Accelerating the transition to climate-neutral industry: An EU perspective

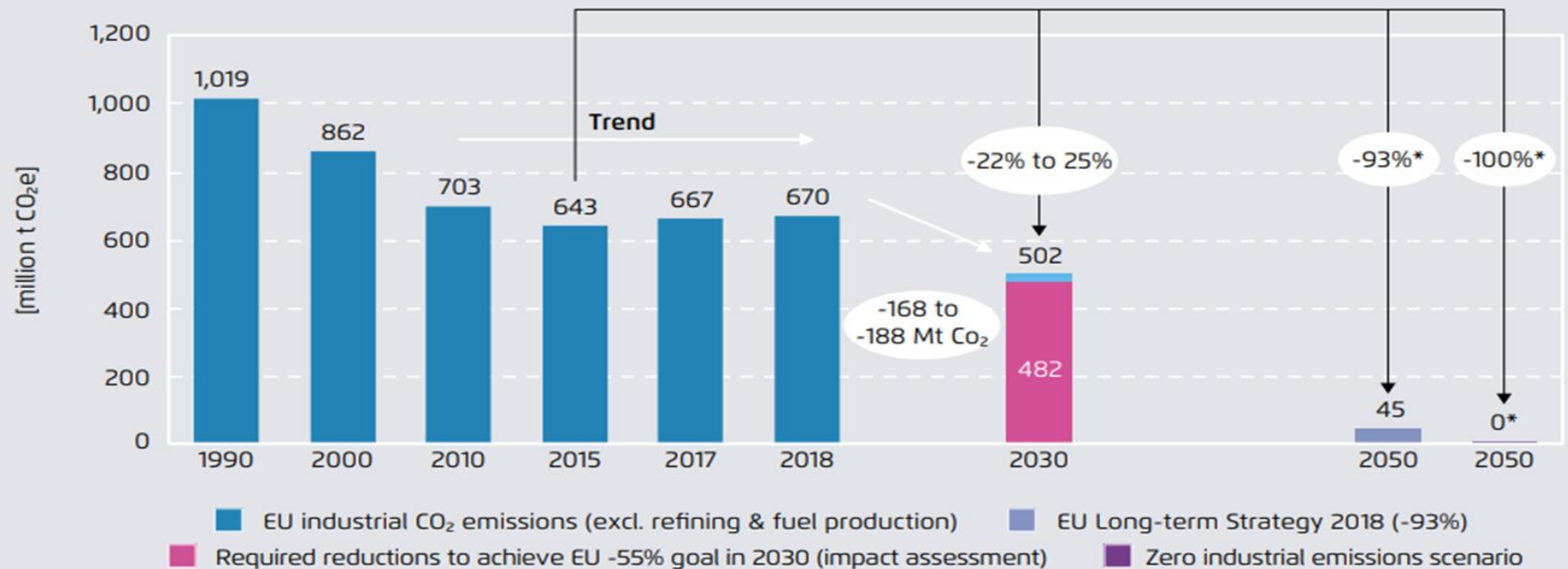## Presentation to the Korean Embassy in Berlin

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MARCH 2022

Agora
Industry

Industry plays a key role in achieving emissions reduction targets in 2030 and 2050 – climate neutrality means all sectors must contribute

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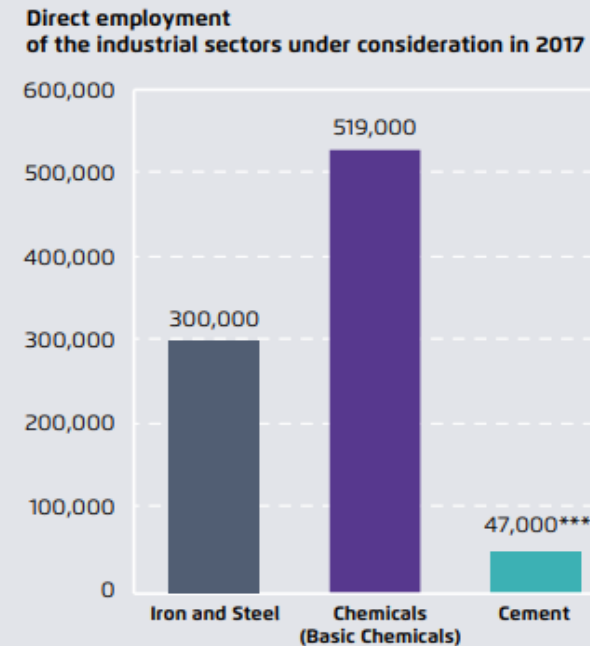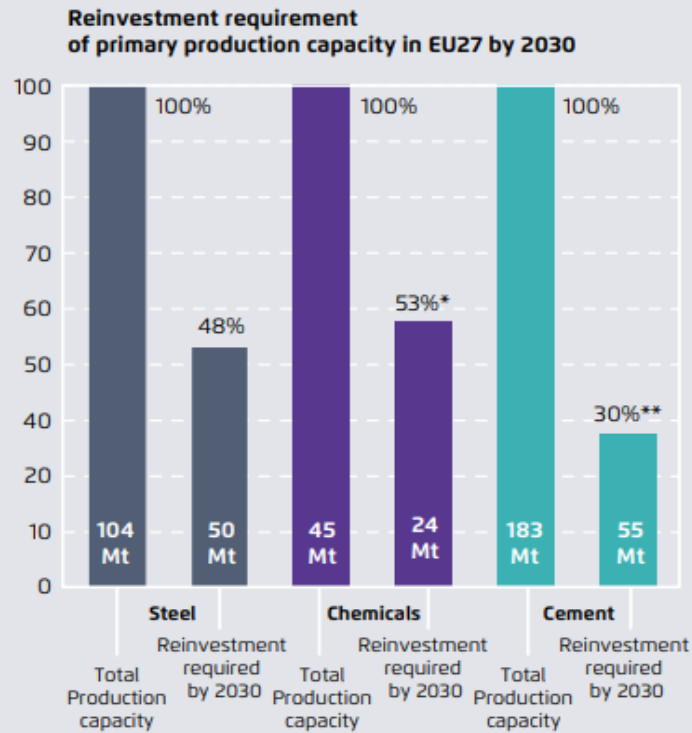Industry

Emissions in the EU: Industrial emissions must decline rapidly now

Legend:
- EU industrial CO_2 emissions (excl. refining & fuel production)
- EU Long-term Strategy 2018 (-93%)
- Required reductions to achieve EU -55% goal in 2030 (impact assessment)
- Zero industrial emissions scenario

Chart data (million t CO_2e):
- 1990: 1,019
- 2000: 862
- 2010: 703
- 2015: 643
- 2017: 667
- 2018: 670
- 2030: 502 (482 + required reductions), -22% to 25%, -168 to -188 Mt CO_2
- 2050: 45, -93%*
- 2050: 0*, -100%*

Trend

Agora Energiewende 2020, based on data from Eurostat, EEA and European Commission.
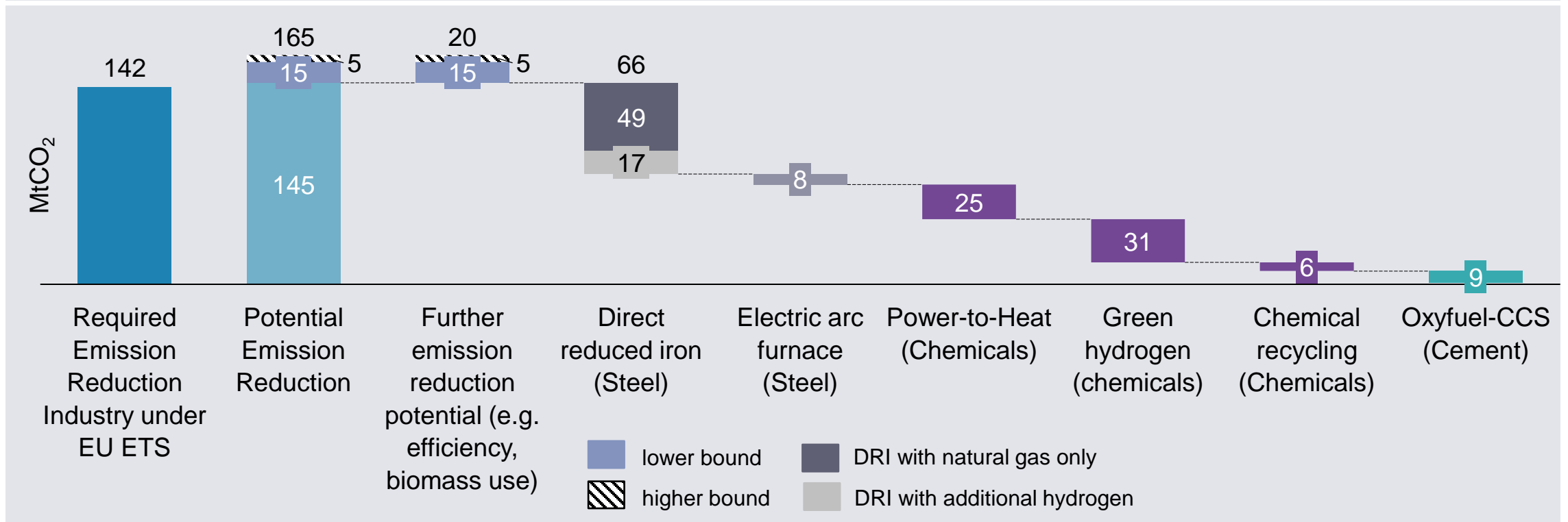
Investments into low-carbon technologies must start during this decade to meet 2050 targets, or plants may be shut down and risk large-scale job losses

Reinvestment needs by 2030 and direct employment in cement, steel and basic chemicals in the EU

Reinvestment requirement of primary production capacity in EU27 by 2030

Steel — Total Production capacity: 104 Mt (100%); Reinvestment required by 2030: 50 Mt (48%)

Chemicals — Total Production capacity: 45 Mt (100%); Reinvestment required by 2030: 24 Mt (53%*)

Cement — Total Production capacity: 183 Mt (100%); Reinvestment required by 2030: 55 Mt (30%**)

Direct employment of the industrial sectors under consideration in 2017

Iron and Steel: 300,000; Chemicals (Basic Chemicals): 519,000; Cement: 47,000***

Agora Energiewende/Wuppertal Institut, 2020

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There are a range of emerging key *climate-neutral* technologies becoming available already

CO2 abatement potential of selected key low-carbon technologies in the steel, chemical and cement sectors by 2030

MtCO$_2$

142	Required Emission Reduction Industry under EU ETS
165 / 15 / 5 / 145	Potential Emission Reduction
20 / 15 / 5	Further emission reduction potential (e.g. efficiency, biomass use)
66 / 49 / 17	Direct reduced iron (Steel)
8	Electric arc furnace (Steel)
25	Power-to-Heat (Chemicals)
31	Green hydrogen (chemicals)
6	Chemical recycling (Chemicals)
9	Oxyfuel-CCS (Cement)

Legend:
- lower bound
- higher bound
- DRI with natural gas only
- DRI with additional hydrogen

Agora Energiewende and Wuppertal Institute, 2020

Circularity and material efficiency also have large potentials as part of a holistic industrial decarbonisation strategy

Estimated abatement potentials from enhanced circularity and material efficiency by material or product in 2030 and 2050.
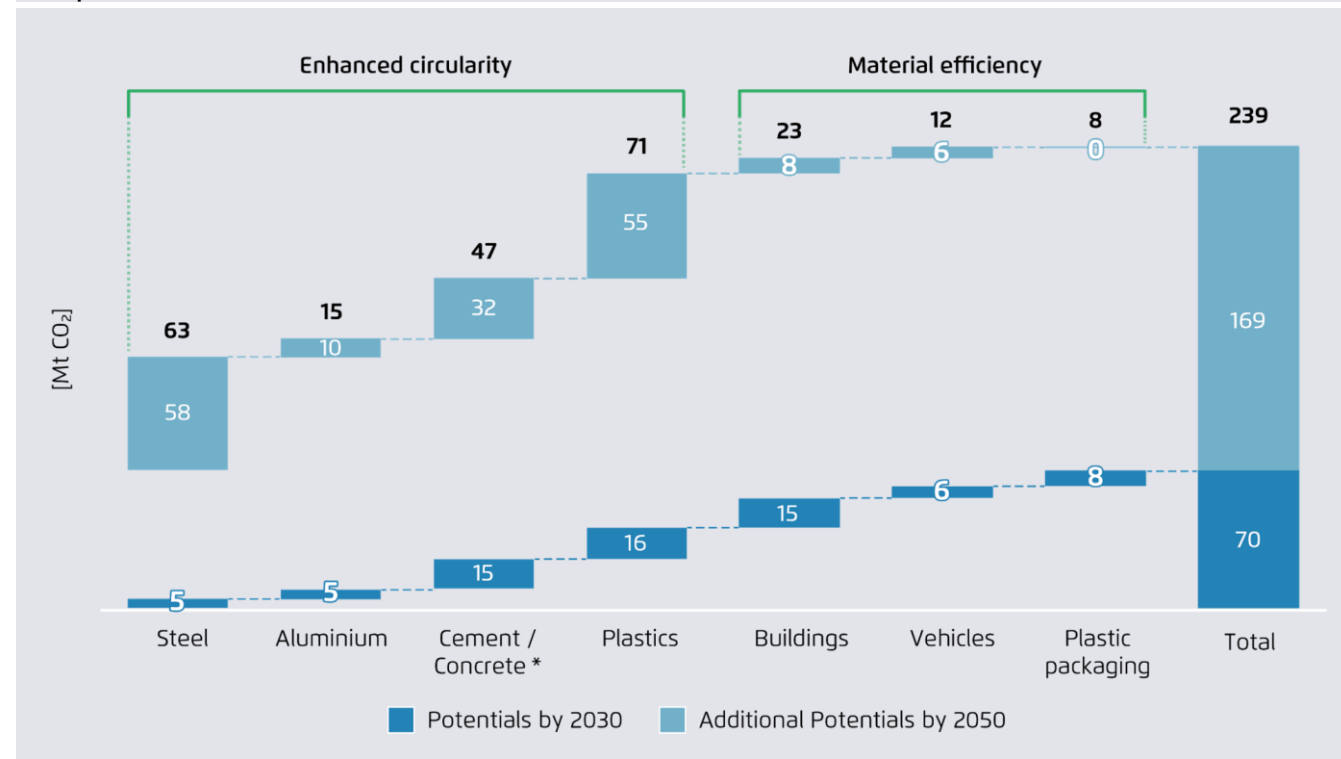
→ For steel, aluminium, cement and plastics materials and products, combined CO_2 abatement potential up to 70Mt by 2030 and 239Mt by 2050, or 10% and 34% of total EU-wide industrial emissions, respectively
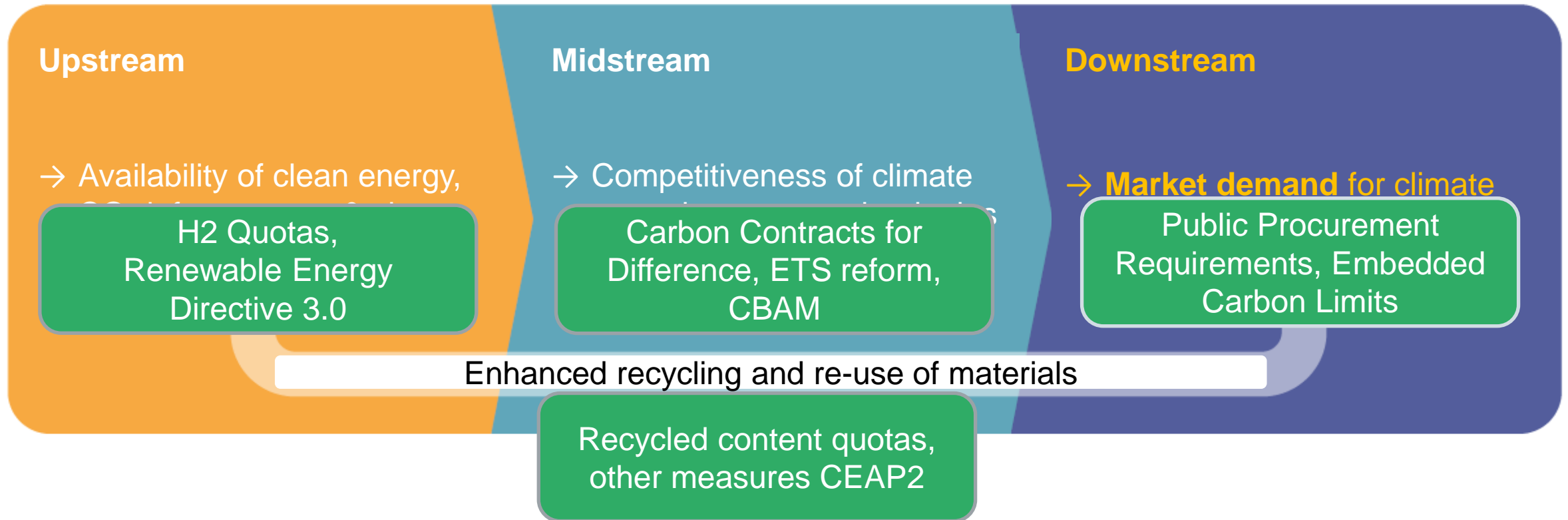
Source: Agora Industry (2022), based on modelling tools provided by Material Economics

E.g. Leading steel companies announcements of plans to invest into climate-neutrality-ready technologies

Agora Industry

Overview of EU steel companies' plans for the deployment and commercialization of DRI plants before 2030

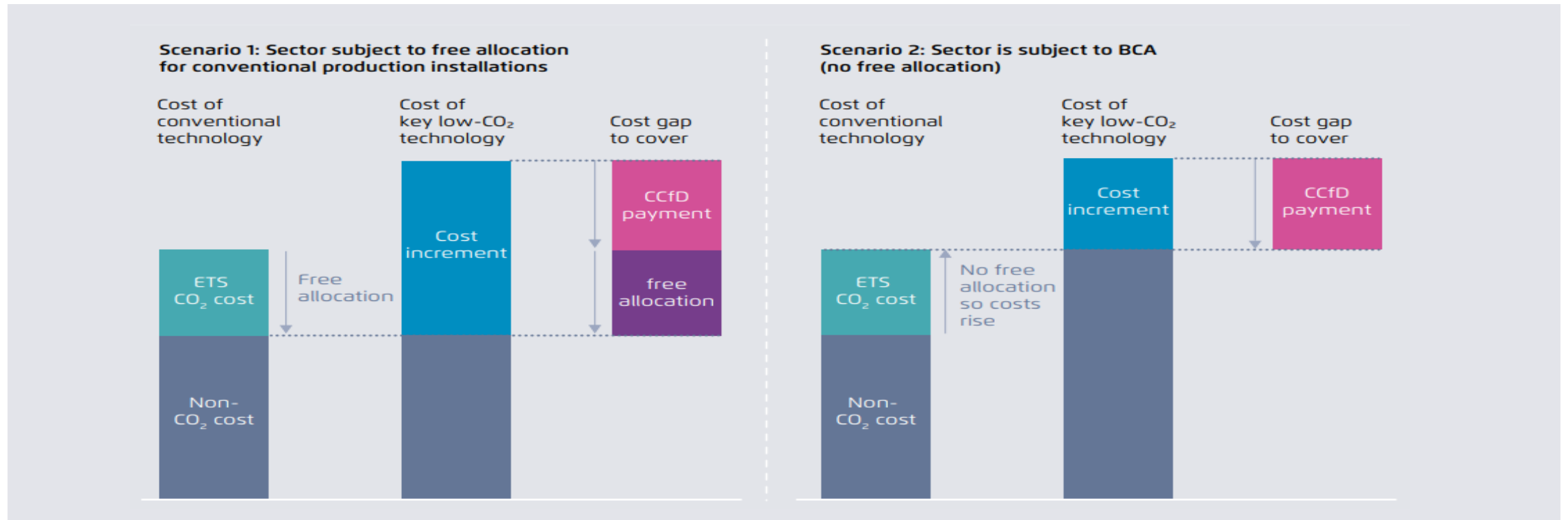| Project, Site	Country	Company	Status Quo	Fuel	Timeline
HYBRIT, Lulea	Sweden	SSAB	Started pilot operation with clean hydrogen in 2020 (TRL 4-5)	Green H_2	2020: pilot plant 2026-33: 3 x commercial plants
DRI, Galati	Romania	Liberty Steel	MoU signed with Romanian government to build large-scale DRI plant within 3-5 years Capacity: 2.5 Mt/DRI/year	Natural gas then clean H_2	2023-2025: commercial
tkH2Steel, Duisburg	Germany	Thyssenkrupp	Plan to produce 0.4 Mt green steel with green hydrogen by 2025, 3 Mt of green steel by 2030	Clean H_2	2025: commercial
SALCOS, Wilhelmshaven	Germany	Salzgitter	Feasibility study to build DRI plant in Wilhelmshaven	Clean H_2	2025: commercial
H-DRI-Project	Germany	ArcelorMittal	Planned construction of an H2-DRI demo plant to produce 0.1 Mt DRI/year (TRL 6-7)	Grey H_2 initially, Then green H_2	2023: demo plant
DRI, Taranto	Italy	ArcelorMittal	Plans to build DRI plant, ongoing negatiations with Italian government	TBD	TBD
IGAR DRI/BF, Dunkerque	France	ArcelorMittal	Plans to start hybid DRI/BF plant and scale up as H2 becomes available	Natural gas then Clean H2	2020s

However, moving from investment plans to final investment decisions and scaling up requires the right conditions to be in place along the value chain…

Upstream

→ Availability of clean energy,

> H2 Quotas,
> Renewable Energy
> Directive 3.0

Midstream

→ Competitiveness of climate

> Carbon Contracts for
> Difference, ETS reform,
> CBAM

Downstream

→ **Market demand** for climate

> Public Procurement
> Requirements, Embedded
> Carbon Limits

Enhanced recycling and re-use of materials

> Recycled content quotas,
> other measures CEAP2

→ EU Green Deal is starting to put this policy package in place. Since it knows robust investment framework is needed for 2020s already.

Some financial support solutions have been suggested to support key technologies, like Carbon Contracts for Difference

The CCfD mechanism with two anti-leakage policies (free allocation vs BCAs)

Scenario 1: Sector subject to free allocation for conventional production installations

Cost of conventional technology — Non-CO_2 cost, ETS CO_2 cost

Free allocation

Cost of key low-CO_2 technology — Cost increment

Cost gap to cover — CCfD payment, free allocation

Scenario 2: Sector is subject to BCA (no free allocation)

Cost of conventional technology — Non-CO_2 cost, ETS CO_2 cost

No free allocation so costs rise

Cost of key low-CO_2 technology — Cost increment

Cost gap to cover — CCfD payment

Agora Energiewende, 2020

Creating markets for climate-friendly basic materials (1): labelling standards are needed to support public and public procurement

Figure 10: Copying the Energy Performance Rating Labels model (left) to make 'material CO_2 performance rating labels'
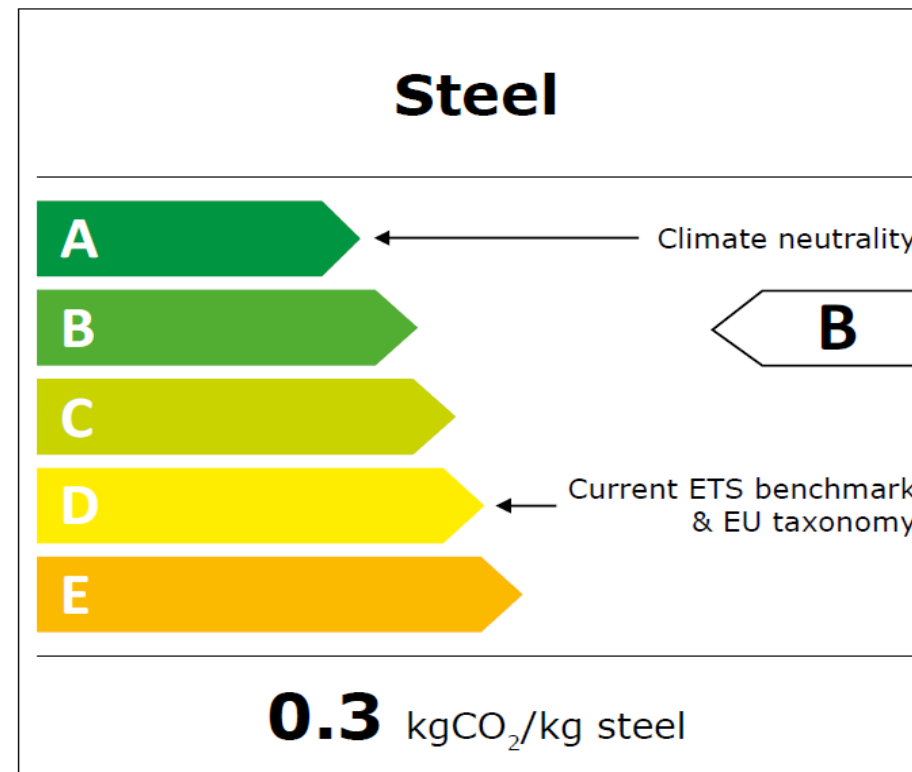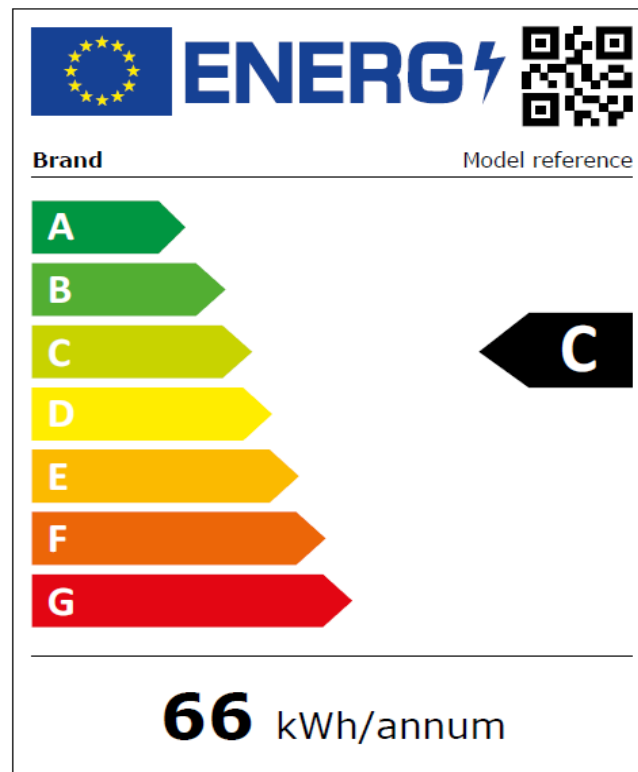
Source: European Commission[39] (left), authors' own example (right)

Creating markets for climate-friendly basic materials (2): Put limits on embedded carbon in certain final products (e.g. buildings, cars, packaging)
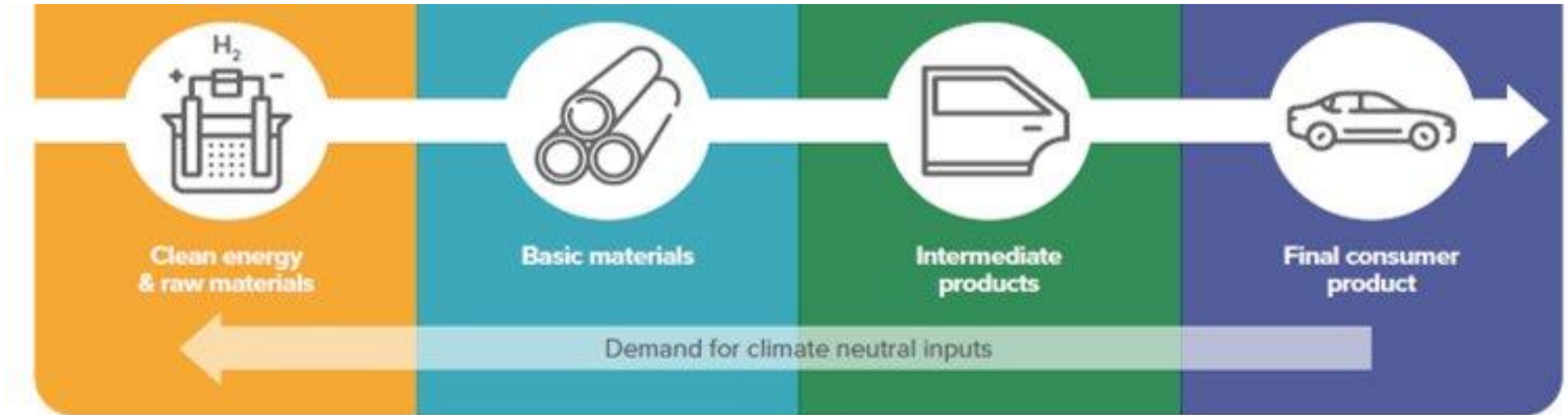
→ Incentivises not only primary materials but also: high quality recycling, material efficient design, substitution to carbon neutral/negative materials

The additional cost of going green is high upstream but low downstream at the final product/consumer end of the value chain

Cement

Cost per tonne of CO_2: CO_2 +100€

B2B cost: +60€ · +75% — Per tonne of cement

Cost to end consumer: +8333€ · +1.7% — On € 500K house

Steel

Cost per tonne of CO_2: CO_2 +132€

B2B cost: +200€ · +20% — Per tonne of steel

Cost to end consumer: +200€ · +1% — On a car

Enabling conditions for the global transformation: an international perspective

Presentation to the Korean Embassy in Berlin

Aylin Shawkat

MARCH 2022

An increasing number of international initiatives aim at establishing scalable lead markets for green basic materials

→ Under **Mission Innovation**, launched in Paris in 2015, members intend to collaborate on innovation in key sectors to drive investments and practical action in research, development and demonstration.

→ Clean Energy Ministerial launched the **Industrial Deep Decarbonization Initiative** (IDDI), through which member countries work on GHG data, standards and GPP policies.

→ **Responsible Steel** works on global standard setting and certification in the steel industry.

→ **The First Movers Coalition**, is a US-led buyers' club of 25 major global companies making purchasing commitments to help commercialise key emerging clean technologies across sectors like steel, aluminium, concrete, chemicals, amongst others. Similarly, **SteelZero** houses private-sector organizations that pledge net-zero emissions procurement by 2050.

→ At COP26, over 40 world leaders have backed and signed up to the **Breakthrough Agenda**, including the US, India, EU, China - representing more than 70% of the world's economy. Steel and hydrogen are among the first breakthroughs, cement is expected to be launched later this year.

There is broad consensus that the UNFCCC process does not suffice to kick-start the global industrial decarbonization

→ **International Carbon Price Floor**
(IMF, June 2021)

→ **Global plan for carbon prices**
(OECD, September 2021)

→ **Global Carbon Price**
(WTO, October 2021)

→ **„Alliance for climate, competitiveness and industry"**
(German government, August 2021; later coalition treaty and G7 programme)

→ **EU-US Agreement on Steel and Aluminum Trade**
(November 2021)

We suggest five areas of collaboration through which international cooperation can advance the global industrial transition

1. Create **scalable markets** for low-carbon and circular materials

2. Support countries to **set sectoral milestones** for industrial decarbonization in key sectors

3. **Capacity building** for industrial decarbonization in developing countries

4. Agree on principles for **green subsidies**

5. Agree on **principles and best practice for carbon leakage prevention** to guide members' development of trade-related industrial decarbonization policies
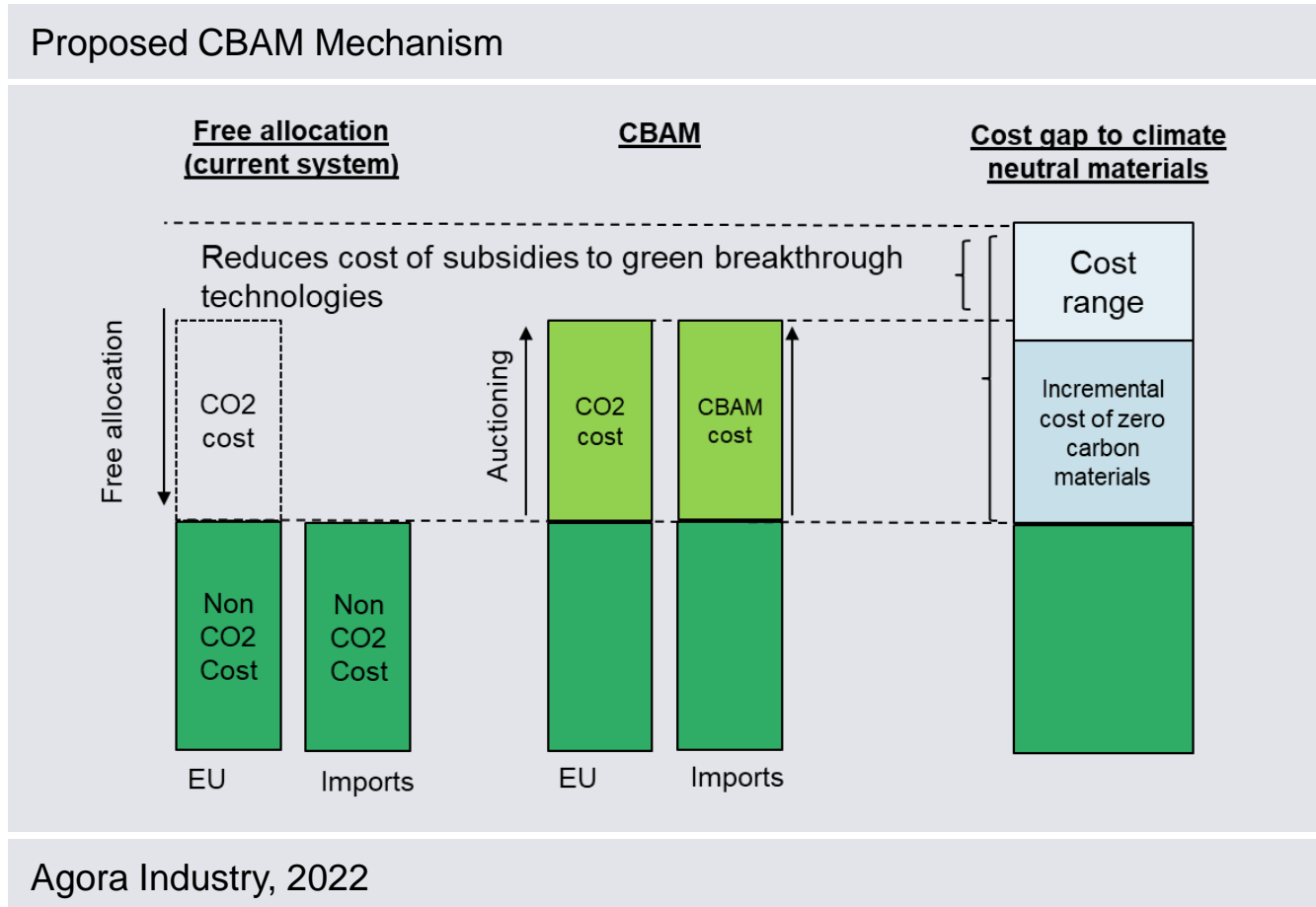
Free allocation is not a sustainable solution to the carbon leakage problem under increased EU climate ambition. The EU must begin to move to an alternative system before 2030.

EU ETS free allocation scenarios vs. the revised ETS cap (with and without cross-sectoral correction factor)
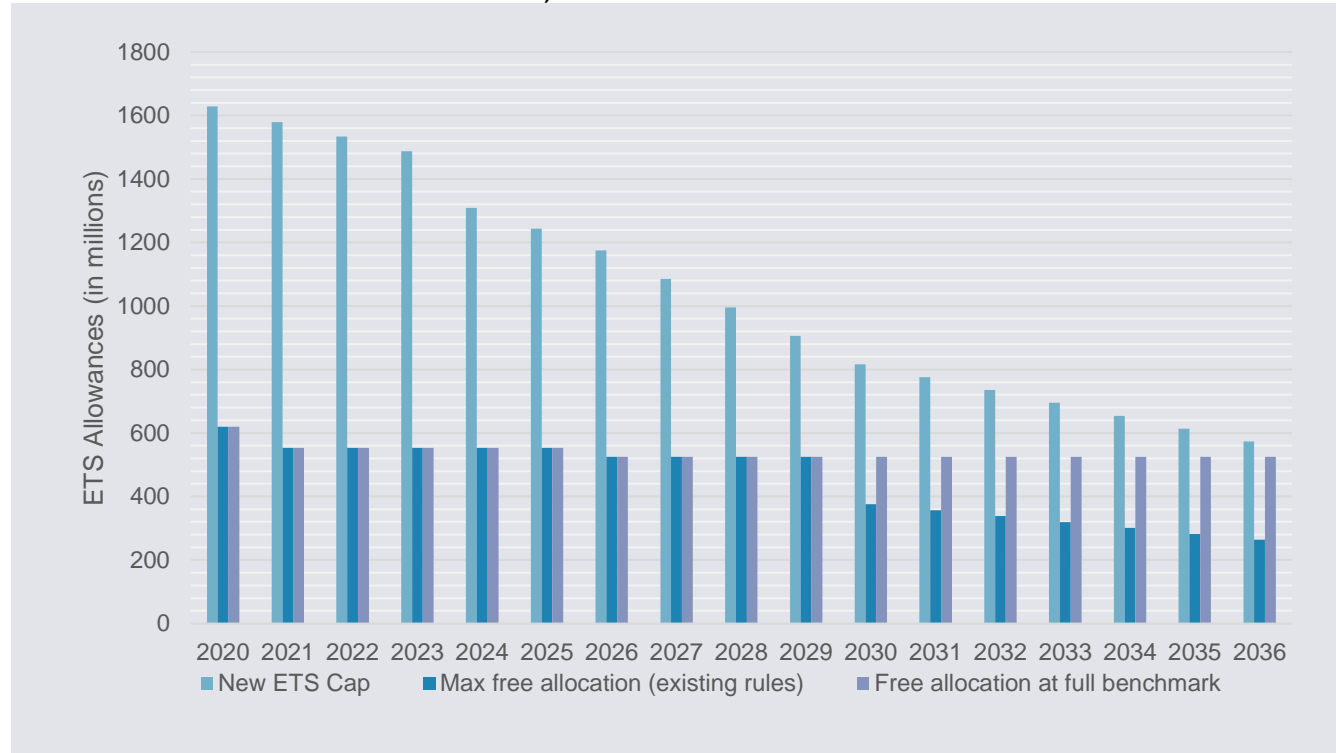
- → Under re-inforced climate ambition, there is simply not enough free allocation to provide 100% of the EU ETS benchmark.

- → By 2030, industry could be short approximately 28% of the full allocation at full benchmark.

- → Abandoning the cross-sectoral correction factor doesnt work for long: free allocation would account for an estimated. 65%, 76%, 91% or ETS cap in 2030, 2033 and 2036, even under tighter ETS benchmarks.

Agora Industry, 2022

Despite some complexities, a CBAM has important advantages as an enabler of climate action in industry

Proposed CBAM Mechanism

Free allocation
(current system)

CBAM

Cost gap to climate
neutral materials

Reduces cost of subsidies to green breakthrough technologies

Free allocation

Auctioning

Cost range

CO_2 cost

CO_2 cost

CBAM cost

Incremental cost of zero carbon materials

Non CO_2 Cost

Non CO_2 Cost

EU

Imports

EU

Imports

Agora Industry, 2022

→ 30-50% of cement and steel sites need major reinvestment by 2030!

→ A clear regulatory signal is required to ensure investments into climate neutrality-compatible technology during 2020s.

→ A CBAM plus auctioning:

- Signals an end to free allocation, strengthening low-CO_2 investment case

- Creates carbon cost pass-through / improves competitiveness of low-carbon and circular economy solutions

- Raises funds to support low-carbon and circular production technologies

Climate Alliances cannot substitute for carbon border adjustments, but the two proposals interact in important ways

- Reduce trade tensions
- Mitigate pressure on exports through lead markets

EU Carbon Border Adjustment Mechanism
- Level domestic playing field
- Allow for carbon-cost pass through

Climate Alliance / International Initiatives
- Scale up international demand for low-carbon products
- Harmonize international standards and trade

- Raise funds for industrial transition
- Raise stakes of negotiations