EPD
INTERNATIONAL EPD SYSTEM

MAGREEN
BY MAGHREB STEEL

ENVIRONMENTAL
PRODUCT
DECLARATION

In accordance with ISO 14025:2006 and EN +15804:2012A2:2019/AC:2021 for:

MAGREEN HOT-DIP GALVANIZED STEEL

MAGHREB STEEL

MENA EPD®
THE INTERNATIONAL EPD® SYSTEM

Program:	The International EPD® System, www.environdec.com
Program operator:	EPD International AB
EPD registration number:	EPD-IES-0009924
Publication date:	2023-07-28
Revision date:	2025-05-23
Validity date:	2028-07-27

ECO PLATFORM EPD VERIFIED

General information

Program information

Program:	The International EPD® System
Program Operator	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
Website:	www.environdec.com
E-mail:	info@environdec.com

Accountabilities for PCR, LCA and independent, third-party verification

Product Category Rules (PCR)

CEN standard EN 15804 serves as the Core Product Category Rules (PCR)

Product Category Rules (PCR): *PCR 2019:14 Construction products, version 1.3.4 Published on 2024.04.30. Based on CEN standard EN 15804. CEN standard EN 15804 serves as the core PCR. UN CPC code 412*.

PCR review was conducted by: The Technical Committee of the International EPD®System. See https://www.environdec.com/about-us/the-international-epd-system-about-the-system for a list of members. Review chair: Claudia A. Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat www.environdec.com/contact.

Life Cycle Assessment (LCA)

LCA accountability: Dr. Rajesh Kumar Singh; Sphera Solutions

Third-party verification

Independent third-party verification of the declaration and data, according to ISO 14025:2006, via:

☒ EPD verification by individual verifier

Third party verifier: Dr. Nasser Ayoub,
Helwan University
Email: nassermayoub@gmail.com

Approved by: The International EPD® System

Procedure for follow-up of data during EPD validity involves third party verifier:
☒ Yes ☐ No
[Procedure for follow-up the validity of the EPD is at minimum required once a year with the aim of confirming whether the information in the EPD remains valid or if the EPD needs to be updated during its validity period. The follow-up can be organized entirely by the EPD owner or together with the original verifier via an agreement between the two parties. In both ways, the EPD owner is responsible for the procedure being carried out. If a change that requires an update is identified, the EPD shall be re-verified by a verifier]

EPD owner

MAGHREB STEEL

Contact: Hanane ELGUINOUI; *Sustainability & Safety Director. Email:* Hanan@maghrebsteel.ma

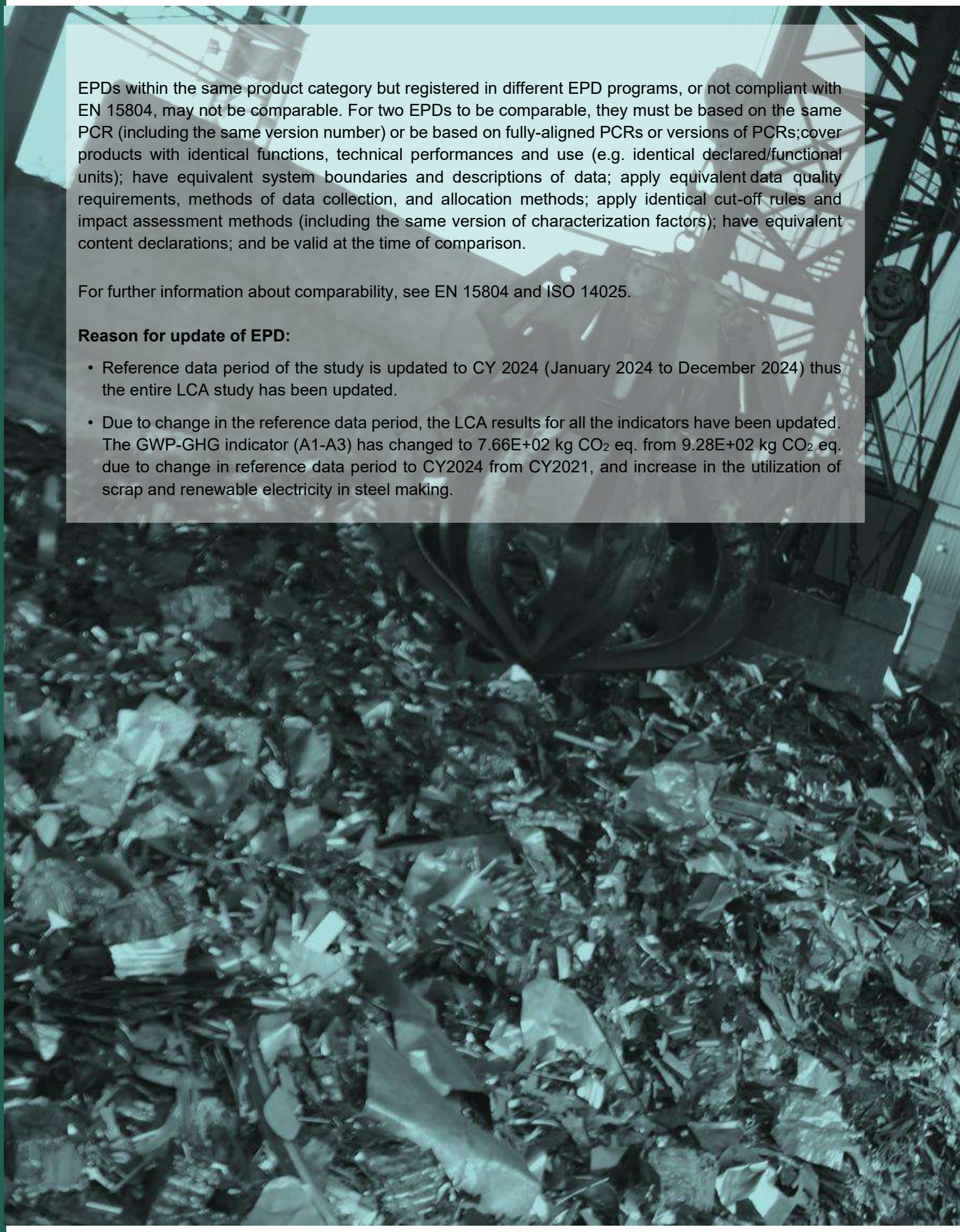
MAGHREB STEEL has sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but registered in different EPD programs, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs;cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterization factors); have equivalent content declarations; and be valid at the time of comparison.

For further information about comparability, see EN 15804 and ISO 14025.

Reason for update of EPD:

- Reference data period of the study is updated to CY 2024 (January 2024 to December 2024) thus the entire LCA study has been updated.
- Due to change in the reference data period, the LCA results for all the indicators have been updated. The GWP-GHG indicator (A1-A3) has changed to 7.66E+02 kg CO_2 eq. from 9.28E+02 kg CO_2 eq. due to change in reference data period to CY2024 from CY2021, and increase in the utilization of scrap and renewable electricity in steel making.



Company information

Description of the organization:

Founded in Morocco in 1975, Maghreb Steel has continued to develop and expand, diversifying its activities and progressively increasing its production capacity.

Maghreb Steel, a leading steel producer in Morocco, specializes in the production of flat steel products. Their manufacturing process involves several key stages, including the melting of recycled scrap metal in electric arc furnaces, followed by casting, rolling, and finishing. This process ensures high-quality green steel with precise specifications.

With over 1700 employees, and over 1 million tons of capacity, Maghreb Steel is committed to contributing to the durability and the green transformation of the steel industry by providing high-quality green steel that meet international standards.

Maghreb Steel's product portfolio covers Steel Slabs, Hot-Rolled Steel, Cold-Rolled Steel, Hot-Dip Galvanized Steel, Coated Steel, Sandwich panel and welded tubes & profiles, providing to various industries such as construction, automotive, and appliances.

Product-related or management system-related certifications:

MAGHREB STEEL's environmental management is based on the international environmental management systems standard. All Maghreb Steel plants have third-party certification: ISO 9001, ISO 16949, ISO 14001, ISO 45001, ISO 50001, and the CSR label.

Name and location of production sites:

Maghreb Steel Site Bled Solb
Secondary Road 3002, Industrial Zone BLED SOLB, Commune Chellalat
Mohammedia – Maroc

Maghreb Steel Site Tit Mellil
Maghreb Steel Site Tit Mellil, National Route 9, km 10, Ahl Loughlam
BP : 3553 Casablanca - Maroc

Product information

Product name: MAGREEN Hot-Dip Galvanized Steel.

Product identification: Galvanized Steel included in this EPD is covered by the following name: MAGREEN Hot-Dip Galvanized Steel which is produced using up to 100% steel scrap and 100% renewable energy in an electric arc furnace (EAF) technology.

UN CPC code: 412.

Geographical scope: Global.

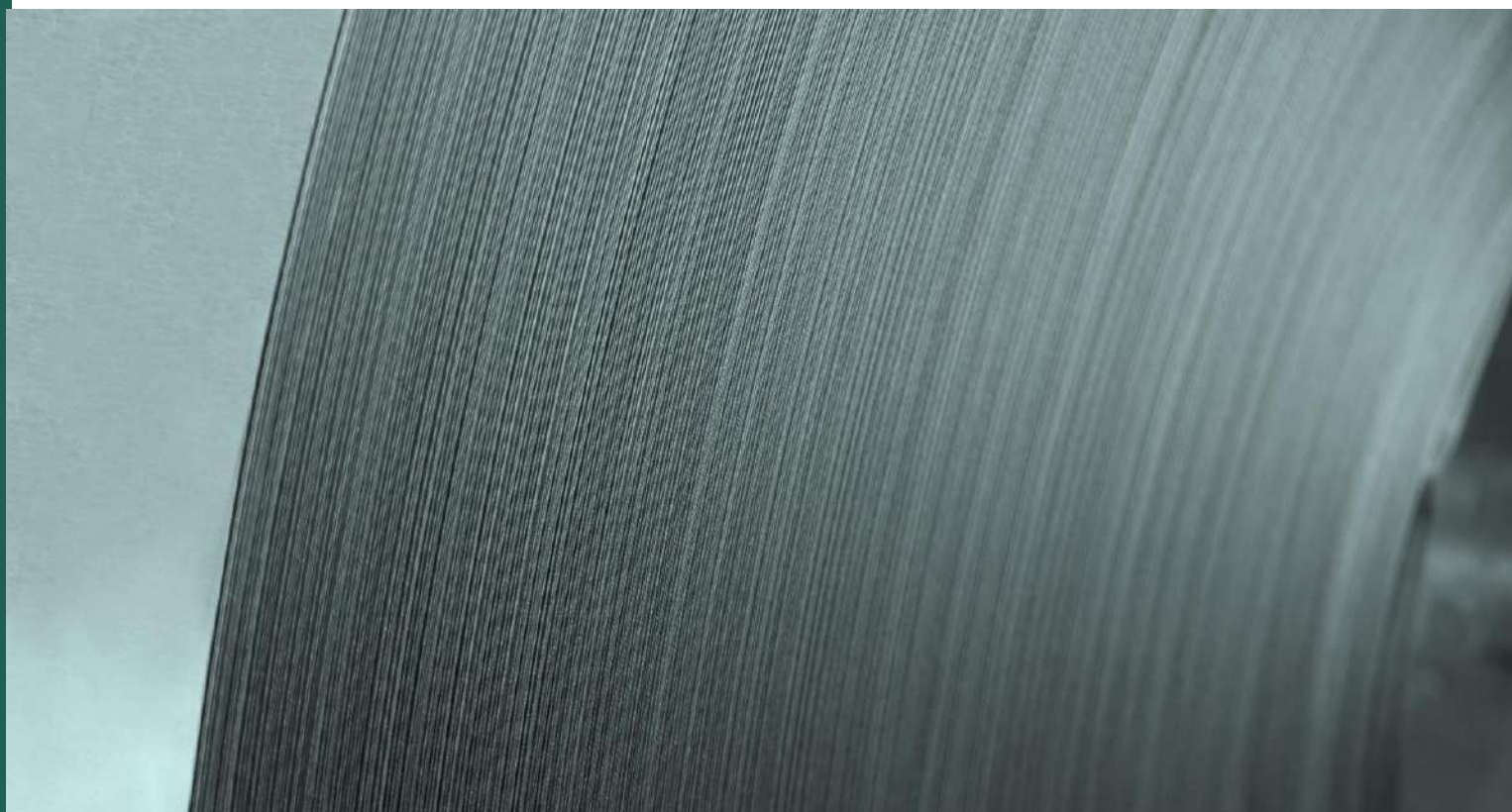
Product description:

This Environmental Product Declaration refers to MAGREEN Hot-Dip Galvanized Steel made from up to 100% recycled scrap and up to 100% renewable energy in an electric arc furnace (EAF), with additional alloying elements added according to the steel grade to achieve the required steel characteristics.

The alloying strategy is well targeted to meet the most specific requirements per application (construction, pressure, large tubes, etc.) & environment (corrosive, under pressure, temperature variation, etc.) according to applicable standards. Information on the various steel compositions is available on www.maghrebsteel.ma.

MAGREEN Galvanized Steel is produced through a continuous galvanizing process that applies zinc for superior corrosion resistance. This metallic coating process is available for a wide range of steel qualities and allows zinc thicknesses of up to 450 g/m² to be deposited on both sides. The product offers excellent corrosion resistance and very good formability. The thickness of the product varies between 0.20 to 3 mm and the width up to 1500 mm.

MAGREEN Galvanized Steel comply with international standards: EN 10346, EN 10143 and ASTM A653/A653M.



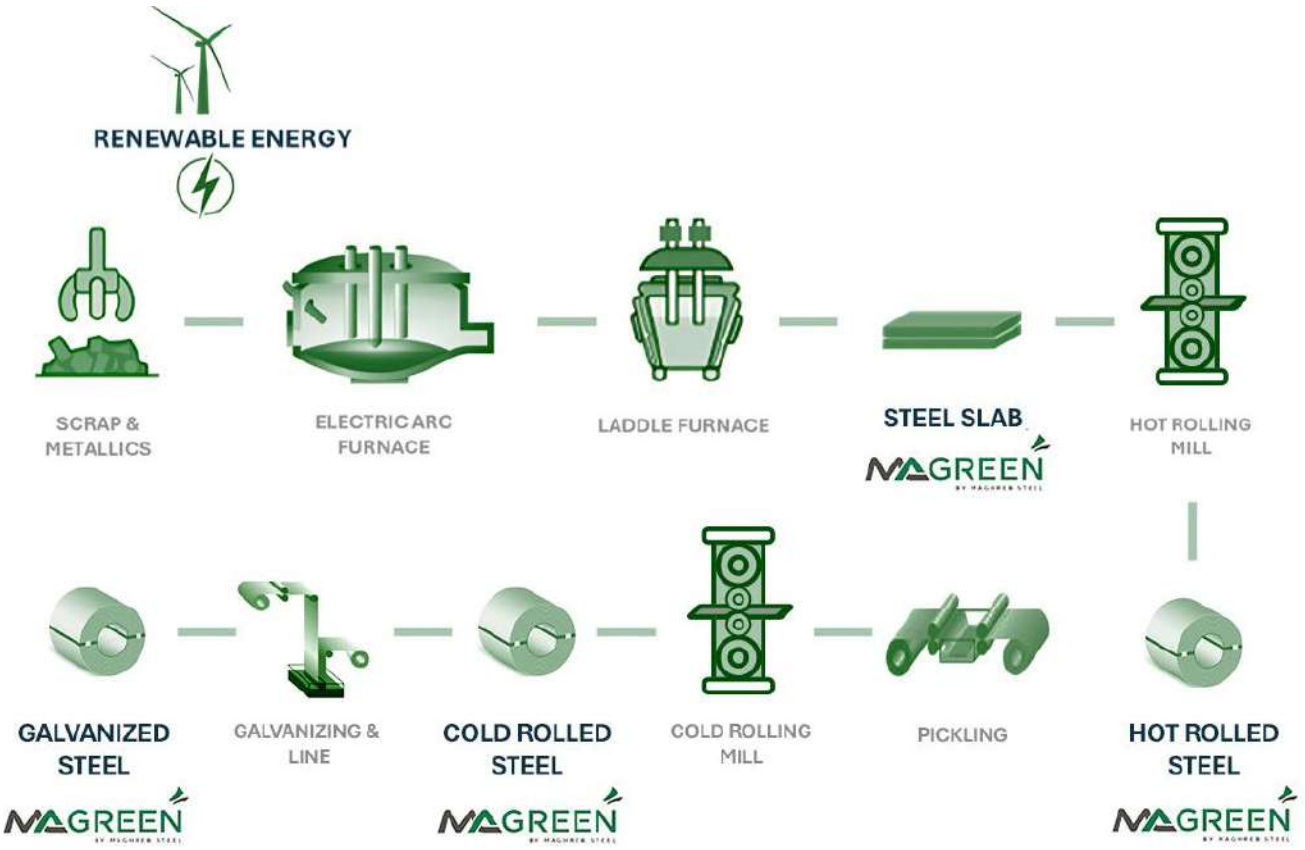
Manufacturing process:

MAGREEN Hot-Dip Galvanized Steel is produced by Maghreb Steel using an Electric Arc Furnace. The primary input for steelmaking is scrap metal. The facility is powered by up to 100% renewable wind electricity. The Electric Arc Furnace outputs steel slabs, which then undergo a continuous rolling process at elevated temperatures, passing through multiple rotating cylinders to produce hot rolled coils. Hot rolled coils then undergo pickling followed by cold rolling to produce cold rolled coils. The cold rolled coils are then dipped in a bath of molten zinc to produce MAGREEN Galvanized Steel.

Maghreb Steel has a galvanizing line and a combined galvanizing and pre-coating line. These coating lines ensure the continuous processing of metal by providing two types of products: galvanized and pre-painted. Continuous galvanizing of steel sheet is an operation that consists of coating a steel strip with a layer of protective zinc.

Applications:

The product is used in various applications, such as construction and household appliances.



LCA information

Functional unit / declared unit: 1 Ton (1000 kg) MAGREEN Galvanized Steel.

Reference service life:

The reference service life for MAGREEN Galvanized Steel is not declared. Galvanized Steel is used in construction with many different application purposes. The lifetime therefore will be limited by the application and corresponding service.

Time representativeness:

The collection of foreground data refers to January 2024 to December 2024.

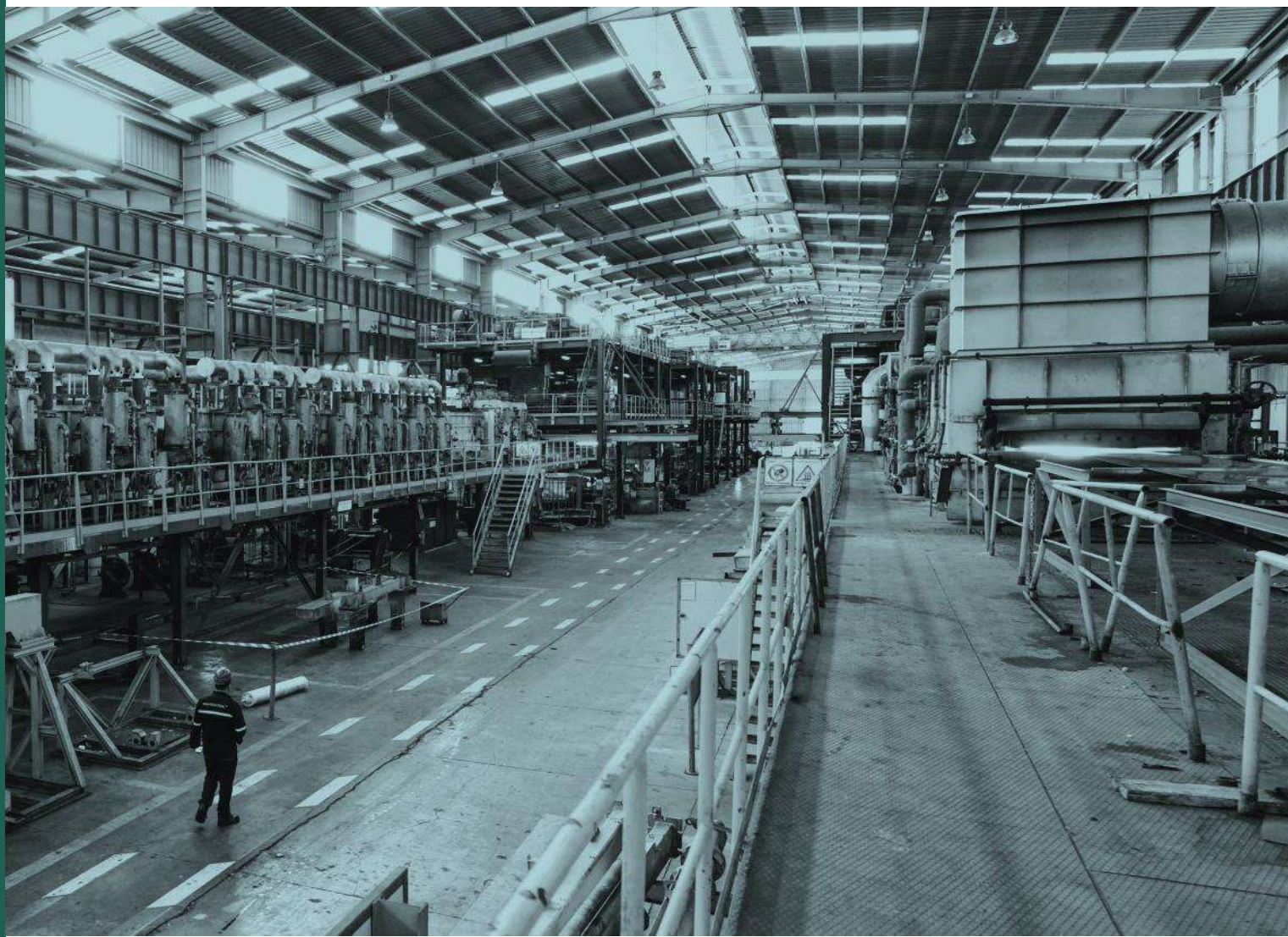
Database and LCA software used:

The background data has been taken from the latest available Sphera Managed LCA Content (MLC) 2024.2 and the LCA model was created using Sphera's LCA for Experts (LCA FE) software, version 10.8.

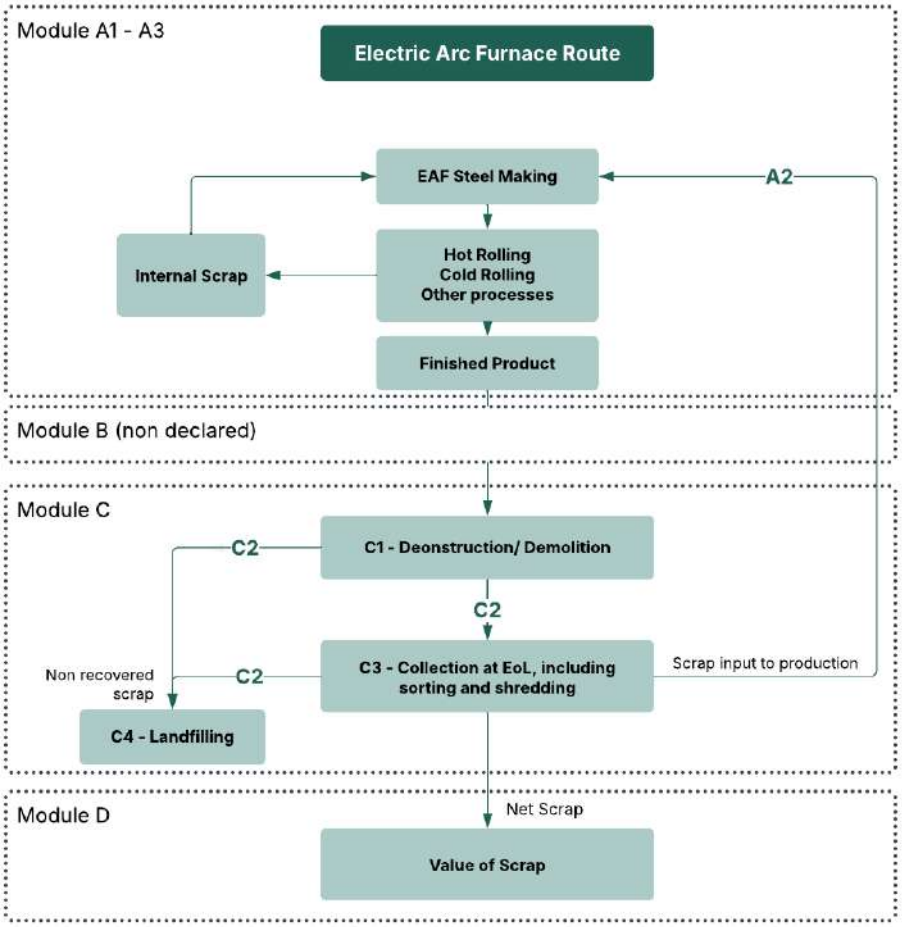
Description of system boundaries:

The system boundary: It includes cradle to gate stage with additional modules C1-C4, and module D.

Reference package used: EN 15804 reference package based on EF 3.1.



System diagram:



- ***Module A1 to A3:***

The product stage includes provision of all materials, products, and energy, as well as waste processing up to the end-of waste state or disposal of final residues during the product stage. Impacts on raw material transportation, including external scrap, and intermediate products are included. The transport distances and routes are calculated based on the manufacturer data. These modules consider the production of MAGREEN Galvanized Steel at Maghreb Steel, in Morocco, using EAF route steel production. Maghreb Steel MAGREEN Galvanized Steel are packed with metal strapping, paper and plastic.

For the modelling (module A3), the electricity supply was based on Morocco country grid mix and Morocco specific renewable energy: wind energy from Sphera Managed LCA Content (MLC) 2024.2. The emission factor for the electricity mix GWP-GHG indicator is 76.10 g CO2eq./kWh.

- ***Module C1 to C4:***

Within this EPD, the modules C1-C4 are included. These modules consider the dismantling of the considered product (C1), the transportation of the dismantled components to their End of Life (EoL) destination (C2), the waste processing for recovery or recycling (C3) as well as the disposal (C4), if given. At EoL, the steel material leaves the product system in C3 for recycling in Module D. The considered EoL scenario for the steel material is 98% recycling and 2% losses.

Category	Subcategory	Unit	Quantity
Collection process	Collected separately	kg	1000
	Collected with mixed construction waste	kg	0
Recovery	Reuse	kg	0
	Recycling	kg	980
	Landfill	kg	20
	Incineration	kg	0
	Incineration with energy recovery	kg	0
	Energy conversion efficiency rate	kg	0
Disposal	Material for final disposal	kg	0
Transport	Deconstruction site to scrap processing plant	km	0
	Scrap processing plant to site for end of waste	km	100

- ***Module D:***

Module D encompasses the declared benefits and loads arising from the net flow of secondary fuels or materials within the product system. It excludes flows allocated as co-products. Metals are considered to reach the end-of-waste state after undergoing sorting and shredding processes. The treatment, along with the net benefits and loads of reuse or recycling potentials (specifically for the net scrap amount), is included in Module D.

Potential environmental benefits are given for the net steel scrap that is produced at the end of a final product's life, calculated as follows:

Net scrap = Amount of steel recycled at end-of-life – Scrap input from previous product life cycles.

In the manufacturing of Maghreb Steel Galvanized Steel, 807 kg of external scrap was used. At the end-of-life, 980 kg of scrap are recovered for recycling and 0 kg for reuse. This means that the system has a net output of 173 kg (i.e., 980 + 0 - 807) of scrap, which is shown in module D as an environmental credit or burden depending on the impact category.

Maghreb Steel does not have direct control over a particular process in the module B-D.

Data quality assessment and declaration:

Process	Source type	Source	Reference year	Data category	Share of primary data, of GWP-GHG results for A1- A3
Manufacturing of product	Collected data	EPD owner	2024	Primary data	50.27%
Generation of electricity used in manufacturing of product	Database and collected data	Sphera MLC 2024.2 and EPD owner	2024	Primary data	9.83%
Transport of raw materials to the manufacturing site	Database	Sphera MLC 2024.2	2024	Primary data	2.25%
Total share of primary data, of GWP-GHG results for A1-A3					62.35%

Note: The share of primary data is calculated based on GWP-GHG results. It is a simplified indicator for data quality that does not capture all relevant aspects of data quality. The indicator is not comparable across product categories.

Cut-off criteria:

The environmental impact of the studied product has been evaluated by considering all significant processes, materials, and emissions. Flows that were excluded are assumed to have a negligible impact, contributing less than 5% to the cumulative impact assessment categories. The production of capital equipment, facilities, and infrastructure required for manufacturing has not been included.

This study has assessed both transit and product packaging wherever possible. For raw materials, packaging could not be considered. However, it is reasonable to assume that most raw materials, particularly those with significant quantities like scrap, pig iron, DRI, and lime, are transported in bulk.

As part of the iterative LCA process, the results obtained from the packaging LCA modeling led to the decision to exclude packaging results from the current LCA outcomes. This is due to the low impact contribution, which was nevertheless reducing the results of most currently observed indicators in EPDs, particularly the GWP-total.

Data quality and sources:

Data quality is compliant with ISO 14025:2006. All primary data were collected for the calender year 2024 (January 2024 to December 2024). All background data come from the Sphera MLC 2024.2.

Allocation:

With any multi-product system, allocation rules are defined to relate the system inputs and outputs to each of the products. Several methods are documented in ISO 14040:2006 and ISO Technical Report 14049. The main co-products (slag) for Electric Arc Furnace are allocated. Scrap inputs in EAF, including pre-consumer scrap, are considered 'burden-free.' Externally sourced pre-consumer scrap is treated as post-consumer scrap, meaning the only burdens considered are transportation (accounted for in A2) and end-of-life scenarios (waste processing, transport, and destination). For these scraps, economic allocation was considered not feasible. Whereas, the main co-products in Hot rolling mill, Pickling line, and Galvanizing lines are economically allocated. For all background data used in the model, the standard allocation assumptions of the used datasets were maintained.

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

	Production			Installation		Use Stage							End-of-Life				Next product system
	Raw material supply	Transport to manufacturer	Manufacturing	Transport to building site	Installation into building	Use / application	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction / demolition	Transport to EoL	Waste processing for reuse, recovery,	Disposal	Reuse, recovery, or recycling
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules declared	X	X	X	NR	NR	NR	NR	NR	NR	NR	NR	NR	X	X	X	X	X
Geography	Africa, Asia and EU												GLO	GLO	GLO	GLO	GLO
Specific data used	62.35% (GWP-GHG)			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation - products	Not relevant																
Variation – Sites	Not relevant																

X- Module declared. NR- Not reported.

Content information

MAGREEN Galvanized Steel Content

Product Components	Weight[1], kg	Post-consumer recyled material, weight	Biogenic material, weight
Steel	979.9	80.7%	0
Metallic Coating	20.1	-	0
Total	1000	-	-
Chemical Composition			
Iron	95%-99.9%	-	-
Manganese	0%-2%	-	-
Aluminum	0%-0.2%	-	-
Silicon	0%-0.5%	-	-
Carbon	0.02%-0.3%	-	-
Other	0%-3%	-	-

[1]. *these numbers are the average values of product compositions.*

Packaging Material	Weight, kg	weight-% of the product	Weight biogenic carbon, kg C/kg
Metal Strapping	0.6	0.06%	0
Paper	0.15	0.015%	0.06
Plastic	0.18	0.018%	0

Products do not contain any substances that can be included in “Candidate List of Substances of Very High Concern for Authorization” and raw materials used are not part of the EU REACH regulation.

Results of the environmental performance indicators

The environmental performance of the functional unit of one ton of Maghreb Galvanized Steel are reported below using the parameters and units specified in PCR 2019:14 v1.3.4.

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.

Mandatory impact category indicators according to EN 15804+A2:2019

Results per 1tonof MAGREEN Galvanized Steel							
Impact indicators	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-total	kg CO_2 eq.	**7.67E+02**	0.00E+00	8.61E+00	0.00E+00	3.01E-01	-2.99E+02
GWP-fossil	kg CO_2 eq.	7.65E+02	0.00E+00	8.25E+00	0.00E+00	2.99E-01	-3.01E+02
GWP-biogenic	kg CO_2 eq.	1.56E+00	0.00E+00	3.64E-01	0.00E+00	-1.26E-06	-9.55E-01
GWP-luluc	kg CO_2 eq.	1.87E-01	0.00E+00	5.95E-04	0.00E+00	1.80E-03	-4.00E-02
ODP	kg CFC -11 eq.	8.23E-10	0.00E+00	1.78E-13	0.00E+00	8.07E-13	-4.04E-11
AP	Mole of H^+ eq.	2.22E+00	0.00E+00	4.48E-02	0.00E+00	2.13E-03	-7.36E-01
EP- freshwater	kg P eq.	1.13E-03	0.00E+00	1.41E-06	0.00E+00	6.80E-07	-7.00E-05
EP- marine	kg N eq.	5.56E-01	0.00E+00	2.29E-02	0.00E+00	5.47E-04	-1.18E-01
EP- terrestrial	Mole of N eq.	6.05E+00	0.00E+00	2.51E-01	0.00E+00	6.03E-03	-1.06E+00
POCP	kg NMVOC eq.	1.63E+00	0.00E+00	4.44E-02	0.00E+00	1.67E-03	-4.80E-01
ADPE	kg Sb eq.	2.44E-02	0.00E+00	1.12E-07	0.00E+00	1.94E-08	-5.05E-05
ADPF	MJ	8.72E+03	0.00E+00	1.18E+02	0.00E+00	3.95E+00	-2.99E+03
WDP	m^3 world equiv.	9.89E+01	0.00E+00	1.40E-02	0.00E+00	3.43E-02	-2.03E+01
Acronyms	**Caption:** GWP - total = global warming potential; GWP - fossil = global warming potential (fossil fuel only); GWP - biogenic = global warming potential (biogenic); GWP - luluc = global warming potential (land use only); ODP = ozone depletion; AP = acidification terrestrial and freshwater; EP freshwater = eutrophication potential (freshwater); EP - marine = eutrophication potential (marine); EP- terrestric = eutrophication potential (terrestrial); POCP = photochemical ozone formation; ADPE = abiotic depletion potential (element); ADPF = abiotic depletion potential (fossil); WDP = water scarcity.						

Additional mandatory and voluntary impact category indicators

Results per 1tonof MAGREEN Galvanized Steel							
Impact indicators	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-GHG*	kg CO_2 eq.	7.66E+02	0.00E+00	8.25E+00	0.00E+00	3.00E-01	-3.01E+02
Acronyms	GWP-GHG*= The indicator is calculated with characterization factors from IPCC AR6 GWP 100, excl biogenic carbon, and includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product.						

Resource use indicators according to EN 15804+A2:2019

Results per 1tonof MAGREEN Galvanized Steel							
Impact indicators	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	9.10E+03	0.00E+00	5.11E-01	0.00E+00	6.89E-01	-1.18E+02
PERM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	9.10E+03	0.00E+00	5.11E-01	0.00E+00	6.89E-01	-1.18E+02
PENRE	MJ	8.72E+03	0.00E+00	1.18E+02	0.00E+00	3.95E+00	-2.99E+03
PENRM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	8.72E+03	0.00E+00	1.18E+02	0.00E+00	3.95E+00	-2.99E+03
SM	kg	8.07E+02	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
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m^3	2.59E+00	0.00E+00	1.91E-03	0.00E+00	1.05E-03	-5.55E-01
Acronyms	**Caption:** PERE = Use of renewable primary energy excluding the renewable primary energy resource used as raw materials; PERM = Use of renewable primary energy as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding the non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water						

Output flows & Waste Indicators according to EN 15804+A2:2019

Results per 1tonof MAGREEN Galvanized Steel							
Impact indicators	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
HWD	kg	3.98E-05	0.00E+00	1.76E-09	0.00E+00	9.83E-10	-2.24E-05
NHWD	kg	1.11E+01	0.00E+00	8.11E-04	0.00E+00	2.00E+01	-3.62E+00
RWD	kg	8.04E-02	0.00E+00	1.28E-05	0.00E+00	4.14E-05	-3.28E-03
CRU	kg	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	0.00E+00	0.00E+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
EEE	MJ	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	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acronyms	**Caption:** 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; EEE = Exported electrical energy; EET = Exported thermal energy						

Additional environmental performance indicators according to EN 15804+A2:2019

Results per 1tonof MAGREEN Galvanized Steel							
Impact indicators	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
PM	Disease incidences	3.11E-05	0.00E+00	1.63E-07	0.00E+00	2.67E-08	-6.90E-06
IR	kBq U235 eq.	8.01E+00	0.00E+00	9.40E-04	0.00E+00	4.79E-03	-6.75E-01
ETF	CTU_e	4.82E+03	0.00E+00	2.45E+02	0.00E+00	2.63E+00	-1.57E+02
HTP-c	CTU_h	7.06E-05	0.00E+00	3.68E-09	0.00E+00	5.37E-11	-1.23E-07
HTP-nc	CTU_h	3.68E-06	0.00E+00	5.48E-08	0.00E+00	2.08E-09	-5.86E-07
SQP	Pt	6.58E+02	0.00E+00	3.49E-01	0.00E+00	1.09E+00	-3.88E+01
Acronyms	**Caption:** PM = Particulate matter emissions; IR = Ionising radiation, human health; ETF= Eco-toxicity (freshwater); HTP-c = Human toxicity, cancer effects; HTP-nc = Human toxicity, non-cancer effects; SQP = Soil quality potential/Land use related impact.						

References

- General Program Instructions of the International EPD® System. Version 4.0.
- PCR 2019:14. Construction Products, Version 1.3.4
- Sustainability of construction works - Environmental product declarations - Methodology for selection and use of generic data; CEN/TR 15941:2010
- EN 15804: EN 15804:2012+A2:2019: Sustainability of construction works -Environmental Product Declarations - Core rules for the product category of construction products.
- EN ISO 14025: EN ISO 14025:2011-10 Environmental labels and declarations - Type III environmental declarations - Principles and procedures
- EN ISO 14040: EN ISO 14040:2009-11 Environmental management - Life cycle assessment - Principles and framework
- EN ISO 14044: EN ISO 14044:2006-10 Environmental management - Life cycle assessment - Requirements and guidelines.
- LCA FE: LCA FE Software System and Database for Life Cycle Engineering, Sphera Solution GmbH, Leinfelden-Echterdingen, 2024 (https://sphera.com/solutions/product-stewardship/life-cycle-assessment-software-and-data/managed-lca-content/)
- WSI and Eurofer's Co-Product Allocation Methodology 2014 – A methodology to determine the LCI of Steel Industry Co-products.
- World Steel Association- CO_2 Data Collection User Guide, Version 9 (May 2019).