Overview of Construction Sector in Portugal

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ASSOCIAÇÃO PORTUGUESA DE CONSTRUÇÃO METÁLICA E MISTA

INTERNATIONAL STEEL

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1. Steel in the World

2. The Portuguese steel construction sector

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Steel in the world

What is steel?

Steel, which is an alloy of iron and carbon, is the most versatile and important engineering and construction material in the world.

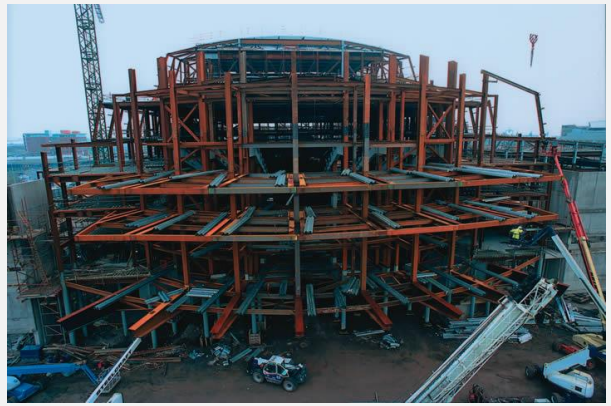
Its use influences every aspect of our lives and the buildings around us - from protective steel toe caps for shoes to refrigerators, from the manufacture of automotive products to building materials, from cargo ships to the most delicate surgical scalpels.

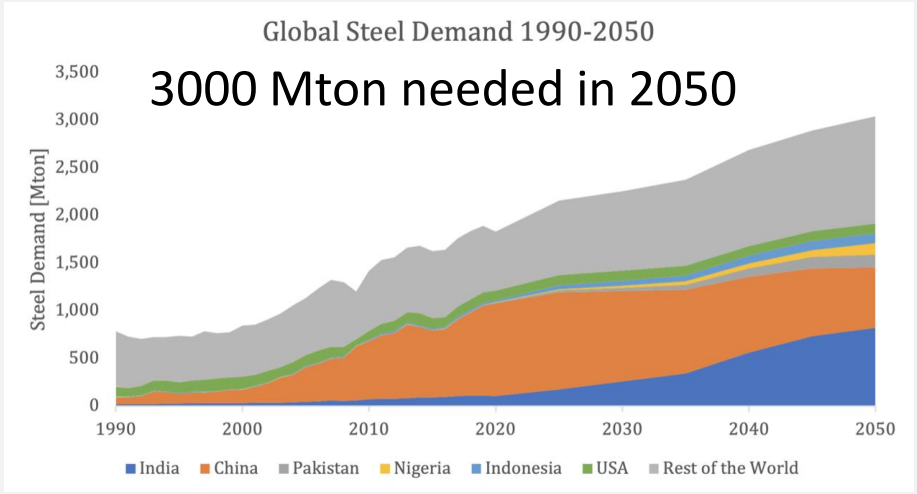
Source: World Steel Association

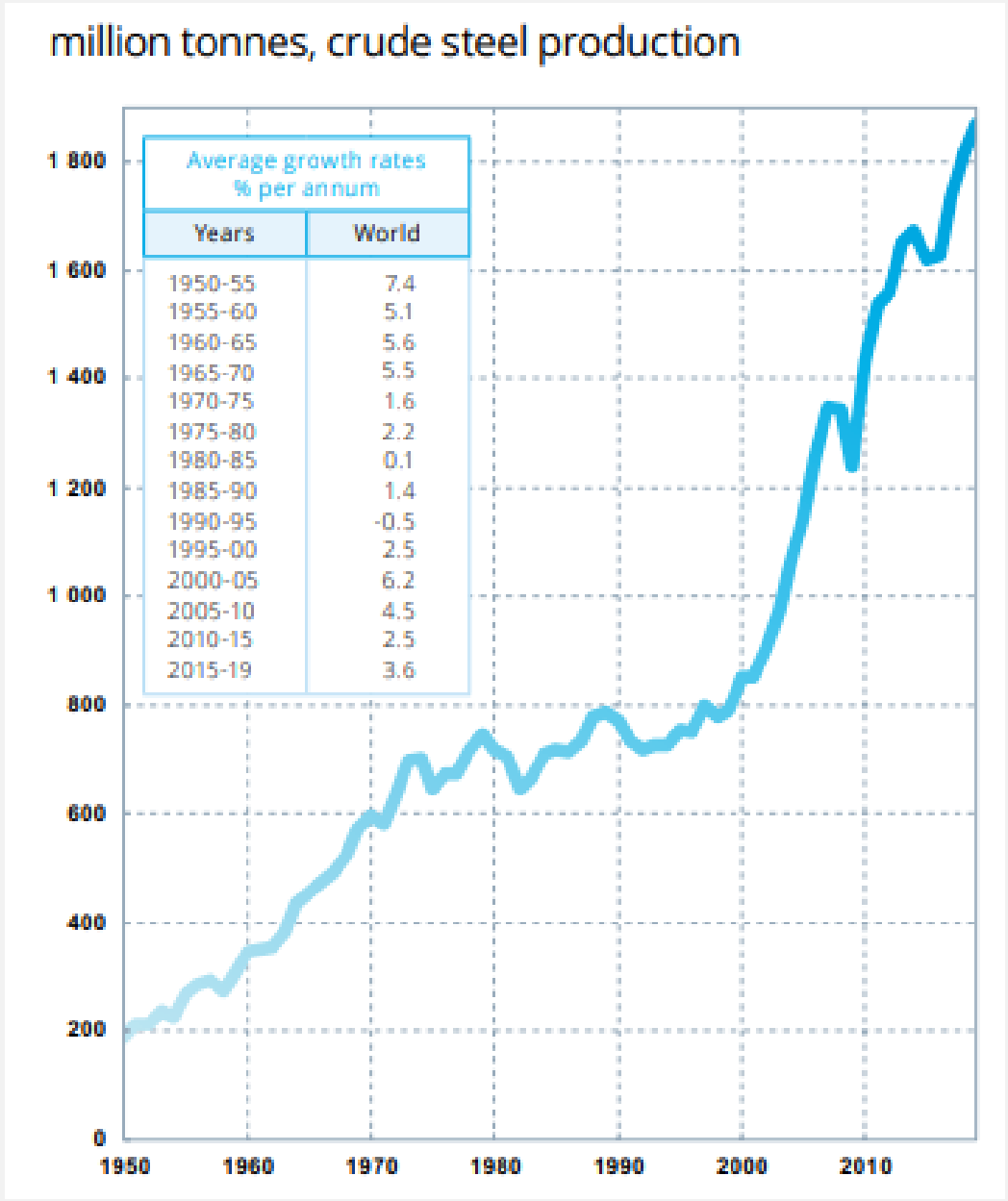
Steel in the World

World Steel Production 1950 – 2019

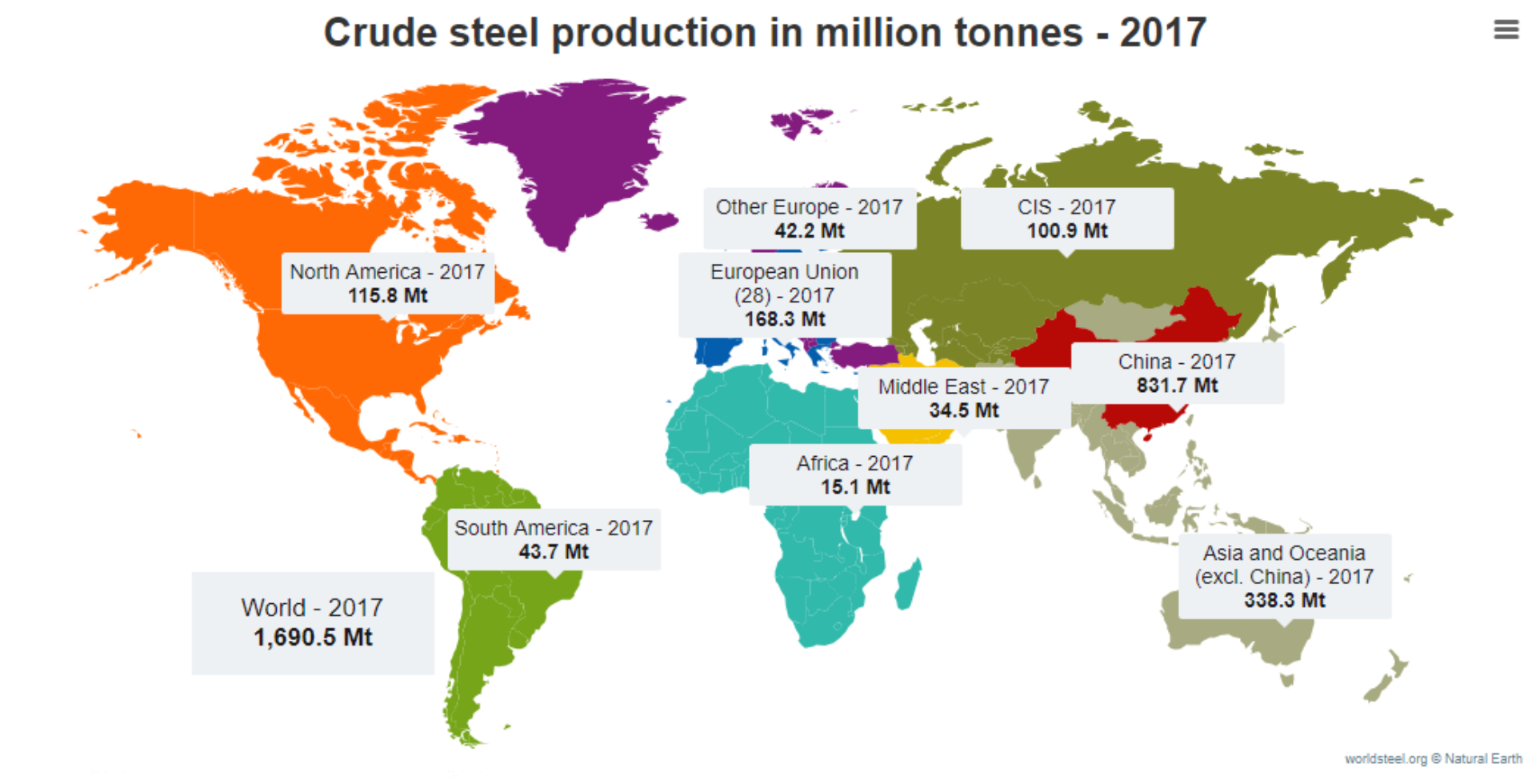
1880 Mton produced in 2019





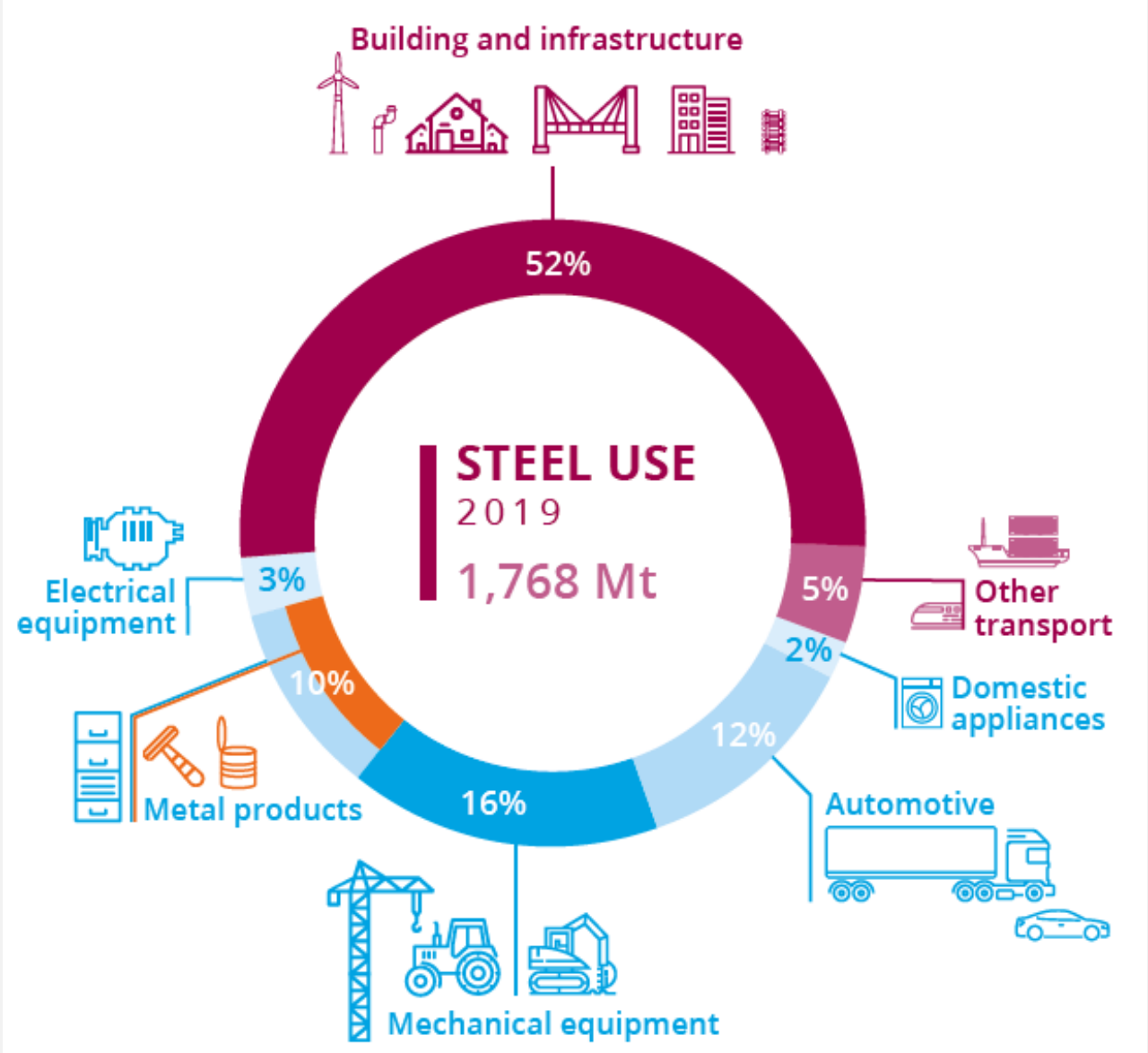


Steel in the World



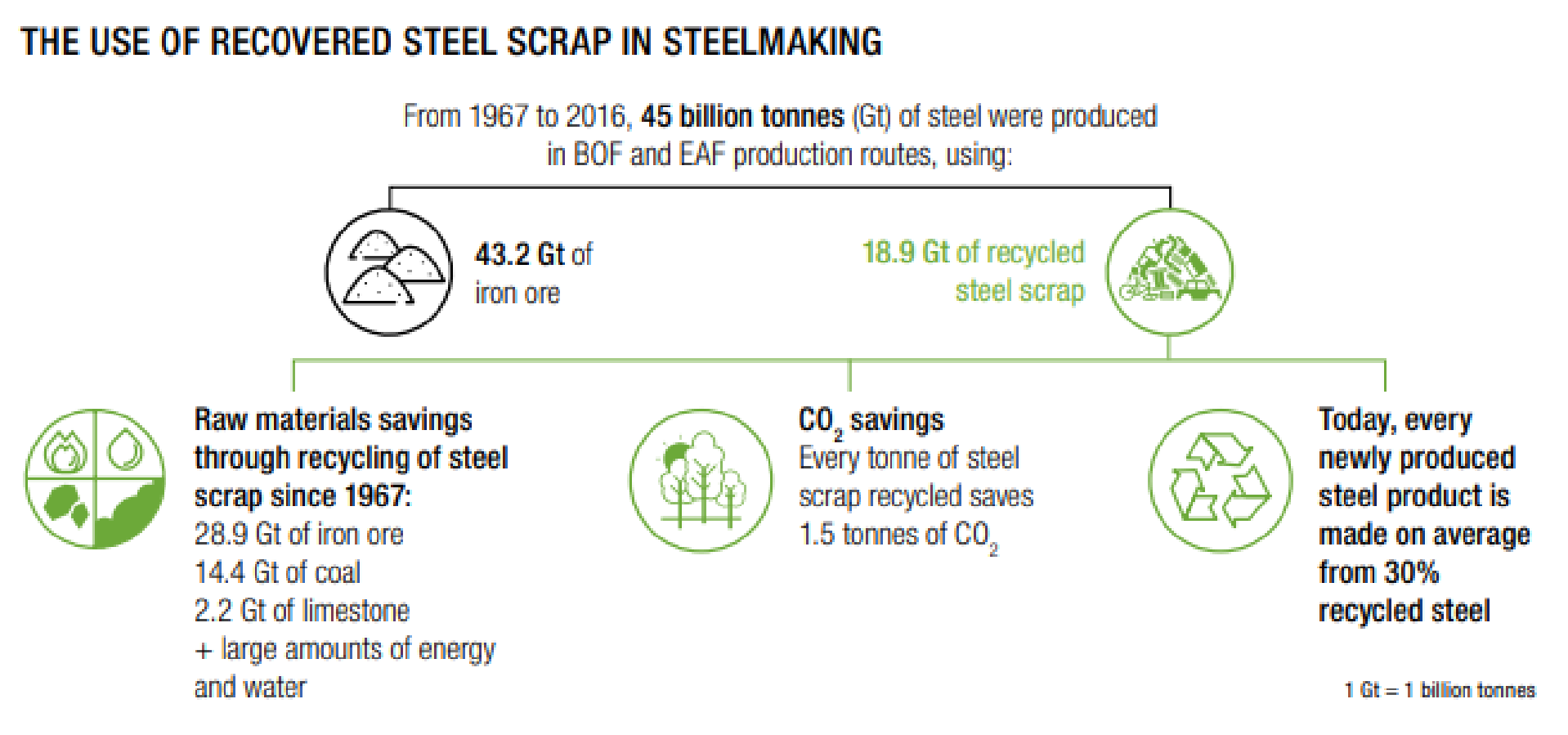
Steel in the World

Breakdown of world consumption of finished steel by end markets



Steel in the World

Recycled steel



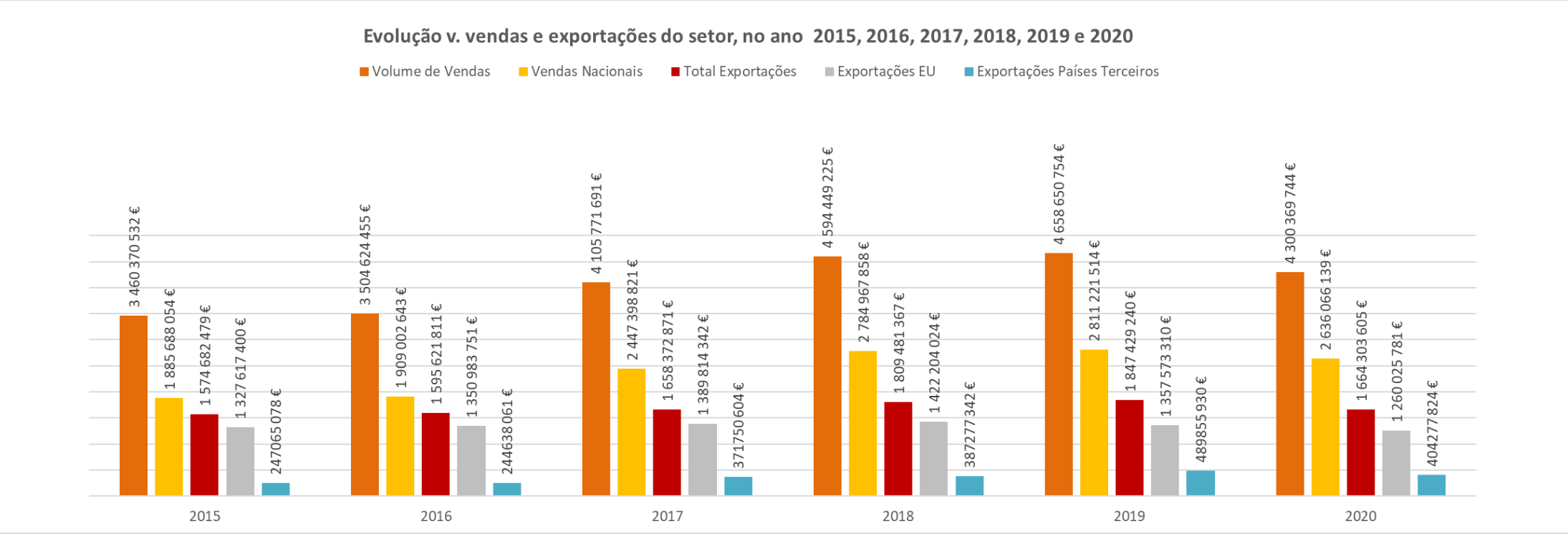
The Portuguese steel construction sector

Classification of Portuguese Economic Activities (CAE) of the steelworking sector

CAE	Description
25110	Manufacture of steel construction structures
24100	Iron and steel industry and manufacture of iron-alloys
24200	Manufacture of tubes, ducts, hollow profiles and related accessories, of steel
24320	Arc or band cold rolling
24330	Cold profiling
25610	Steel treatment and coating
25992	Manufacture of other miscellaneous steel products, n.e.s.

The Portuguese steel construction sector

National sales and exports - 2015 to 2020
Steelworking sector



Source: D&B Informa data for the CAE's 25110, 24100, 24200, 24320, 24330, 25610, 25992, from 2015 to 2020

The Portuguese steel construction sector

General data for the years 2015 to 2020
Steelworking sector

Year	No. of Employees	Turnover	% GDP	Total Exports	% Exports
2 015	26 253	3 460 508 595 €	1,93%	1 574 682 479 €	2,19%
2 016	27 494	3 504 624 455 €	1,89%	1 595 621 811 €	3,19%
2 017	28 891	4 105 771 691 €	2,13%	1 658 372 871 €	3,20%
2 018	31 514	4 594 449 225 €	2,28%	1 809 481 367 €	3,12%
2 019	33 831	4 658 650 754 €	2,19%	1 847 429 240 €	3,08%
2 020	33 196	4 300 369 744 €	2,15%	1 664 303 605 €	3,10%

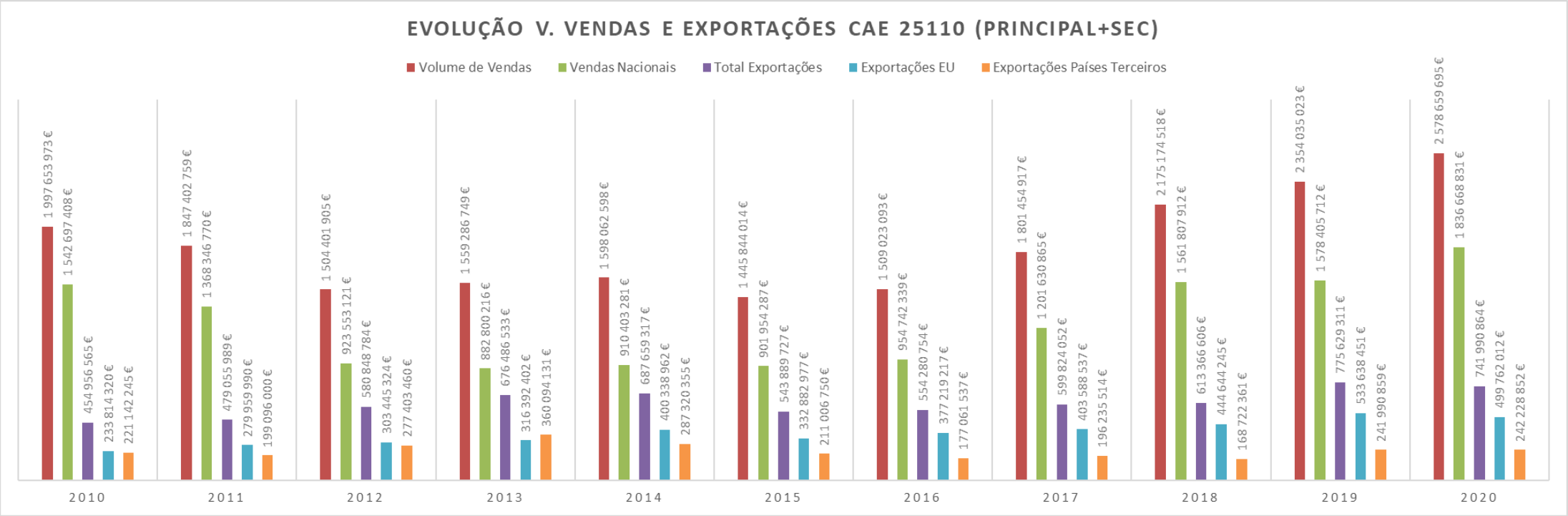
Source: D&B Informa data for CAE's 25110, 24100, 24200, 24320, 24330, 25610, 25992, from 2015 to 2020

The Portuguese steel construction sector

CAE 25110 – Primary and secondary

CAE	Description
25110	Manufacture of steel construction structures

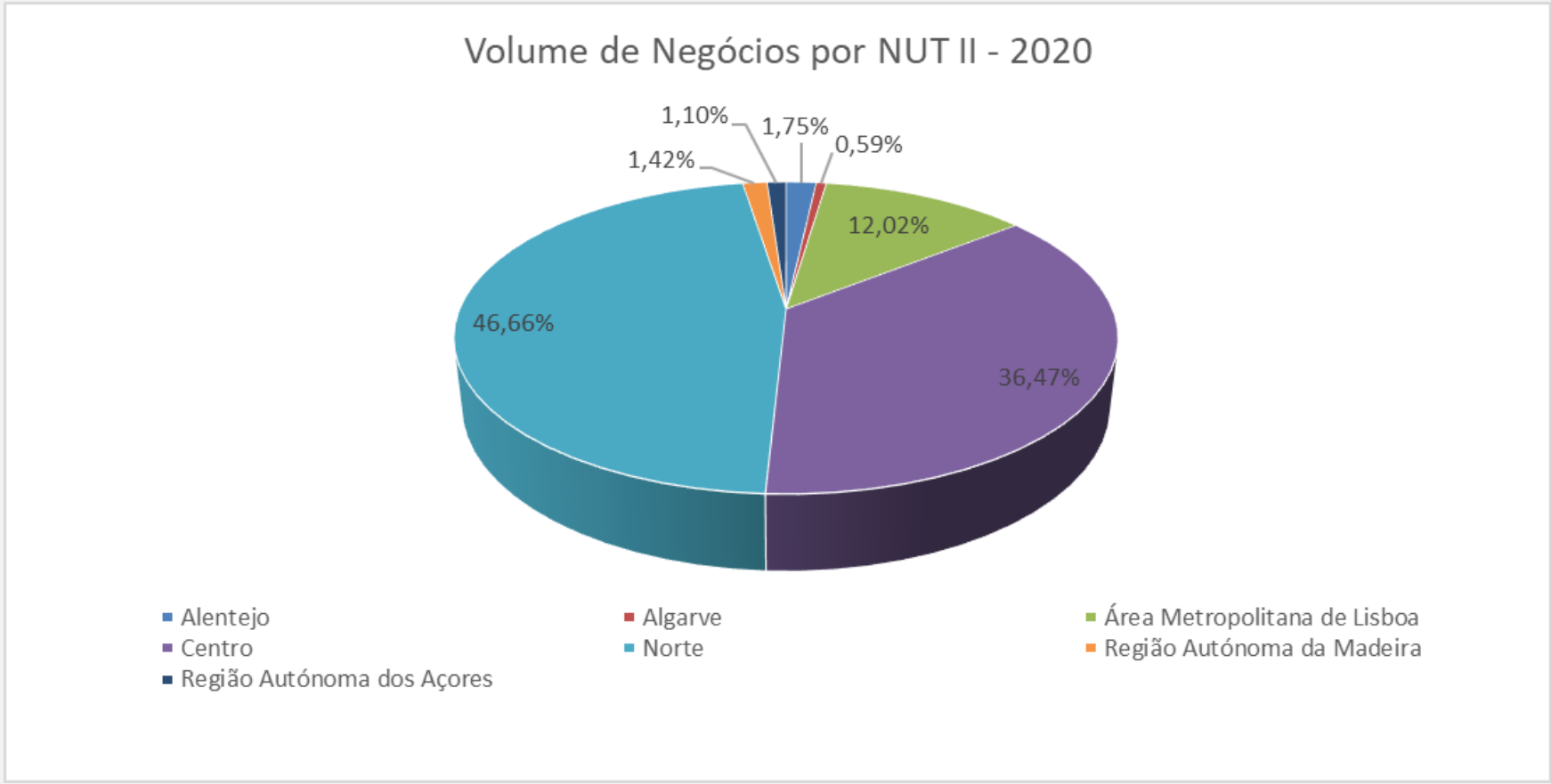
The Portuguese steel construction sector



Source: D&B Informa data for CAE 25110 (Primary+Secondary) - Manufacture of steel construction structures, from 2010 to 2020

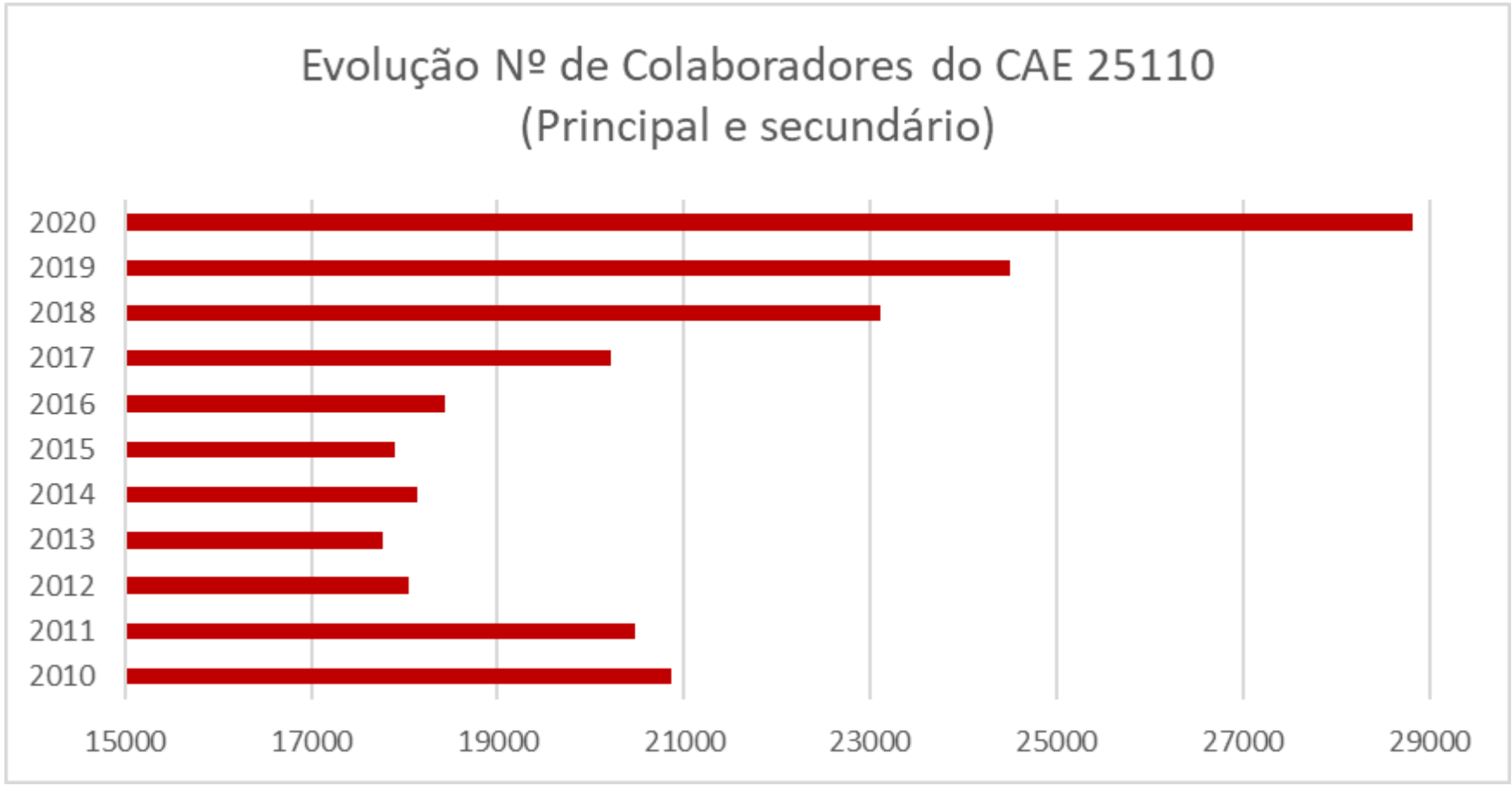
The Portuguese steel construction sector

CAE 25110 – Primary and secondary



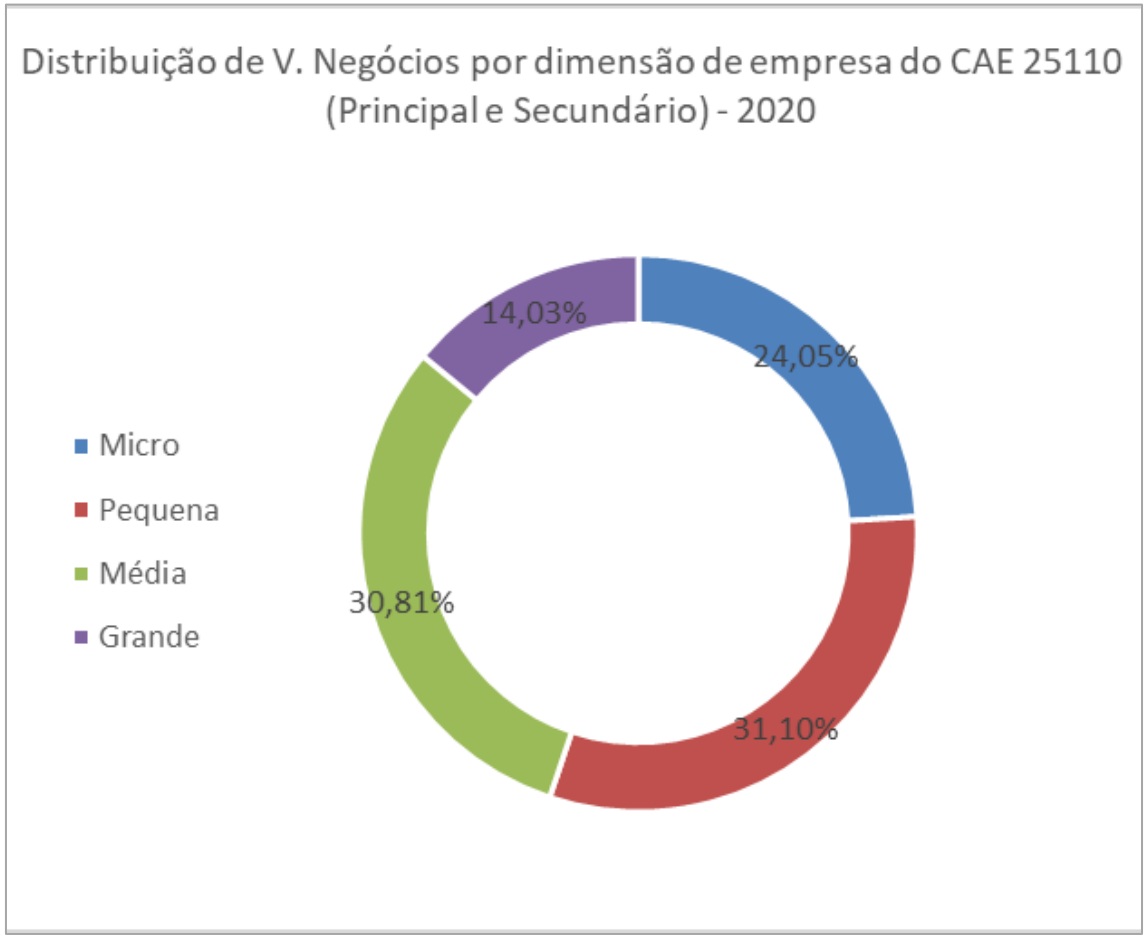
Source: D&B Informa data for CAE 25110 (Primary+Secondary) - Manufacture of steel construction structures, from 2010 to 2020

The Portuguese steel construction sector



Source: D&B Informa data for CAE 25110 (Primary+Secondary) - Manufacture of steel construction structures, from 2010 to 2020

The Portuguese steel construction sector

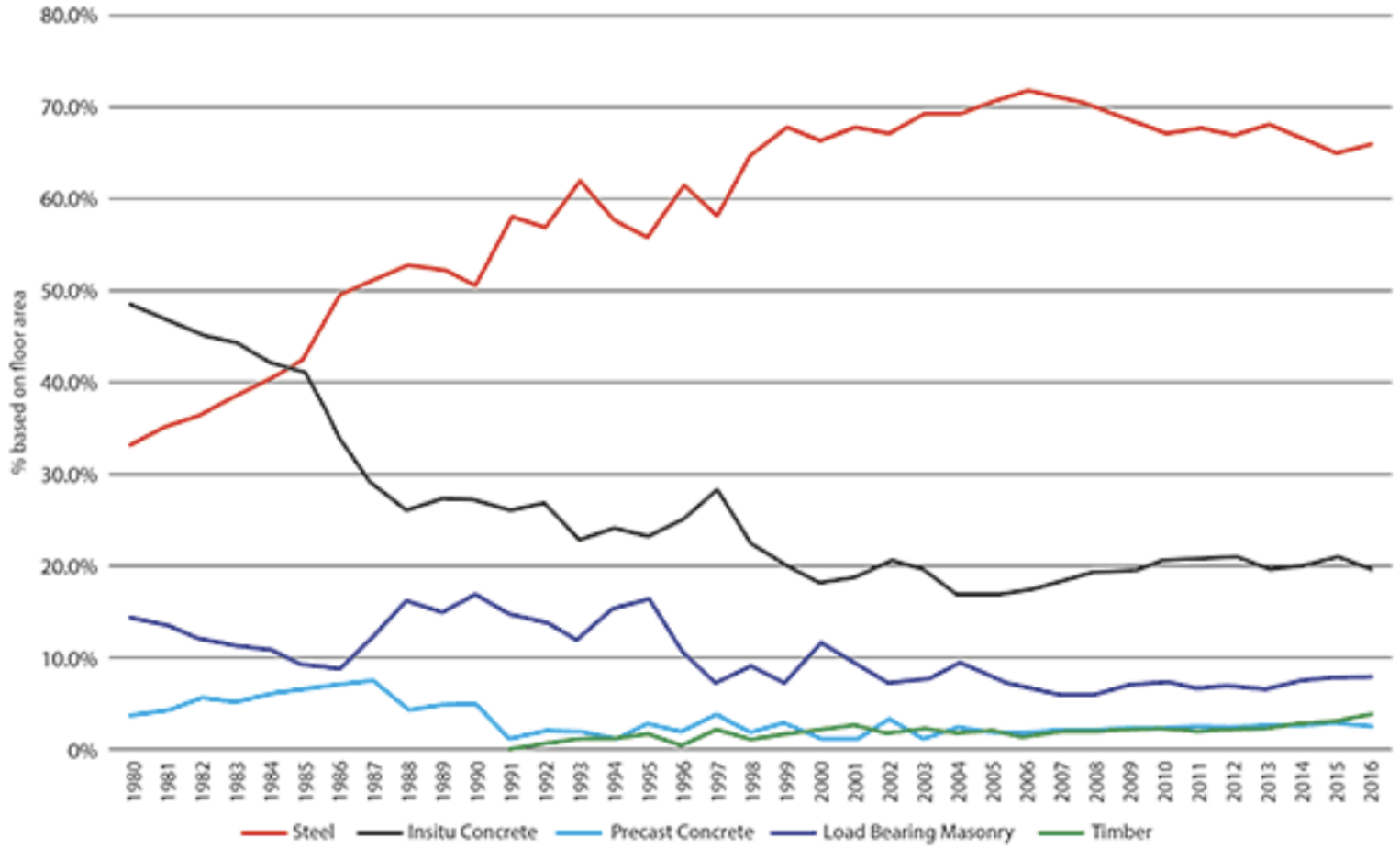


Source: D&B Informa data for CAE 25110 (Primary+Secondary) - Manufacture of steel construction structures, from 2010 to 2020

The Portuguese steel construction sector

Evolution of Multi-Story Building Construction in the UK

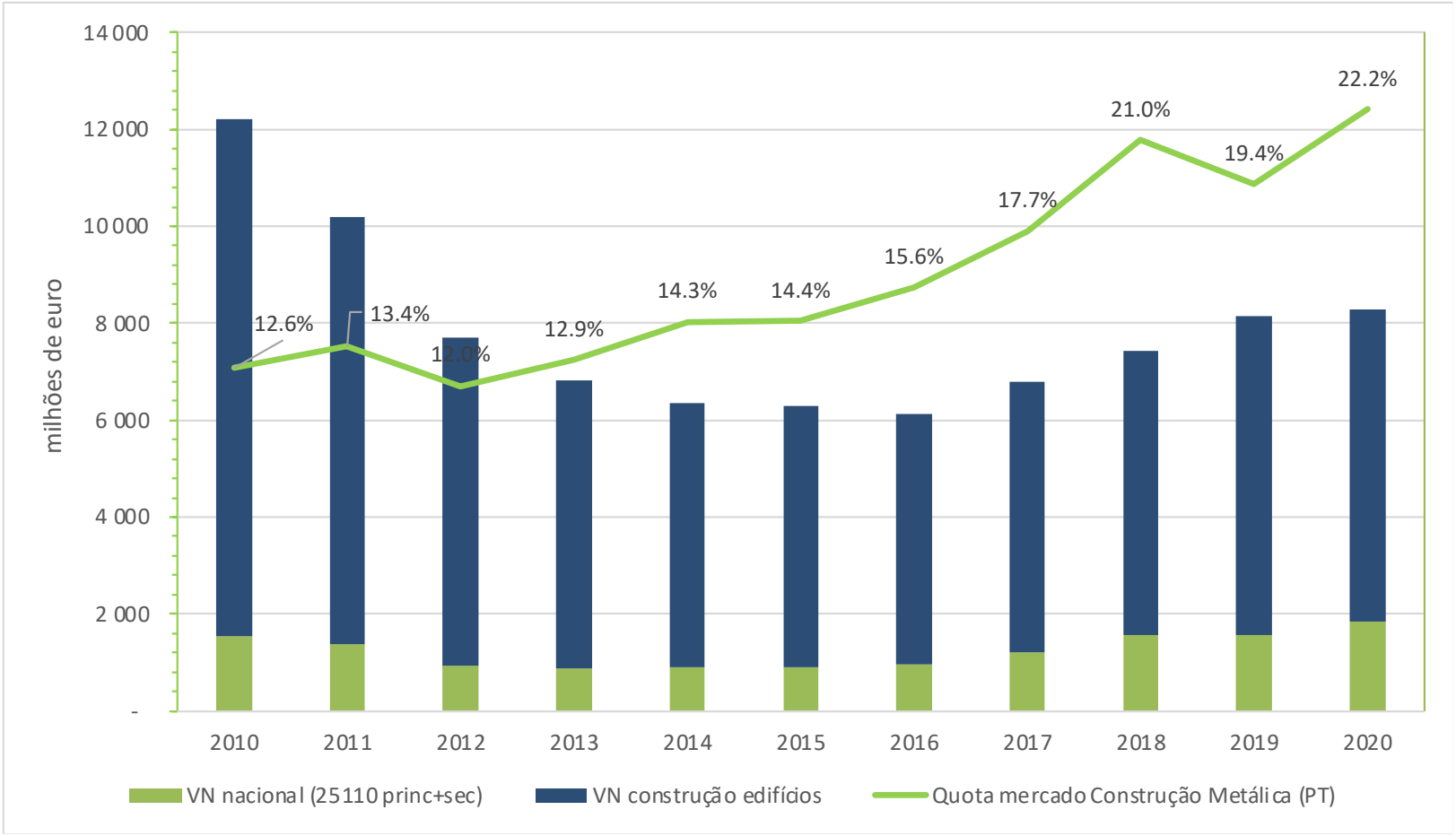
Steel vs. Reinforced concrete/Masonry/Wood [Non-residential buildings]



Source: BCSA

The Portuguese steel construction sector

Evolution of the market share of Steel and Composite Construction in Portugal (primary and secondary CAE 25110) within the Construction Sector (2010-2020)



Source: D&B Informa data for CAE 25110 (Primary+Secondary) - Manufacture of steel construction structures, from 2010 to 2020 and INE

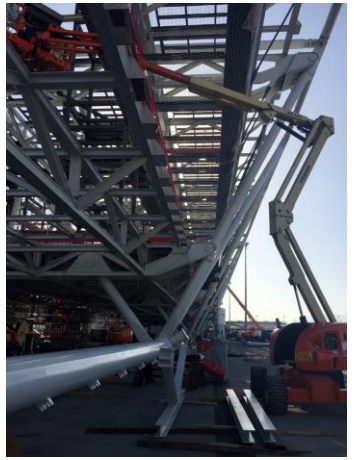
Portuguese steel construction in the world

Steel Construction Contractor : Martifer

Location: Geneva, Switzerland

Responding to the need to expand Geneva airport, this project emerged, which started in 2017 and was completed in 2020.
The project foresaw a new building five hundred and twenty meters long and twenty meters wide, consisting of seven modules. For the execution of this long-term work, the client entrusted its execution to a national company.

Imagens: cortesia Martifer



Portuguese steel construction in the world

Architect: Santiago Calatrava
Contractor: Martifer

Location: Rio de Janeiro, Brazil

With a post-modern, organic and sustainable construction, the Museum of Tomorrow represents an icon of the cultural identity of the city of Rio de Janeiro. Proposing to be a museum of arts and sciences, it also intends to have an active voice in warning about the dangers of climate change and environmental degradation.

Relying on the competence and capacity of the Portuguese steelworking sector, the production and assembly of this building was the responsibility of a leading national company.

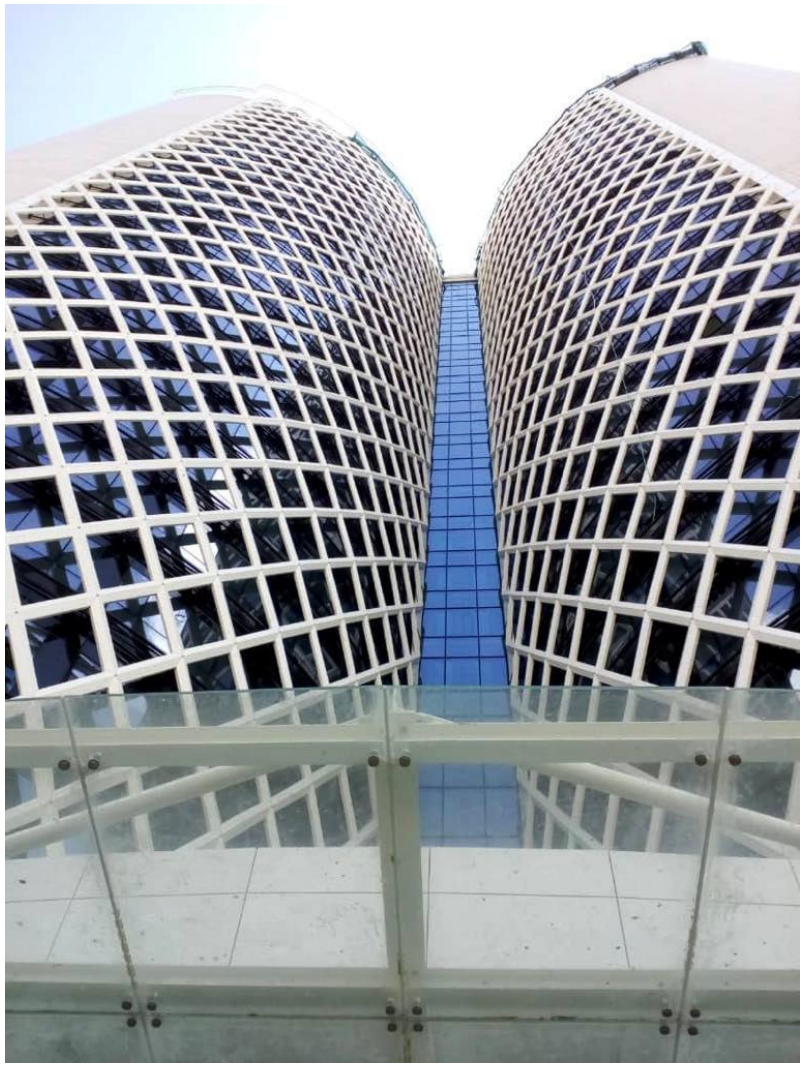
Photos: courtesy Martifer

Portuguese steel construction in the world

Contractor: Teixeira Duarte, SA
Structure: Seveme - Indústrias metalúrgicas SA

Location: Algiers, Algeria

With an overall project value of over eleven million euros, the manufacture and assembly of the approximately twenty-four thousand square meters of glazed facades and an exoskeleton-shaped shading system was the responsibility of a Portuguese company.



Photos: website Seveme, SA

Portuguese steel construction in the world

Location of the Project: Paris, France
Completion: 01/02/2017
Tonnage: 2500 ton
Structural Concept: Tribune
Project Owner: France Galop
Engineering: Jaillet Rouby
Architecture: Dominique Perrault Architecture
Steel Fabricator: Bysteel
General Contractor: Bouygues OPB

Paris Longchamp is recognized worldwide as a highly challenging course. After two years of work, the Longchamp racetrack has become Paris Longchamp.
The new track offers visitors a new racing experience. The race for the Prix de l'Arc de Triomphe is the high point of racetrack life.
Therefore, the main challenge of this project is to be able to host this event, which attracts up to 60,000 spectators, under exceptional conditions, and receives a much smaller number of people on normal race days.

Photos: XI CMM Conference Book

Portuguese steel construction in the world

Composite steel + concrete road deck
Location: Red Sea, Egypt
GRID INTERNATIONAL – *Consulting Engineers, Lisbon PT*

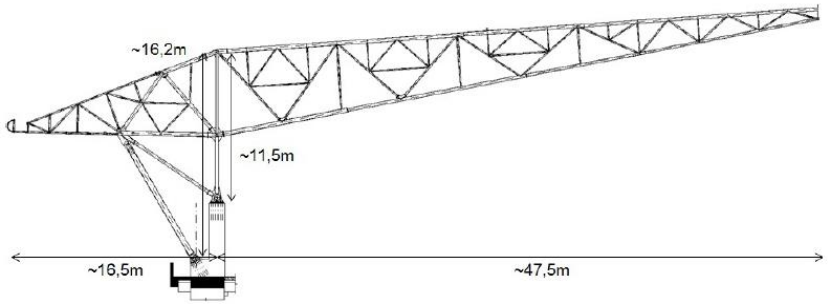
In 2017, an offshore platform for a maritime oil and gas supply terminal in the Red Sea, Egypt, was completed.

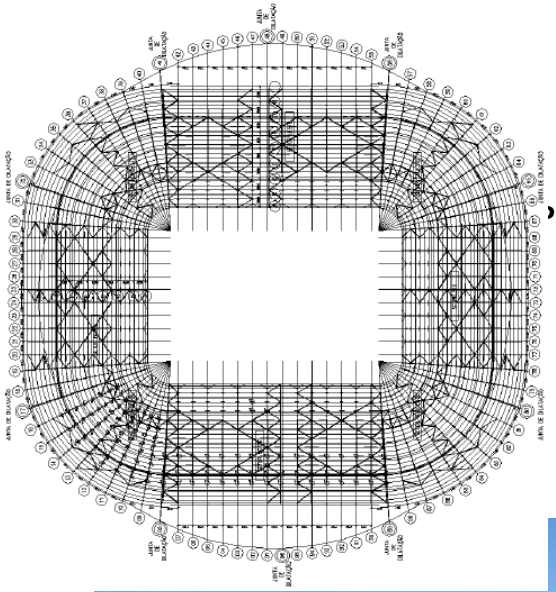
It is a 3 km long F-shaped structure with three docking piers for oil tankers.

The Project included the following structures: 3 km of road deck over the sea; 3 loading platforms; 3 support platforms; 534 steel piles and 16,000 m³ of concrete built in 9 months.

Photos XII CMM Conference Book

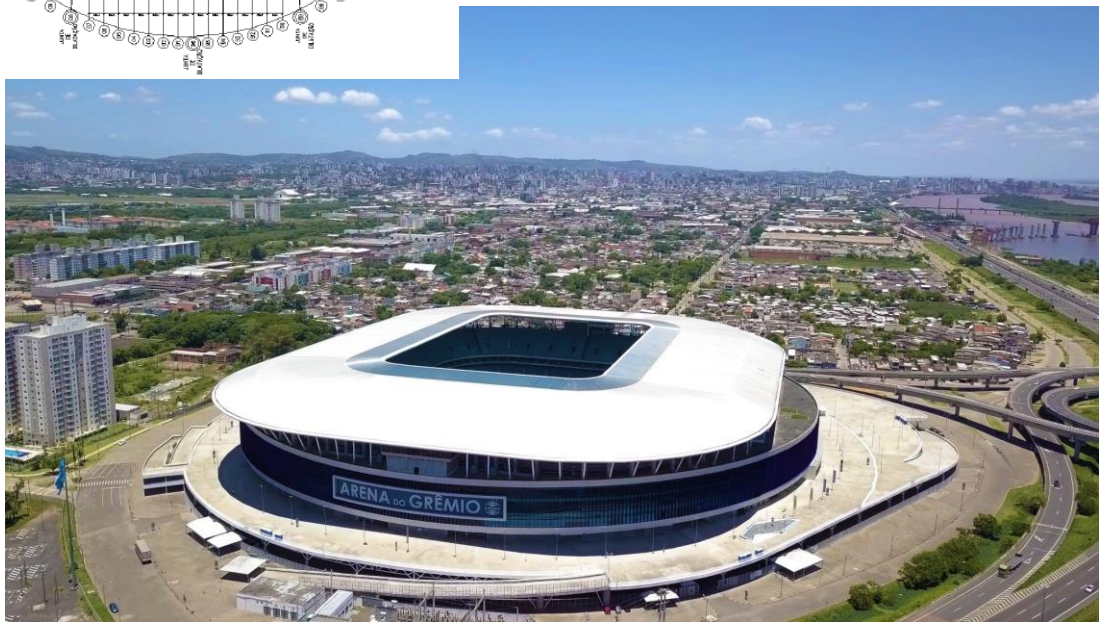
Portuguese steel construction in the world





Location of the Project: Porto Alegre, Brazil
Conpletion: 01/12/2012
Covered Area : 42 400 m²
Covered seats : 60 540
Project Owner: OAS Arena and Grêmio Foot-Ball Porto-Alegrense
Architecture: Plarq
Engineering: Tal Projecto
Steel Structure fabricator: Martifer
General Contractor: Construtora OAS

Boasting the status of the seventh largest stadium in Brazil, Arena Gremio represents an important place in that country's stadium network. This infrastructure is the stage for major events, such as the Copa América.
The project and design of the roof was the responsibility of two Portuguese companies.



Photos: livro IX CMM Conference e Book and WordPress

The Challenge of Sustainability

SUSTAINABLE DEVELOPMENT GOALS

PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21·CMP11

The Challenge of Sustainability

The climate emergency

Goals:
2100: temperature increase < 1.5°C
2050: carbon neutrality
2030: 55% reduction in emissions (vs. 1990)
GHG emissions:
Construction: 38% of the total
Concrete: 8% of the total
Steel: 8% of the total

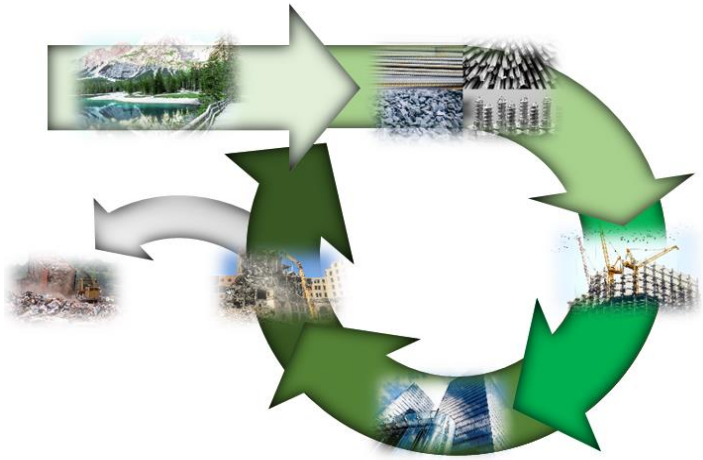
Steel demand **nearly doubles** by 2050.

The Challenge of Sustainability

Challenge 1: Circular Economy

EU Waste Framework Directive
(Directive 2008/98/EC)

Minimization of waste production and reduction/elimination of new resource extraction.



The European Waste Directive requires a **life cycle** approach of products and materials.

The Challenge of Sustainability

5. LCA: Results

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED)

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	MND	MND	MND	MND	MNR	MNR	MNR	MND	MND	MND	MND	X	MND	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 ton structural steel

Parameter	Unit	A1-A3	C3	D
Global warming potential	[kg CO_2-Eq.]	1.13E+3	1.84E+0	-4.13E+2
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	1.96E-9	6.85E-12	1.62E-6
Acidification potential of land and water	[kg SO_2-Eq.]	2.16E+0	5.84E-3	-8.07E-1
Eutrophication potential	[kg $(PO_4)^3$-Eq.]	2.19E-1	6.69E-4	-6.66E-2
Formation potential of tropospheric ozone photochemical oxidants	[kg ethene-Eq.]	4.02E-1	4.01E-4	-1.78E-1
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	4.92E-4	8.92E-7	-8.92E-4
Abiotic depletion potential for fossil resources	[MJ]	1.02E+4	2.04E+1	-3.94E+3

EPDs reflected a production mix that did not differentiate processes

26% BOF and 74% EAF

A1-A3: **1,13 ton CO2eq/ton**

C3: 0,002 ton CO2eq/ton

D: -0,413 ton CO2eq/ton

TOTAL: **0,719** ton CO2eq/ton

1. General Information

bauforumstahl e.V.

Programme holder
IBU - Institut Bauen und Umwelt e.V.
Panoramastr. 1
10178 Berlin
Germany

Declaration number
EPD-BFS-20180116-IBG2-EN

This declaration is based on the product category rules:
Structural steels, 07.2014
(PCR checked and approved by the SVR)

Issue date
25/10/2018

Valid to
24/10/2023

Structural Steel: Sections and Plates

Owner of the declaration
bauforumstahl e.V.
Sohnstraße 65
D-40237 Düsseldorf

Declared product / declared unit
The declared unit is 1 t of structural steel (sections and plates)

Scope:
This environmental product declaration covers steel products rolled out to structural sections, merchant bars and heavy plates, intended for bolted, welded or otherwise connected constructions of buildings, bridges and other structures.

This environmental product declaration is valid for the following products:

Heavy Plates produced by:
- Dillinger with the sites in Dillingen (Germany) and Dunkirk (France)

Hot rolled sections produced by:
- ArcelorMittal on the sites Differdange (Luxembourg), Dabrowa (Poland), Esch-Belval (Luxembourg), Bergara (Spain), Hunedoara (Romania), Olaberria (Spain), Warszawa (Poland) and Rodange (Luxembourg)
- Peiner Träger (Germany)
- Stahlwerk Thüringen (Germany)

The production shares in this EPD are 26% Basic Oxygen Furnace route (primary steel production) and 74% Electric Arc Furnace route (secondary steel production) based on the total yearly production volume. The data used represent >95% of the annual production of sections and plates from all BauforumStahl member companies.

ENVIRONMENTAL PRODUCT DECLARATION

as per /ISO 14025/ and /EN 15804/

Owner of the Declaration	bauforumstahl e.V.
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-BFS-20180116-IBG2-EN
ECO EPD Ref. No.	ECO-00000770
Issue date	25/10/2018
Valid to	24/10/2023

Structural Steel: Sections and Plates
bauforumstahl e.V.

The Challenge of Sustainability

LCA: Results

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED; MNR = MODULE NOT RELEVANT)

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A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	MND	MND	MND	MND	MNR	MNR	MNR	MND	MND	MND	MND	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A1: 1 metric to of XCarb™ structural steel sections

Parameter	Unit	A1-A3	C3	C4	D
Global warming potential	[kg CO_2-Eq.]	3.33E+2	1.60E+0	1.43E-1	2.14E+2
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	4.84E-11	4.69E-14	7.83E-16	-4.74E-12
Acidification potential of land and water	[kg SO_2-Eq.]	7.46E-1	2.99E-3	8.57E-4	3.22E-1
Eutrophication potential	[kg $(PO_4)^{3-}$-Eq.]	7.51E-2	4.48E-4	9.72E-5	1.25E-2
Formation potential of tropospheric ozone photochemical oxidants	[kg ethene-Eq.]	8.27E-2	2.60E-4	6.58E-5	1.16E-1
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	4.04E-4	4.70E-7	1.44E-8	5.13E-4
Abiotic depletion potential for fossil resources	[MJ]	3.81E+3	1.82E+1	1.95E+0	1.94E+3

Markets now demand EPDs that differentiate processes: XCarb

100% EAF

A1-A3: **0,333 ton CO2eq/ton**

C3: 0,002 ton CO2eq/ton

D: 0,214 ton CO2eq/ton

TOTAL: **0,549** ton CO2eq/ton

General Information

ArcelorMittal Europe

XCarb™ Recycled and renewably produced structural steel sections and merchant bars

Programme holder
IBU – Institut Bauen und Umwelt e.V.
Panoramastr. 1
10178 Berlin
Germany

Owner of the declaration
ArcelorMittal Europe – Long Products
66, rue de Luxembourg
L-4221 Esch-sur-Alzette
Luxembourg

Declaration number
EPD-ARC-20210132-CBB1-EN

Declared product / declared unit
1 metric tonne of XCarb™ Recycled and renewably produced structural steel sections and merchant bars.

This declaration is based on the product category rules:
Structural steels, 11.2017
(PCR checked and approved by the SVR)

Scope:
The declared unit is 1 metric tonne of XCarb™ Recycled and renewably produced structural steel sections and merchant bars produced by ArcelorMittal.
The Life Cycle Assessment is based on data collected from the EAF plants involved in the production: Differdange & Esch-Belval (sites of Belval, Differdange and Rodange) in Luxembourg; Bergara & Olaberria in Spain. The data used represent >95% of annual production with 2019 data for deliveries based on Guarantee of Origins renewable electricity supply.

Issue date
19/07/2021

Valid to
18/07/2026

ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A1*

Owner of the Declaration	ArcelorMittal Europe
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-ARC-20210132-CBB1-EN
Issue date	19/07/2021
Valid to	18/07/2026

XCarb™ Recycled and renewably produced
Structural steel sections and merchant bars
ArcelorMittal Europe

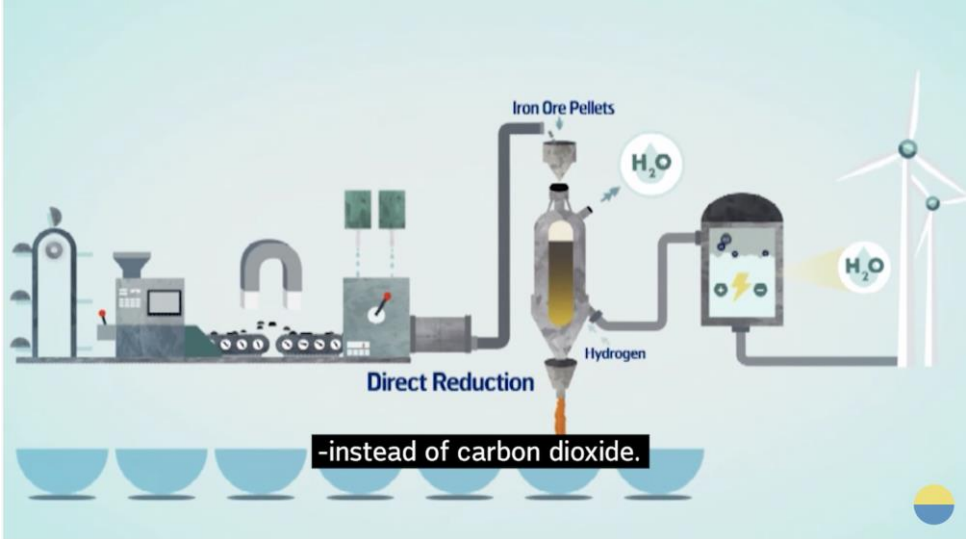
The Challenge of Sustainability

Challenge 2: Decarbonization of steel production

Reduction in the carbon intensity of steel (EU)
2050: carbon neutrality
2030: 30% reduction in emissions (vs. 2018)

Current carbon emissions :
Average (2018): 1,85 ton CO2eq/ton steel
High: 2-2,5 ton CO2eq/ton steel
Low: 0,3 ton CO2eq/ton steel (DRI)

Two Paths:
CO2 reduction (efficiency improvement)
Complete decarbonization (technological transition)



DRI – Direct Reduction Iron is a process that is revolutionizing the steel industry, using green electricity and hydrogen. It replaces the blast furnace (BOF) process, which uses coking coal to remove oxygen from iron ore, with a direct reduction process that uses hydrogen.

The Challenge of Sustainability

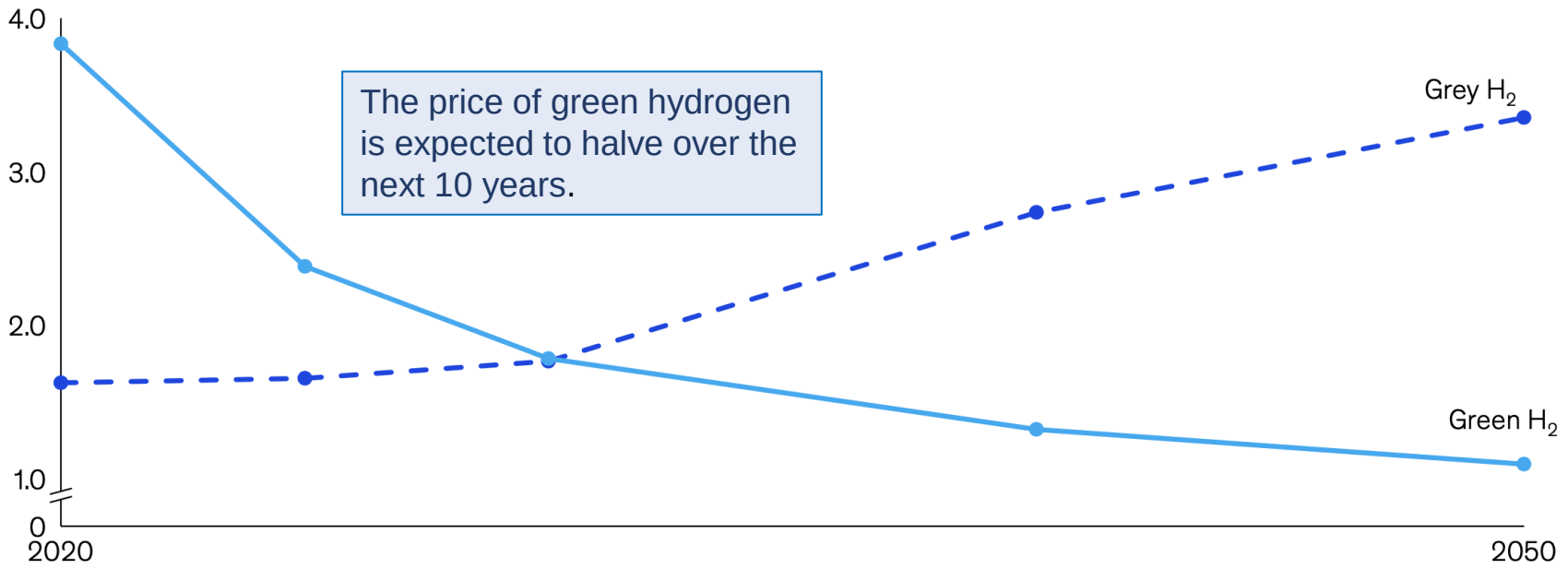
Technology landscape for decarbonization in steel production

SOURCE: McKinsey analysis

	CO_2 reduction			Full decarbonization possible		
						
	Blast furnace efficiency (BOF)	**Biomass reductants**	**Carbon capture and usage**	**Electric arc furnace (EAF)**	**DRI plus EAF using natural gas**	**DRI plus EAF using H_2**
Strategy	Make efficiency improvements to optimize BF/BOF operations	Use biomass as an alternative reductant or fuel	Capture fossil fuels and emissions and create new products	Maximize secondary flows and recycling by melting more scrap in EAF	Increase usage of DRI in the EAF	Replace fossil fuels in DRI process with renewable energy or H_2
Examples	Optimized BOF inputs (DRI, scrap), increased fuel injection in BF (e.g., hydrogen, PCI)	Tecnored process	Bioethanol production from CO_2 emissions	EAF – usage to melt scrap	Current DRI plus EAF plants using natural gas (NG)	MIDREX DRI process running on H_2 HYL DRI process running on H_2
Current outlook	Technology readily available at competitive cost	Process possible in South America and Russia, due to biomass availability	Not available on an industrial scale	Technology readily available at competitive cost	Technology readily available	Technology available at high cost

The Challenge of Sustainability

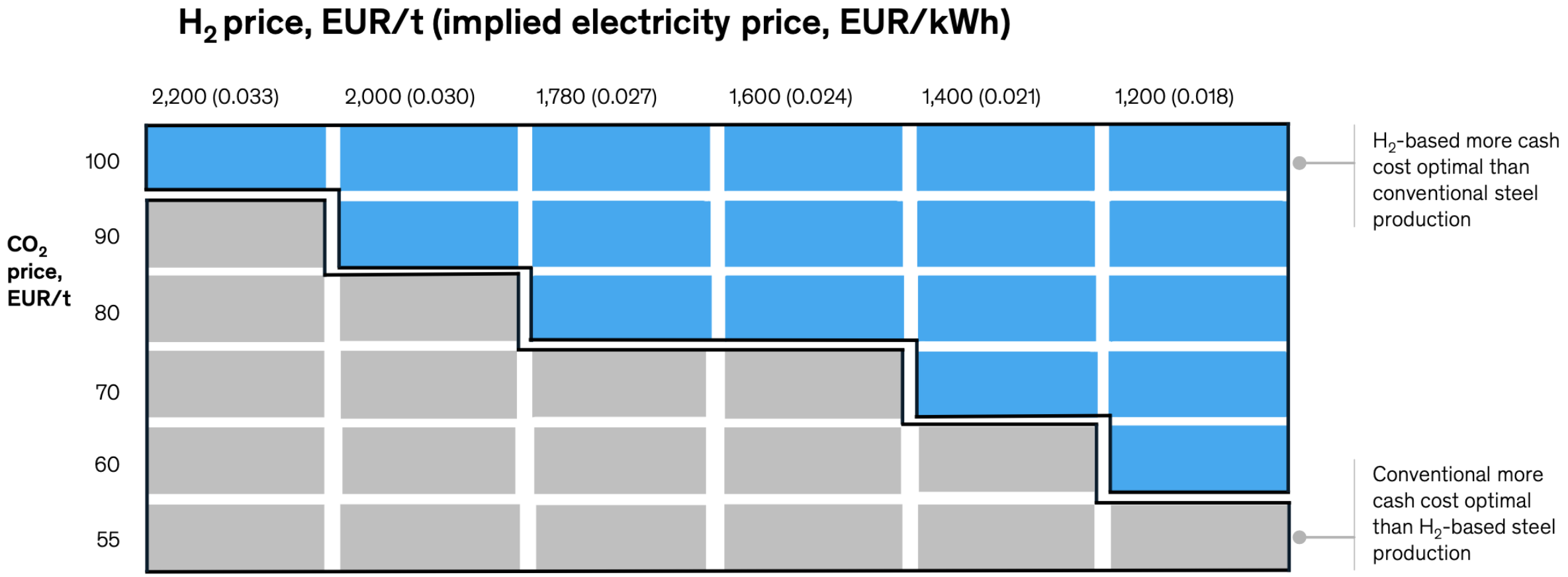
H_2 price development, Germany, EUR/kg H_2



SOURCE: Hydrogen Council

The Challenge of Sustainability

Cost competitiveness of pure hydrogen steel production.
Sensitivity analysis: reduction in the cost of H2 and increase in the price of CO2.



SOURCE: McKinsey hydrogen-based steel model

Doubts and additional clarifications

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