Accelerating the Transformation of the Steel Industry in Southeast Asia

Indonesia Chapter

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Global Steel scenario decarbonization plans

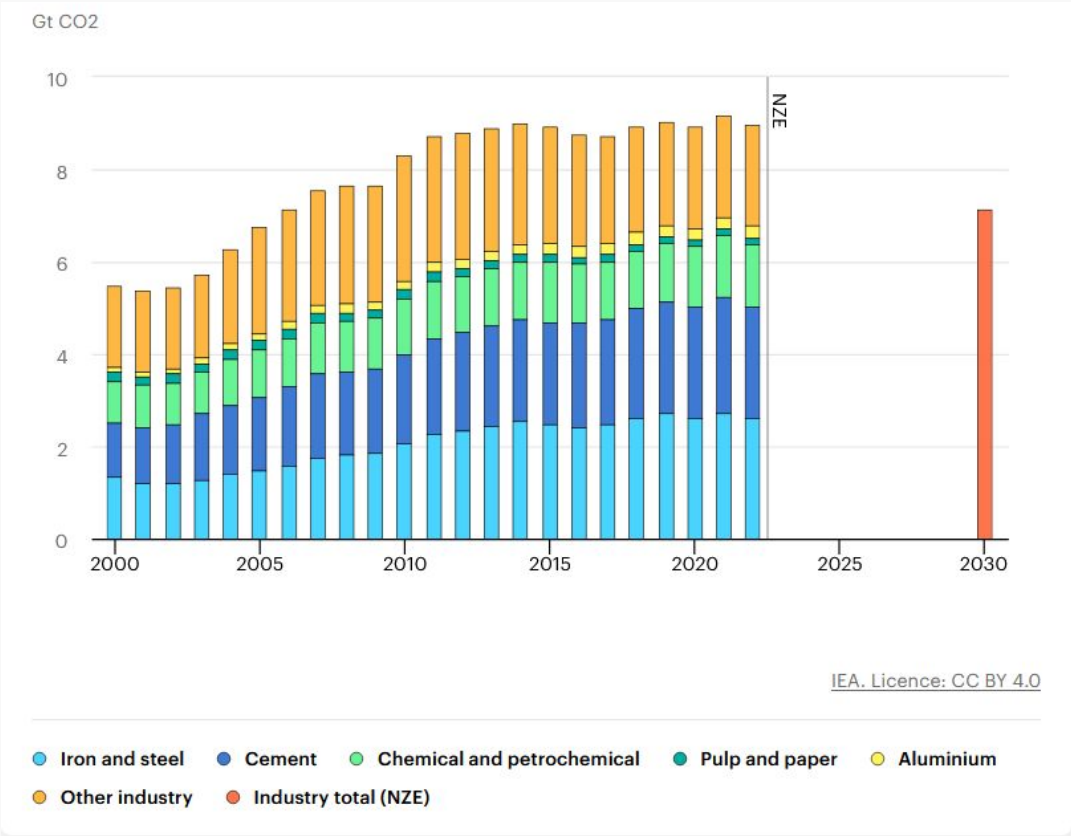
Learning for ASEAN Countries

Kajol

Global GHG Emission in Industry

Industry accounts for 44 % of global CO_2 emissions

Global CO_2 emissions from industry and Net Zero Emissions by 2050 Scenario



- If the electricity and heat requirements of industry are taken into account, industry is responsible for around 44 % of global CO_2 emissions (32.6 GtCO2)
- The 5 basic industries of steel, cement, chemicals, aluminum and paper alone account for 20 % of global CO_2 emissions
- Industrial CO_2 emissions have grown the most in absolute terms since 1990
- Global demands for basic materials continues to increase
- Without a comprehensive transformation of industrial production, the climate protection targets of the Paris Agreement cannot be achieved

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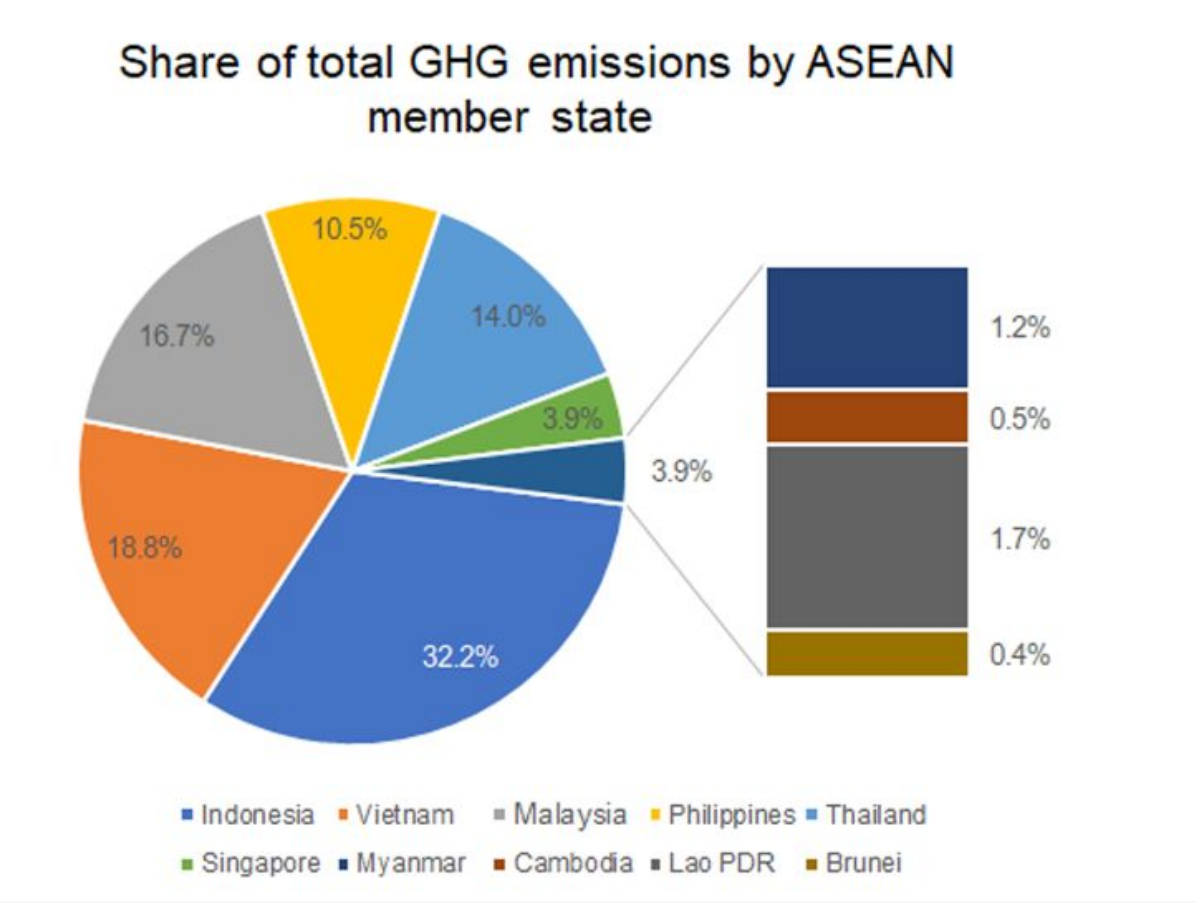
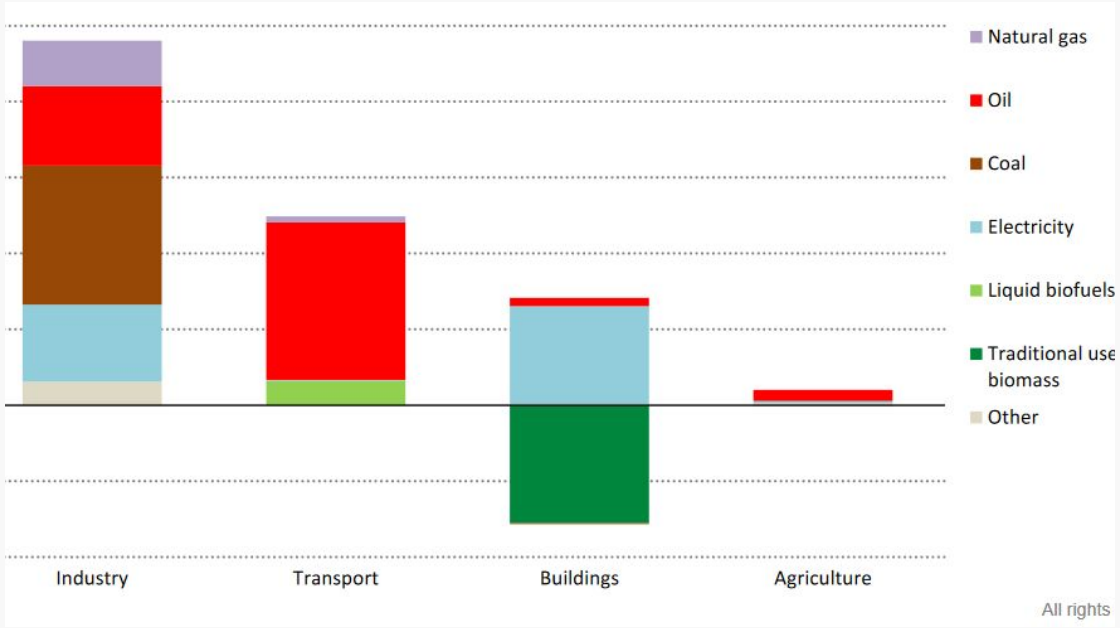
Energy and Sector Emission Scenario ASEAN



Change in final energy consumption by fuel in selected end-use sectors in Southeast Asia between 2000 and 2020



Applied Energy, 2022
IEA, Southeast Asia Energy Outlook 2022

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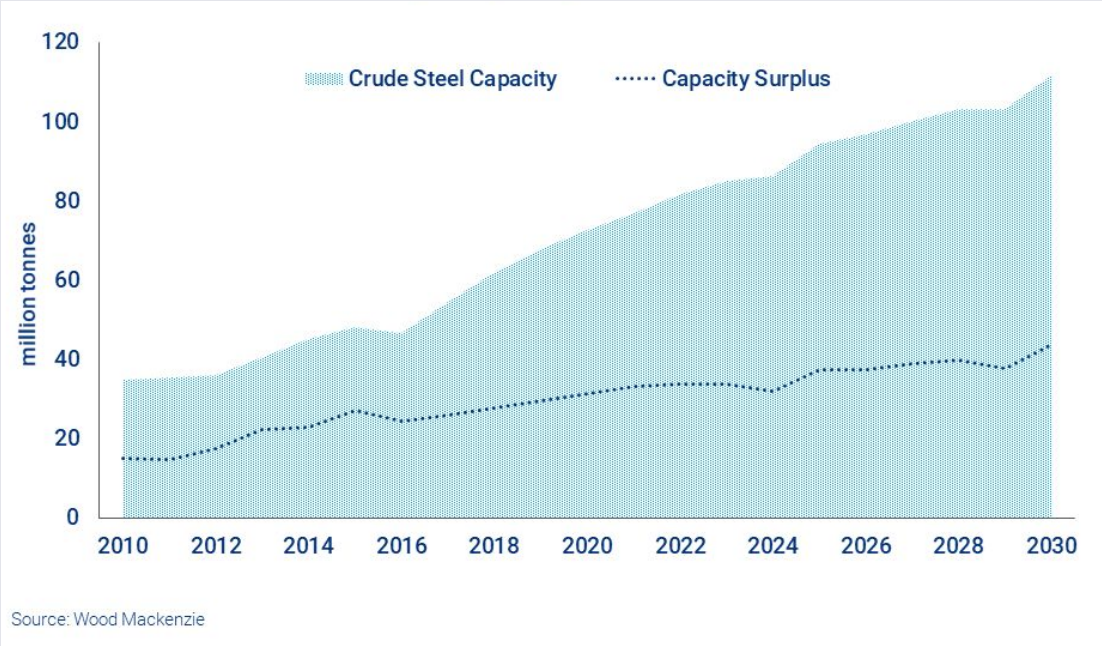
Steel Surge in Southeast Asia

Steel Production and capacity projections



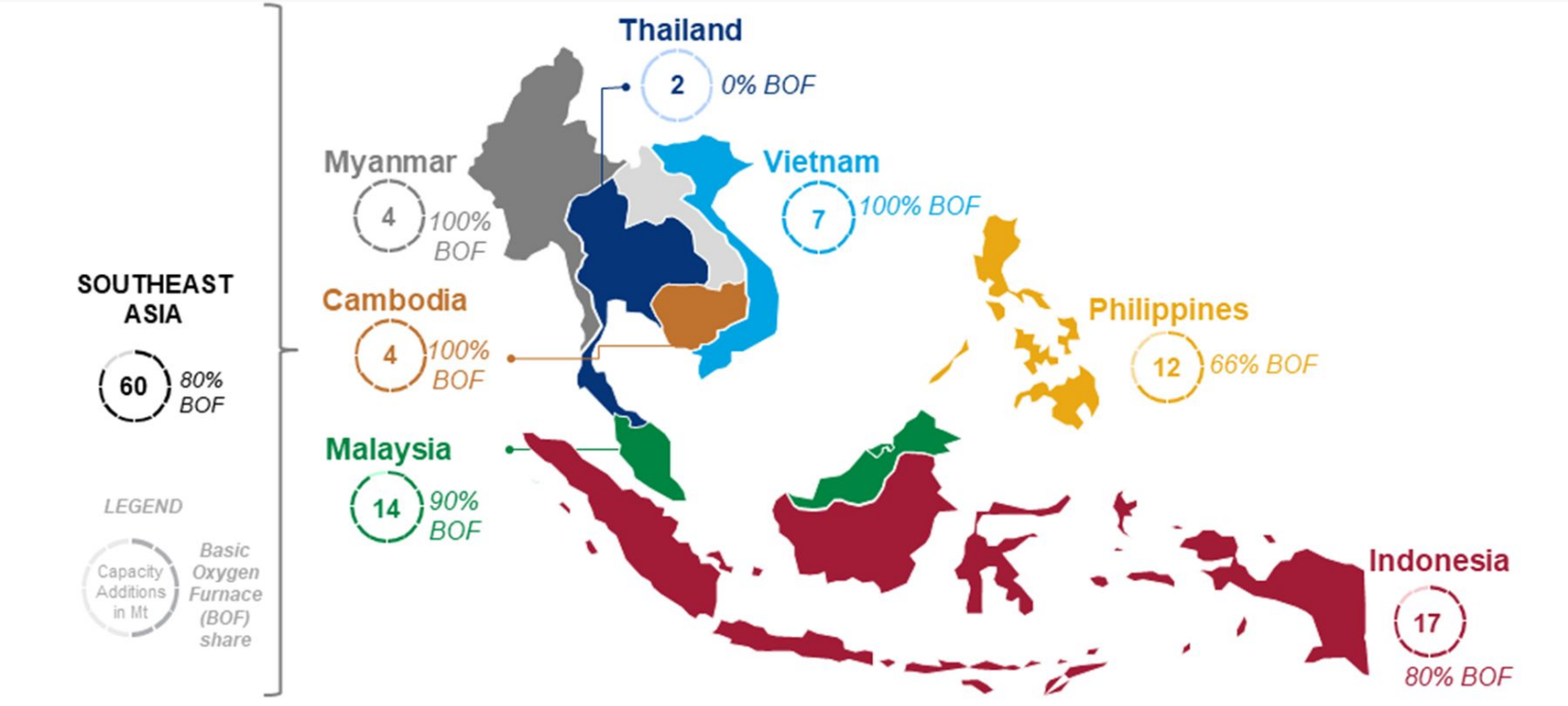
OECD, World steel association

Steel Demand and GDP (Forecast for 2023)

Country	Steel demand, million t	Y-o-Y, %	GDP, Y-o-Y,%
Vietnam	22.4	+0.8	+6-6.5
Indonesia	17.4	+5	+5.3
Thailand	16.7	+3.7	+2.7-3.7
Philippines	10.8	+6	+6-7
Malaysia	7.8	+4.1	+4.5
Singapore	2.5	0	+0.5-2.5
Total	77.6	+3.4	-

World steel association, SEAISI

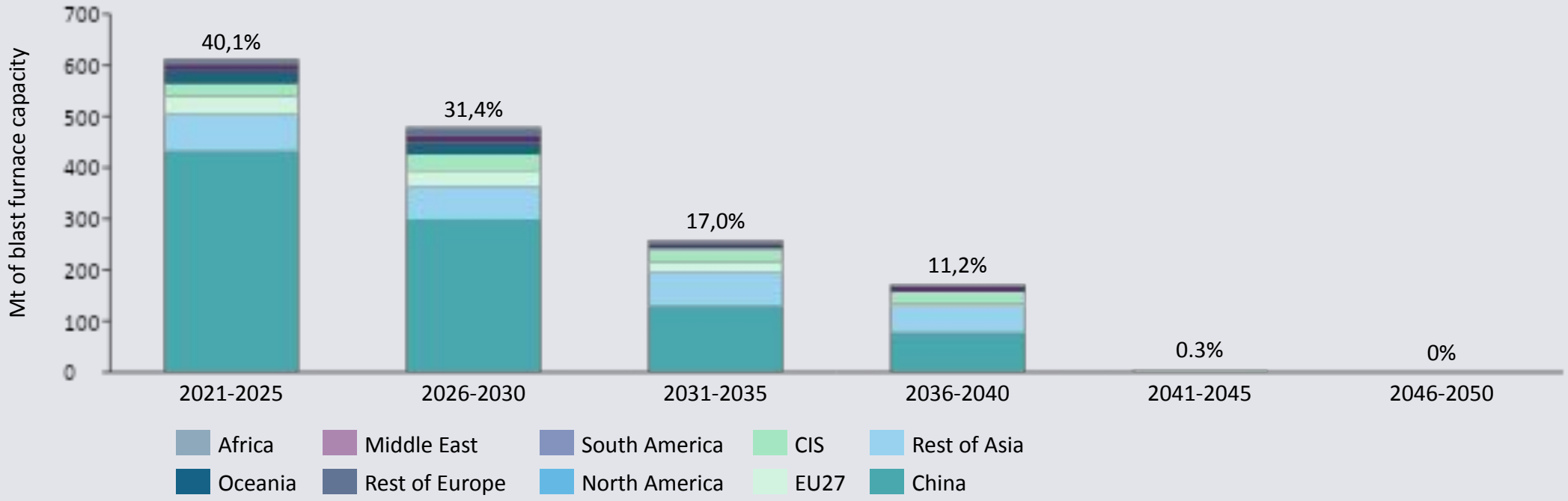
Dependance on Blast Furnace



- According to SEAISI the basic oxygen furnace (BOF) technology in Southeast Asia was 32% from 2011-2020, and it is forecasted a 25% rate over 2020-2026
- Steel made by BF/BOF is still competitively priced in some regions and the concerns about future scrap supply and rising costs can discourage the switch to EAF in these regions.

Is a phase-out of unabated coal in steel by 2040 within reach?

Share of global blast furnace fleet that reaches the end of their service life* requiring reinvestment



Agora Industry based on World Steel Dynamics, 2021;

Agora Industry, Wuppertal Institute & Lund University for China, 2021

*After a service life of 15-20 years a blast furnace requires reinvestments for refurbishment or substitution

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Key technologies for Steel Decarbonisation

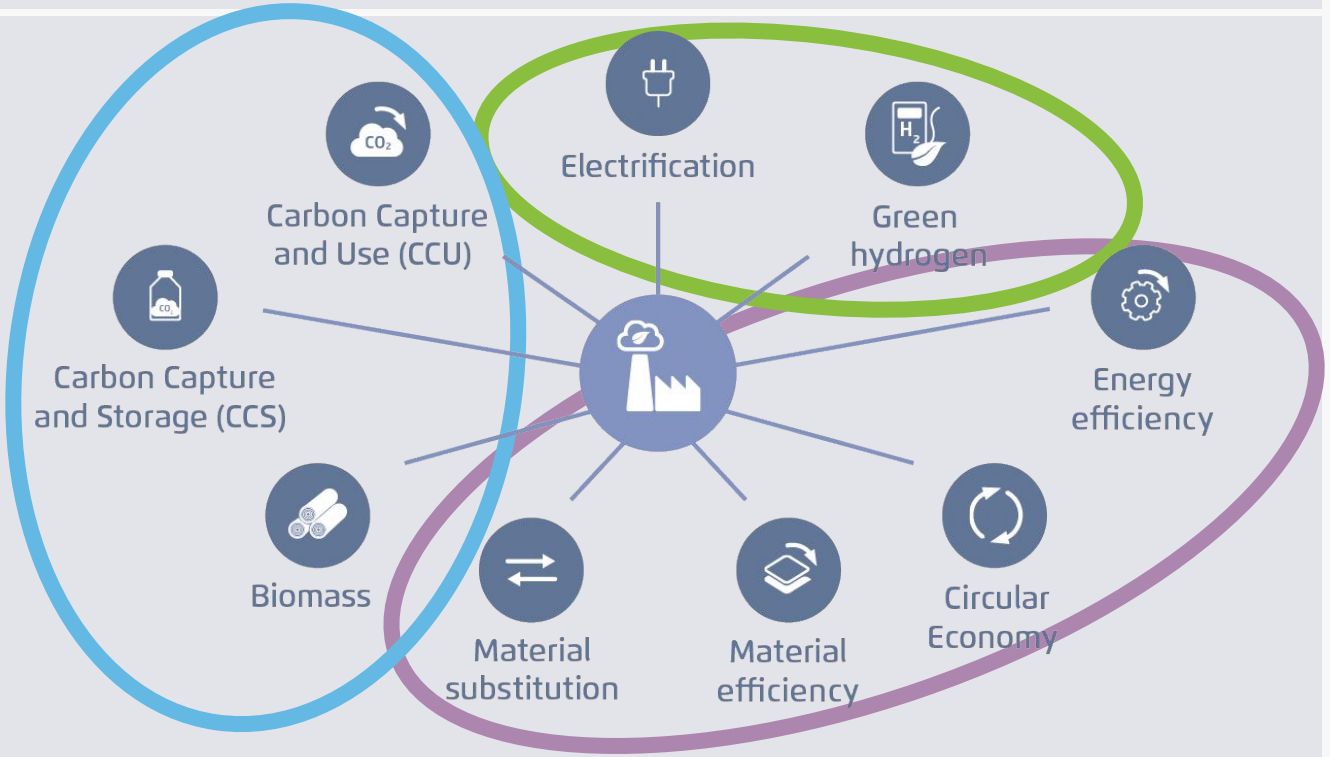
Overview of possible key technologies for a (largely) carbon neutral steel

Steel	Key technology	Earliest possible market readiness
	Direct reduction with hydrogen and smelting in the electric arc furnace	2025 – 2030 (phase-in with natural gas)
	Alcaline iron electrolysis	likely after 2050
	HIsarna® process in combination with CO_2 capture and storage	2035 – 2040
	CO_2 capture and utilization of waste gases from integrated blast furnaces	2025 – 2030

- DRI plants can produce primary steel using natural gas or clean hydrogen. The iron ore is reduced to produce DRI, which can then be smelted in an EAF to produce primary steel
- Replaces coal-based steelmaking capacity with secondary steelmaking capacity.
- Increasing steel scrap supply over time will allow to feed a growing number of electric arc furnaces that melt steel scrap to steel

A combination of different strategies enables a climate-neutral industry

Strategies for enabling a climate-neutral industry



Agora Energiewende (2019)

1. Strategy: Direct and indirect use of renewable electricity

→ Direct use of green electricity

→ Indirect use of green electricity through green hydrogen

2. Strategy: Resource efficiency and the circular economy

→ Energy efficiency

→ Material efficiency

→ Material substitution

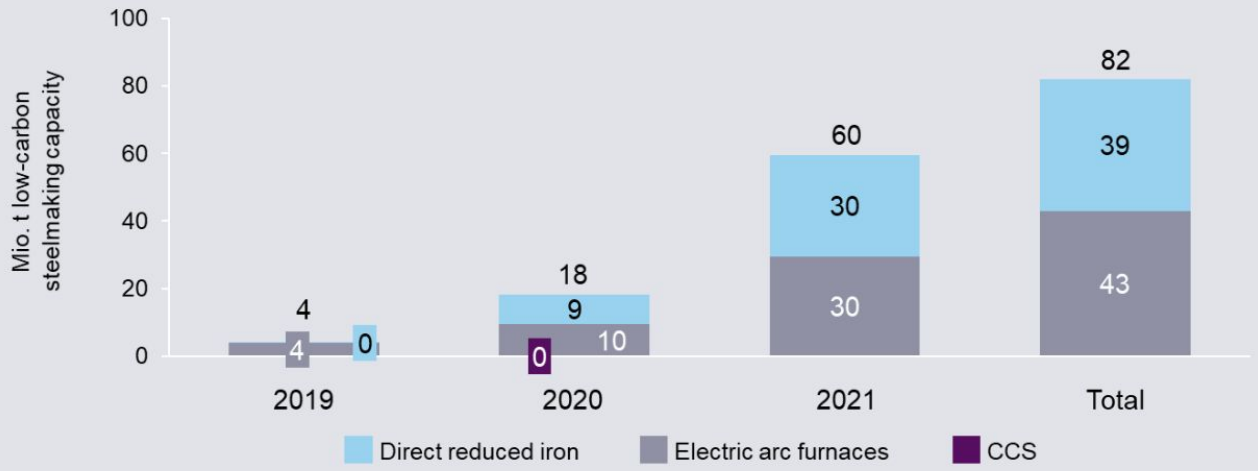
3. Strategy: Closing the carbon cycle

→ Carbon Capture Use and Storage (CCU/S)

→ Biomass as feedstock and BECCS

Low Carbon Steel Projects in pipeline

Global low-carbon steel announcements to be built before 2030



Agora Energiewende, 2021

→ The announced low-carbon steel projects based on DRI cover Oceania, Asia, Europe, North America

→ Until sufficient supplies of clean H2 are available, DRI plants can be operated with natural gas. Over time, they can blend in increasing shares of clean H2 without requiring retrofits.

→ At the same time, scaling up high-quality scrap steel supply chains in the circular economy will allow substituting coal-based steelmaking capacity with EAF.

→ No steel company worldwide is working on the commercialization of CCS on coal-based blast furnaces. (Re-) investing into blast furnaces in the 2020s may be a dead-end road

The industry transformation needs smart policies along the whole value chain

Clean energy and raw materials infrastructure (upstream)

Planning and financing of renewable energy and CCU / CCS infrastructure

Sustainability criteria for alternative raw materials and biomass

Climate-friendly production processes (midstream)

Carbon Contracts for Difference

Innovation funding

Carbon pricing and effective anti-carbon leakage system

Climate-friendly end products (downstream)

Definition of the green premium

Embedded carbon limits

Green public procurement of green steel

Requirements and quality standards for steel and scrap recycling

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Thank you for your attention!

Do you have any questions or comments?

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