEE = Exported Electrical Energy
ETE = Exported Thermal Energy

RESOURCE USE per functional unit or declared unit (A1 and A2)

	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PERE	MJ	8,21E+02	5,07E+00	8,30E-02	8,26E+02	8,69E+00	1,62E+01	2,72E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,30E+00	1,67E+00	4,00E+01	5,18E-02	2,62E+02
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	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	8,21E+02	5,07E+00	8,30E-02	8,26E+02	8,69E+00	1,62E+01	2,72E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,30E+00	1,67E+00	4,00E+01	5,18E-02	2,62E+02
PENRE	MJ	3,05E+04	3,51E+02	2,10E+01	3,09E+04	5,99E+02	1,70E+03	3,20E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,10E+03	1,15E+02	2,48E+02	6,09E+00	-1,47E+04
PENRM	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	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	MJ	3,05E+04	3,51E+02	2,10E+01	3,09E+04	5,99E+02	1,70E+03	3,20E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,10E+03	1,15E+02	2,48E+02	6,09E+00	-1,47E+04
SM	kg	0,00E+00	0,00E+00	1,90E+01	1,90E+01	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	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	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
NSRF	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	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	8,78E+00	5,40E-02	1,16E-03	8,84E+00	9,30E-02	1,98E-01	3,38E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	8,68E-02	1,79E-02	1,21E-01	6,43E-03	-8,72E-01

PERE = Use of renewable primary energy excluding renewable primary energy 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 resources excluding non-renewable 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 materials
RSF = Use of renewable secondary fuels
NSRF = Use of non-renewable secondary fuels
FW = Use of net fresh water

BIOGENIC CARBON CONTENT per functional unit or declared unit (A1 and A2)

	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
BBCpr	kg C	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	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
BCCpa	kg C	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	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

BCCpr = Biogenic carbon content in product
BCCpa = Biogenic carbon content in packaging

CALCULATION RULES

The different environmental impact categories and additional parameters, which are required for EPDs in accordance with EN15804+A1/A2 and the Dutch Bepalingsmethode (2025), are calculated. A distinction is made between set 1 and set 2 indicators.

Modules A1-A3:
Primary data was used to model all on-site processes A1-A3, based on data collected in 2022, for both Dunkirk and Messempre plants. The data includes:
- The provision of resources, additives, and energy
- Transport of resources and additives to the production site
- Production processes on-site including energy
- Production of additives, disposal of production residues, and consideration of related emissions
- Recycling of production/manufacturing scrap. Steel scrap is assumed to reach the end-of-waste status once is shredded and sorted, thus becomes input to the product system in the inventory.

Module A4:
A 390 km of transport by "Transport, freight, lorry, unspecified {GLO}" has been considered. This corresponds to the distance between the production site in Messempré,France to Utrecht, Netherlands, as suggested in the bepalingsmethode. For adapted and specific calculation, the actual transport distance can be multiplied by the following MKI values per ton-km:
In case of EN 15804+A1, the following values could be used:
Euro 6 truck : 0,00891 MKI
Euro 6 truck HVO100: 0,00765 MKI
Inland vessel : 0,00558 MKI
In case of EN 15804+A2, the following values could be used:
Euro 6 truck: 0,018 MKI
Inland vessel : 0,009 MKI.
The adress of the mill is Route de Messempré, 08110 Messempré, France .

Modules A5 :
This module has been modelled according to the cat 3. report of the NMD for sheet piles. 1% construction waste has been assumed. This loss is modelled as internally recycled, as it usually comes back to module A1.

Modules B1- B7:
Sheet piles corrode during the use (B1), leading to a material loss of approximately 21%, which is treated as landfilled inert waste. Also, it is not always possible to extract all the installed material, and hence a 4% additional loss is considered. This is modeled under module B1 using Ecoinvent data and could be scaled to a project specific percentage. There are no impacts associated with modules B2 through B7.

Module C1:
This module has been modelled similar to the module A5, according to the cat 3. report of the NMD for sheetpiles.

Module C2:
A 50 km transport has been assumed from the decommissioning to the sorting/shredding, as per the bepalingsmethode. The scrap attains end of waste point after shredding and sorting.

Module C3 & C4:
The following scenario has been assumed, based on a thorough analysis on the EoL scenarios of the sheet piles from ArcelorMittal, considering the application, corrosion factors and the unrecoverable materials: 5% Reuse, 70% Recycling, and 25% Landfill (21 % corroded and 4% left on ground). The End of Life scenario is primarly based on a parametric study, including different profiles, applications and corrosion rates. For temporary applications, it is assumed that the sheet piles are used twice, yielding to a reuse rate of 5 % in the overall scenario.
End of life allocation complies the requirements of EN 15804:2012+A2 (2019), section 6.4.3.3 and generally follows the polluter pays principle.

Module D:
In module D, the credits of avoided virgin steel production and the burdens of recycling process are accounted. The net material flow from module C3 to D is 750 kg, including both the recycling (700 kg) and reuse (50 kg) fractions. The recycling is modelled with the “Value of Scrap” dataset approach, as outlined in the Worldsteel LCI methodology. Reuse is modelled as - (A1-A3).

Allocation rules:
The steel industry's allocation method, developed by Worldsteel and EUROFER (2014), has been adapted for A1-A3 modelling. It aligns with EN 15804+A2 and uses physical allocation, considering input/output changes and inherent material properties.
Coke oven co-products (e.g., coke, gas, tar) are allocated based on net calorific value (NCV).
Blast furnace outputs are allocated economically, between pig iron and slag.
The basic oxygen furnace (BOF) inputs/outputs are allocated either by energy, material content, or assigned 100% to crude steel or slag. Majority of inputs and outputs allocated on the basis of an energy function associated with crude steel (fEST) as outlined in the Worldsteel methodology. The gas balances in the model indicate that all generated waste gases (i.e. coke oven, blast furnace, BOF gas,etc.) are utilized internally for energy purposes. System expansion is carried out for the steam and electricity, if and when they are partially used internally and partially get to be exported out of the system boundary.

Cut-off rules:
Measurement of on-site emissions were performed by ArcelorMittal and those emissions are considered. The specific emissions that are linked to the provision of thermal and electrical energy are also considered in the specific processes. All reported data are incorporated and modelled using the best available LCI data. Data for the sites were cross-checked with one another to identify potential data gaps. No processes, materials or emissions that are known to make a significant contribution to the environmental impact of the products studied have been omitted. On this basis, there is no evidence to suggest that input or outputs contributing more than 1% to the overall mass or energy of the system - or that are environmentally significant - have been omitted. It can be assumed that all excluded flows contribute less than 5% to the impact assessment categories. Packaging materials and its transportation are neglected due to low contribution to the overall life cycle results. The capital goods are included in the calculation.

Data quality:
The primary data are ArcelorMittal site specific and the ecoinvent "cut-off by classification" database (3.6 for set 1 indicators, and 3.9.1 for set 2 indicators) was used as the main source for the secondary data for upstream and downstream processes. The average data quality of the main primary and secondary data are ranging from 1,3 to 2,5 (1 = very good, 2 = good, 3 = fair, 4 = poor, 5 = very poor).

SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION

The End-of-Life scenarios (i.e. 5% reuse, 70% recycle and 25% landfill) considered in this study are based on the statistical data from ArcelorMittal. Ultimately, while using the EPD data (for instance for the Environmental Cost Indicator calculations (MKI)) the end user must be able to determine the project-specific scenario. Hence, three 100% scenarios are defined for reuse, recycle and landfill.

To reach the desired project specific end-of-life scenario, the user should add up the following ECI scores formulas from the ECI table values (100% scenario's).
- Reuse
Reuse ECI = [Reuse % / (Reuse% + Recycled% + (Losses% − 25%))] x ECI 100% Reuse
- Recycled
Recycled ECI = [Recycled % / (Reuse% + Recycled% + (Losses% − 25%))] x ECI 100% Recycle
- Losses
Losses ECI = [(Losses% − 25%) / (Reuse% + Recycled% + (Losses% − 25%))] x ECI 100% Landfill
Where:
• Reuse (%) = Percentage of material reused related to the 1000 kg
• Recycled (%) = Percentage of material recycled related to the 1000 kg
• Losses (%) = Total percentage of material lost (minimum 250kg = 25%) related to the 1000 kg. Losses is considered to be a combination of corrosion, unrecovered and landfill.

Additional information on the ECI for set 2 results from the main table and default scenario:
The ECI for modules A1-A3 is € 376,-/ton; A4 is €7,51,-/ton; A5 is €37,35,-/ton; B1 is €0,34,-/ton and B2-B7 = €0,-/ton.

EoL scenario (Set 1 results)	MKI C1	MKI C2	MKI C3	MKI C4	MKI D	MKI Total EoL phase
Default	10,28	0,82	6,45	0,03	-158,39	-140,81
100% Reuse	10,28	0,82	6,45	0,03	-169,15	-151,57
100% Recycle	10,28	0,82	6,45	0,03	-157,56	-139,98
100% Landfill	10,28	0,82	6,45	0,57	4,14	22,26

EoL scenario (Set 2 results)	MKI C1	MKI C2	MKI C3	MKI C4	MKI D	MKI Total EoL phase
Default	26,54	1,44	4,59	0,06	-172,99	-140,36
100% Reuse	26,54	1,44	4,59	0,06	-280,63	-248,00
100% Recycle	26,54	1,44	4,59	0,06	-165,30	-132,67
100% Landfill	26,54	1,44	4,59	1,26	4,34	38,17

DECLARATION OF SVHC

No substances listed on the "Candidate List of Substances of Very High Concern for Autorisation" by the European Chemicals Agency EC 1907-2006 are contained in the steel in declarable quantities.

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