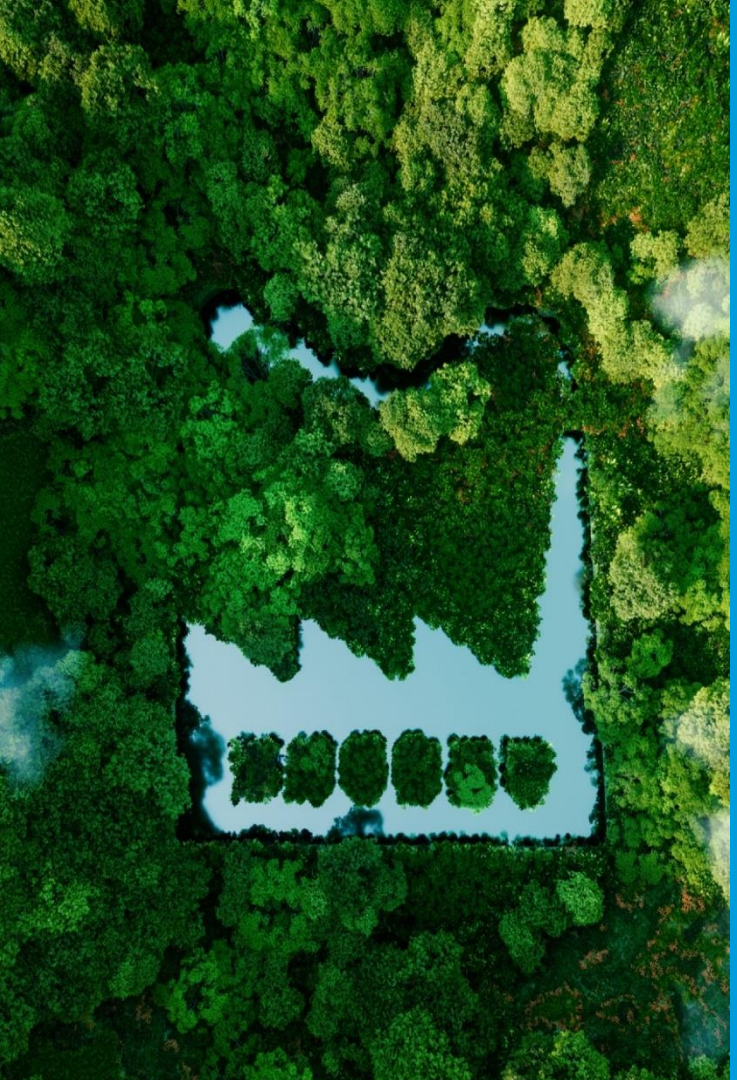

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Progress by innovation

Technology Options and Trends in Decarbonizing Industries, drawing on national and regional experience

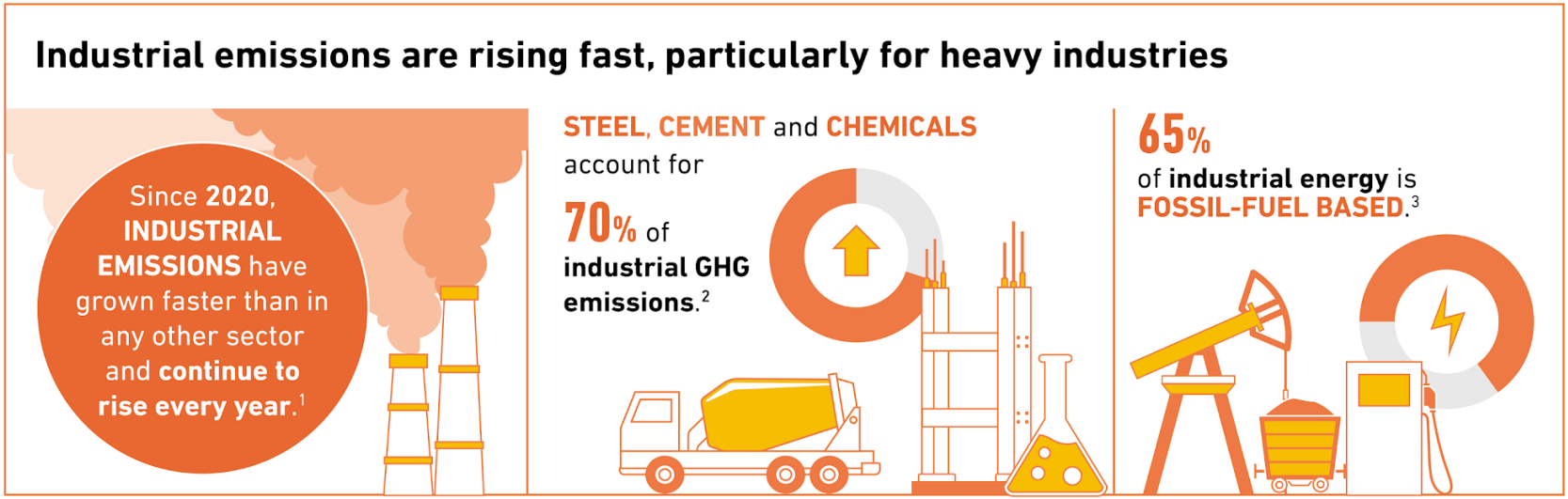
Enabling mitigation ambition and implementation in industries, drawing on national and regional experience

Nurzat Myrsalieva

Yeosu, 21 April 2026

Industrial sector is a major contributor to energy demand and emissions today

37% of global final energy consumption
22% of global energy-related CO_2 emissions
nearly 31% (15.9 Gt CO_2e) when factoring in indirect emissions from electricity use
Industrial emissions **have nearly doubled since 1990**
Fossil fuel combustion – 56.5% emissions, while **Process emissions** - 43.5%

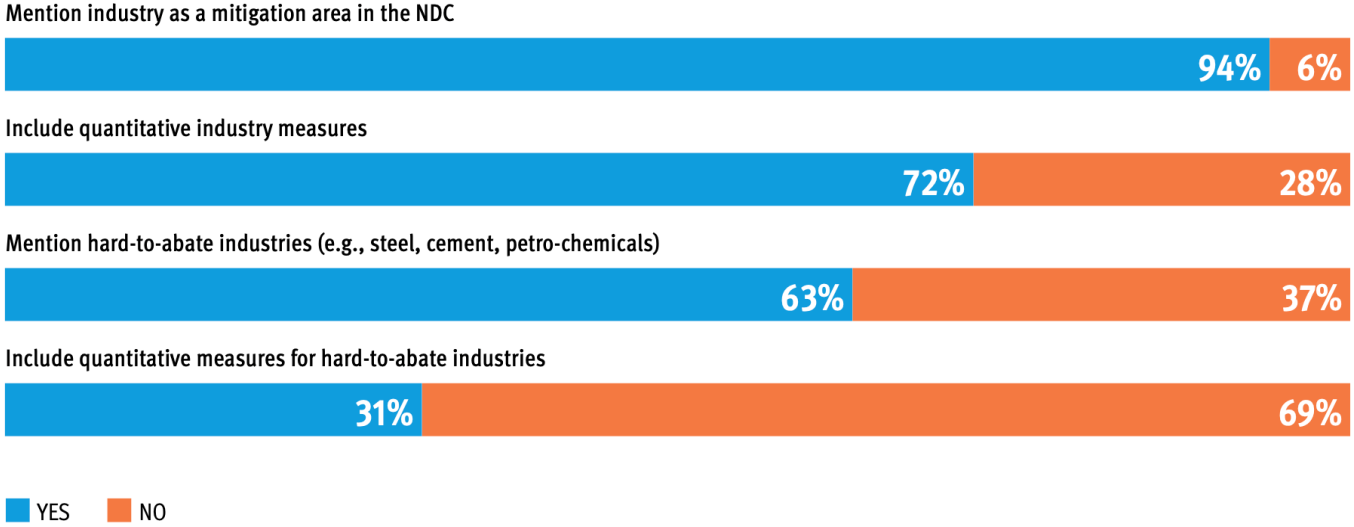


Source: UNIDO (2025) NDC 3.0 Guidebook for Industrial Decarbonization

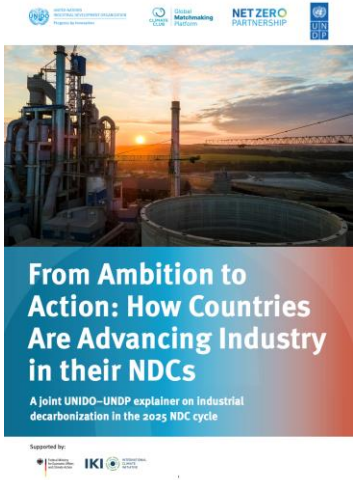
Countries are beginning to give significant attention to industrial decarbonization within climate strategies

FIGURE 1: NDC INDUSTRY ANALYSIS

Data as of October 30th, 2025



Source: UNDP analysis as of October 30th 2025



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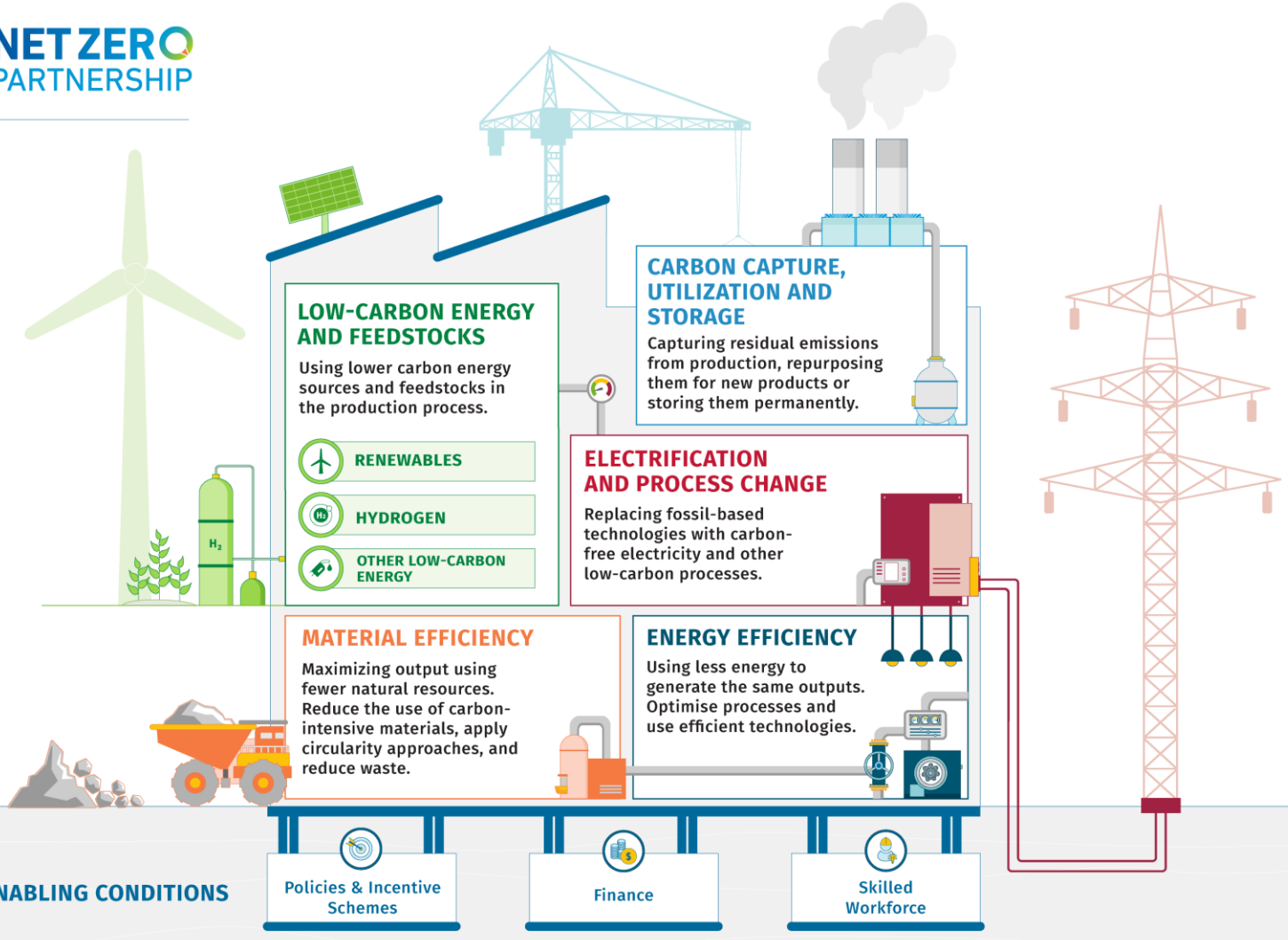
NET ZERO PARTNERSHIP

INDUSTRIAL DECARBONIZATION: 5 BUILDING BLOCKS

These five building blocks represent essential levers for industry to achieve net-zero. They should be pursued in ways that reflect each country's industrial landscape, workforce capacity and policy context, while also leveraging opportunities for optimisation through digitalisation and AI.



Supported by:
Federal Ministry for Economic Affairs and Climate Action
IKI INTERNATIONAL CLIMATE INITIATIVE
on the basis of a decision by the German Bundestag

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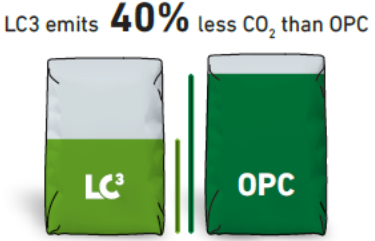
SUSTAINABLE DEVELOPMENT GOALS

SCALABLE TECHNOLOGY SOLUTIONS FOR INDUSTRIAL DECARBONIZATION

Material efficiency:

LC3 – low carbon cement: reducing 95% clinker in OPC → 35% clinker in LC3 resulting in 40 – 50% CO_2 emission reduction, with reduced OPEX. Applicable globally, with greatest relevance for Africa. Potential to scale up cement production while reducing emissions.

Up to **90%** of Ordinary Portland Cement (OPC) emissions come from clinker

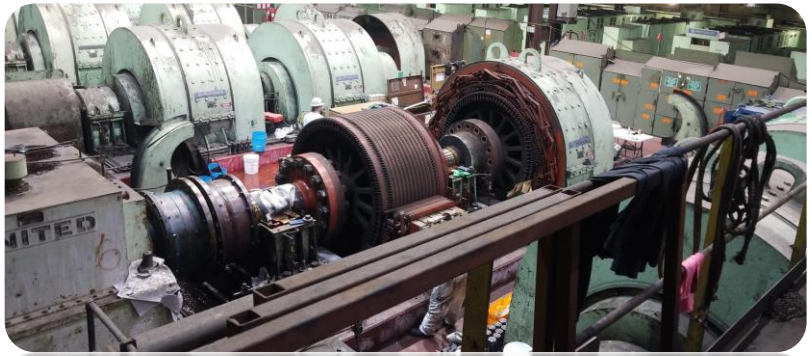


Industrial Energy Efficiency:

Motor-driven systems efficiency: Electric motor systems account for about 60% of global industrial electricity consumption

Motor-system optimization can reduce an individual plant's energy consumption by up to 30%.

Efficient motor systems are applicable, with greatest potential in EMDEs. Easily scalable and low-cost solution, reducing OPEX.



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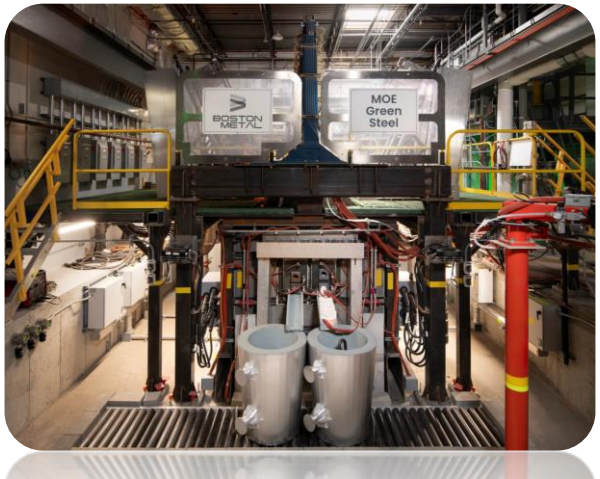
SUSTAINABLE DEVELOPMENT GOALS

SCALABLE TECHNOLOGY SOLUTIONS FOR INDUSTRIAL DECARBONIZATION

Renewables coupled and hydrogen (green H_2) used as heat source and feedstock in industry (steel, chemicals, cement) can significantly reduce GHG emissions (e.g. H-DRI process). The solution is capital intensive and is suitable for regions with abundant water and renewable energy resources. Feasibility highly dependent on H_2 production cost.



Electrification - mature technologies available for low to medium heat (electric boilers, industrial heat pumps). Applicable globally in wide range of industries. For high-temperature processes technologies are in development/demonstration stage.

SCALABLE TECHNOLOGY SOLUTIONS FOR INDUSTRIAL DECARBONIZATION

Carbon Capture Utilization and Storage for residual emissions. Requires significant investment on site and external infrastructure and significantly impacts OPEX. Innovations like the new Metal-Organic Frameworks (MOFs) offering improved selectivity and energy efficiency can improve CCUS feasibility. Applicable in regions with high concentration of cement industry.

Thank you!

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