



FACILITATING STEEL COMPANIES' TRANSITION TO LOW-CARBON STEEL

WHILE ADDRESSING LONG-STANDING STRUCTURAL CHALLENGES

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Michele RIMINI: michele.rimini@oecd.org

Danhak GU: danhak.gu@oecd.org



The steel sector at a crossroad, the role of the OECD

The OECD Steel Committee aims to support the viability of the steel industry, through policies that reduce market distortions and promote competitive and open markets for steel.

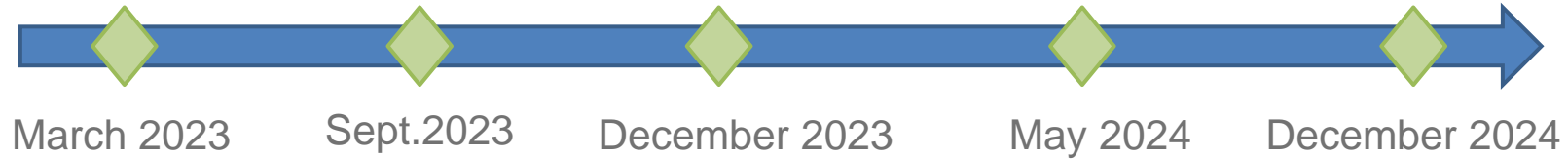
Decarbonisation and **excess capacity** are key drivers for structural adjustment in the sector,

We help governments making sense of these intertwined challenges through:

- Monitoring of steel market developments (capacity, supply, demand, raw materials)
- Assessment of excess capacity and the role of government in sustaining and creating it
- Monitoring of trade flows and trade policies
- Monitoring of government interventions in the sector
- **Recent work on decarbonisation**



Decarbonisation in the work of the OECD Steel Committee 2023-24



Indicators on Decarbonisation Progress

The Steel Industry & the Low-carbon Transition

The Circular Economy & Scrap

Hydrogen as a new Strategic Input

Workshop on Technological Solutions



Interim Report



Final Report



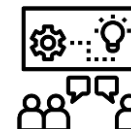
Interim Report



Final Report



Final Report





Rationale for this report

- How are steel companies adapting to the low-carbon transition and what are the related challenges?
- How can policies help address these challenges?

Underlying questions

- How can the competitiveness of low-carbon emissions steel be fostered?
- How could the low-carbon transition facilitate steel firms' structural adjustments?
- How can we ensure that low-carbon steel facilities coming online do not feed excess capacity?



Outline

Steel companies & decarbonisation:
The state of play

Identifying patterns in companies'
decarbonisation strategies

Policy mapping & policy insights

- ✓ Companies' decarbonisation strategies, pathways, projects
- ✓ Scope: top steel producers for each region
- ✓ Groups of companies with similar approaches
- ✓ Drivers shaping these strategies
- ✓ Decarbonisation **challenges**
- ✓ **Mapping of policies** enabling steel decarbonisation
- ✓ **Policy insights** to facilitate the steel industry's transition



Methodology: Identifying challenges from companies' decarbonisation strategies & policy mapping

Company's challenges & low-emission projects

- ✓ Identifying challenges:
 - Interim report, company's annual report, white papers, articles, etc.
- ✓ A total of **229** low-emission projects
- ✓ Targeted Technologies: Energy efficiency, Hydrogen, H-DR, CCUS, Scrap, emerging technologies,
- ✓ Investment size
- ✓ Source: World Steel Dynamics, Company's annual report, Green Steel Tracker

Policy mapping

- ✓ **11** jurisdictions, a total of **87** policies
 - Policy instruments: Regulation, R&D, funding, plan....
- ✓ Targeted Technologies: Energy efficiency, Hydrogen, H-DR, CCUS, Bioenergy, Scrap, emerging technology, Not technology specific
- ✓ Supply-side VS Demand-side
- ✓ Phase-in VS Phase out
- ✓ Which challenges addressed?
- ✓ Source: Climate Club policy databases, Gov. policy briefings, etc.



Key Challenges for Decarbonisation 1/3

1) Technology scale-up

✓ Rapid technological maturity is key but technological readiness is limited

- 74% CCUS (TRL 5)
- 52% H2-DRI-EAF (TRL 6)
- 11% Iron Oxide Electrolysis (TRL 4-6)

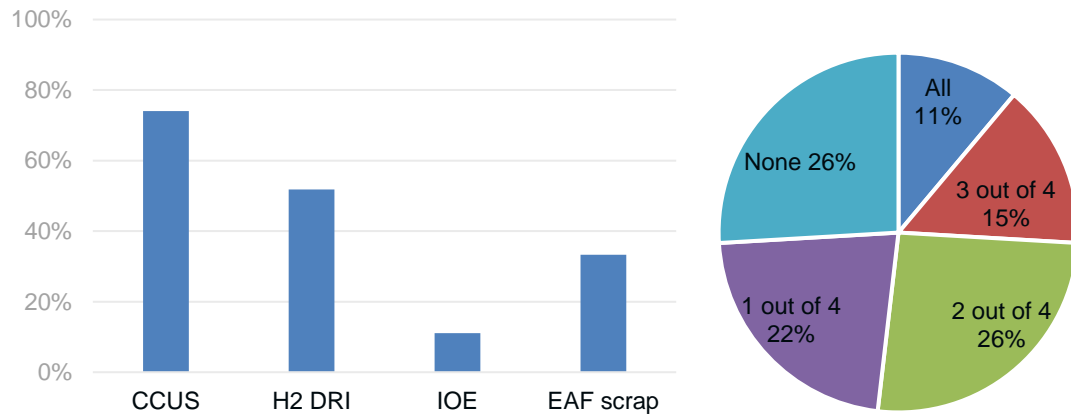


Figure 1 & 2. Share of low-carbon breakthrough technologies selected by the sample companies' decarbonisation strategy

✓ Low-emission technologies must be compatible with long-term net zero goals

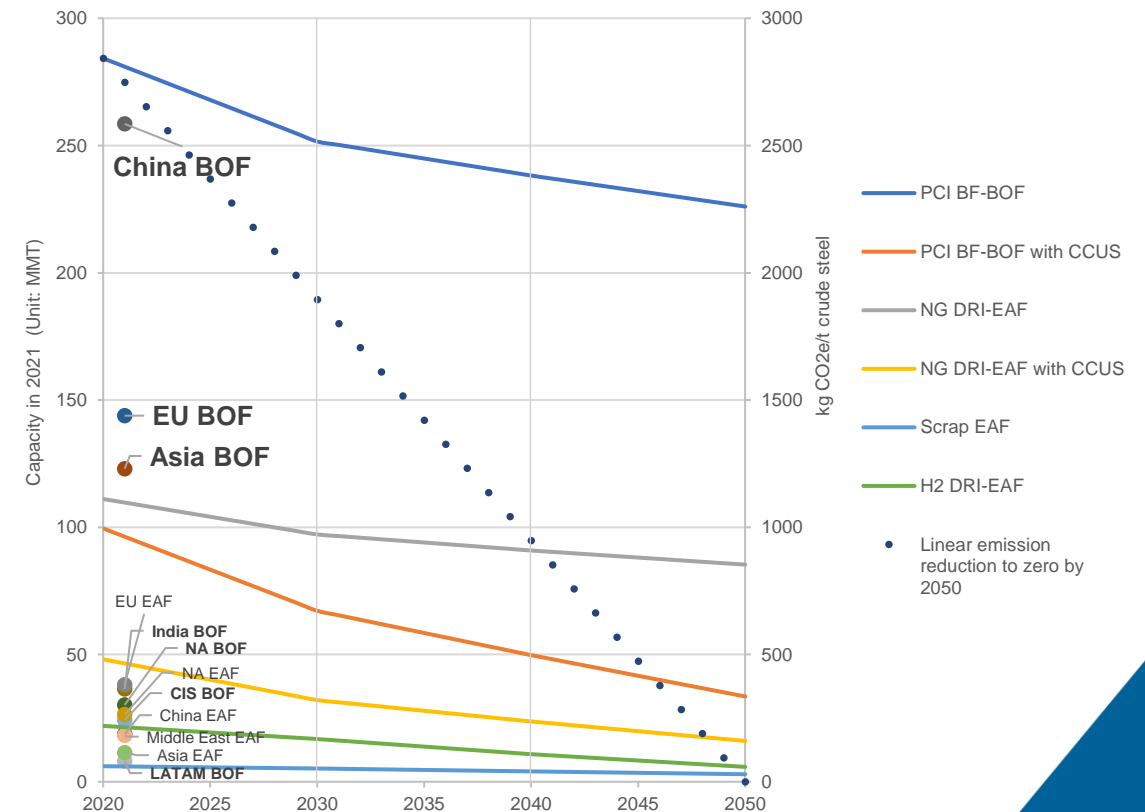


Figure 3. Emission intensity of selected technologies [IEA (2023), Vogl and Ahman (2019)].



Key Challenges for Decarbonisation 2/3

2) Finance

- ✓ Low- to near zero-carbon innovative technologies are capital-intensive
- ✓ Investment costs for **Development up to TRL 9 + Production plants + Auxiliary facilities + OPEX + electricity +....** (per 1 MTPA crude steel)

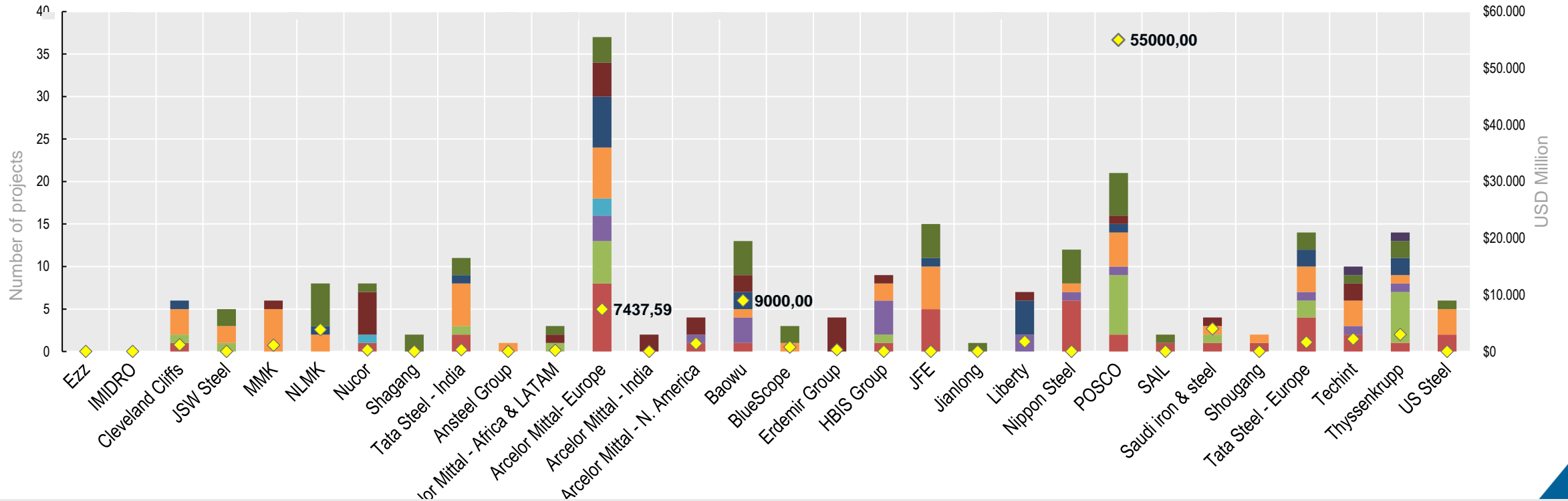


Figure 4. Investment siWe and the number of low-emission projects announced by the sample companies [World Steel Dynamics [2023]]



Key Challenges for Decarbonisation 3/3

3) Resources

- ✓ **Steel decarbonisation depends on significant limited resources**
- ✓ Key resources for technology route types:
 - CCUS: carbon storage sites & carbon transportation
 - H2-DRI-EAF: availability of green hydrogen
 - DR-grade pellets & iron ore with high iron content
 - Scrap

4) Demand / Market for low-carbon steel

- ✓ **10-50%** cost increase per tonne of low-emission steel
- ✓ High demand-signal from downstream industries esp. automotive industry to reach scope 3 emissions
 - > **Voluntary commitments**

5) Barriers to exit

- ✓ By 2050, steelmaking based on
 - **44% electrolytic hydrogen,**
 - **37% CCUS-equipped facilities,**
 - **14% IOE**
- ✓ By 2050, steel production will grow from 1880 Mt (2022) to 1960 Mt (2050) (IEA, 2023)
 - > **4.3 % increase** (IEA, 2023)



The status quo and net-zero ambition in selected jurisdictions

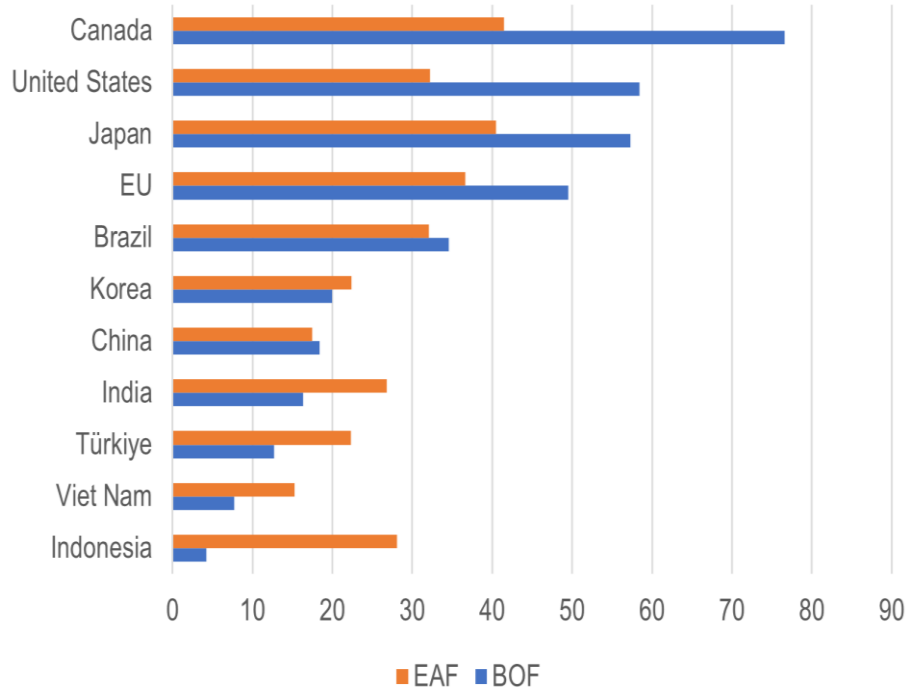


Figure 5. Average age of steelmaking capacity by types of asset

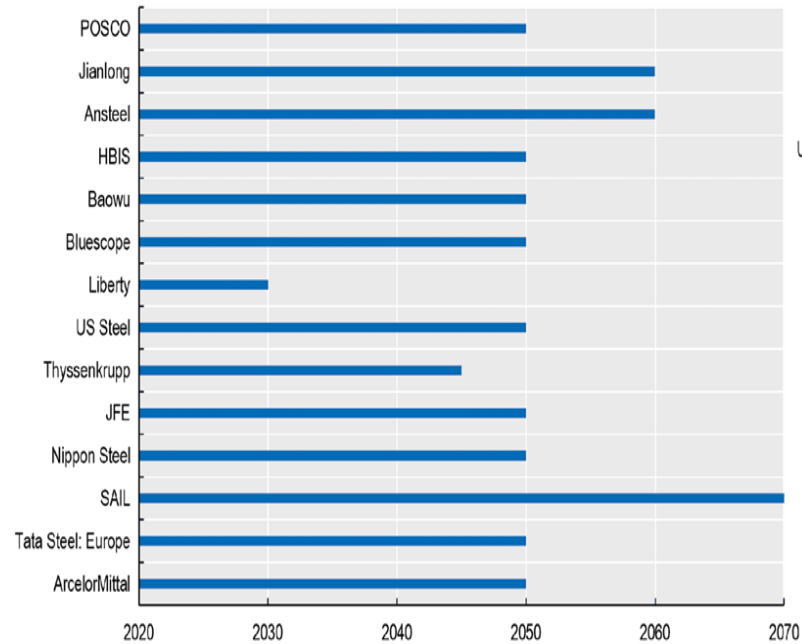
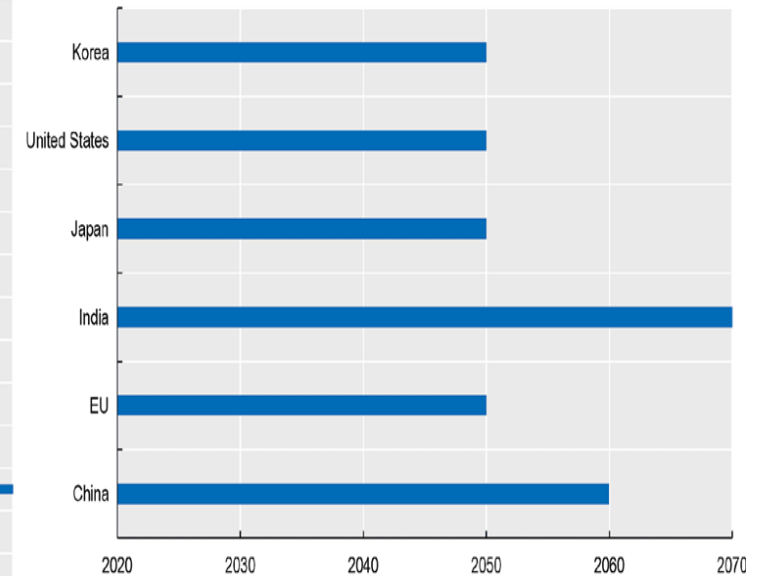
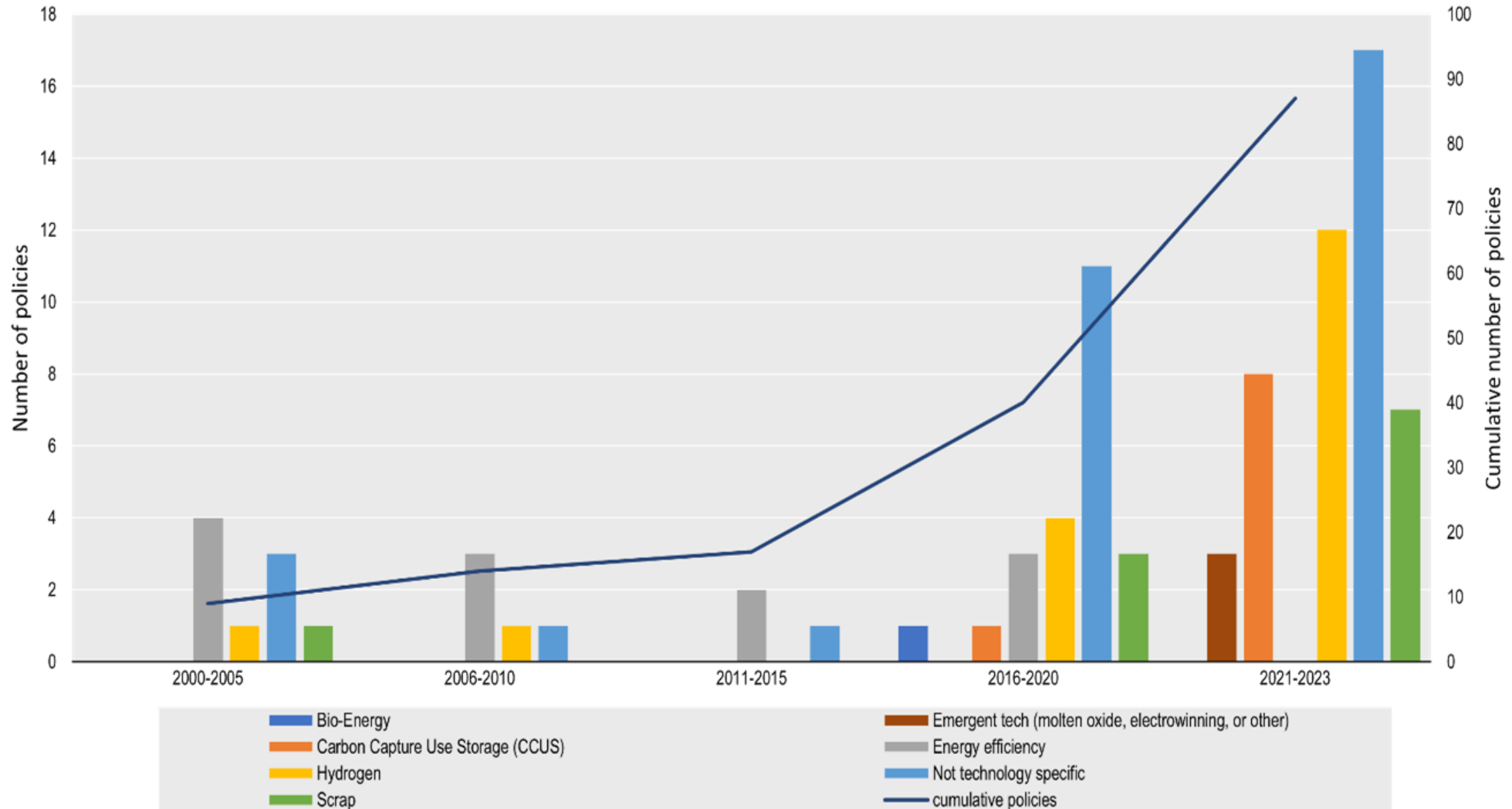


Figure 6. Net-zero target years in company strategies and net-zero target years set by government





Key findings: Timeline of policy announcements and their target technologies





Key findings: Comparing focus areas between company low-emission projects & policies

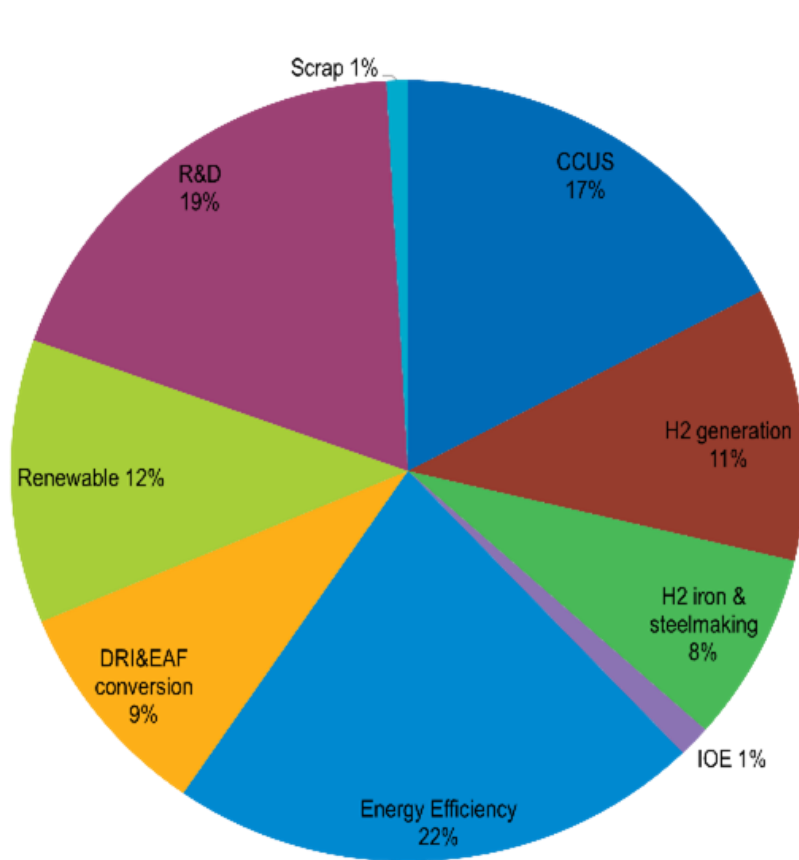


Figure 8. Technology profiles of low-emission projects from the sample companies [World Steel Dynamics [2023]]

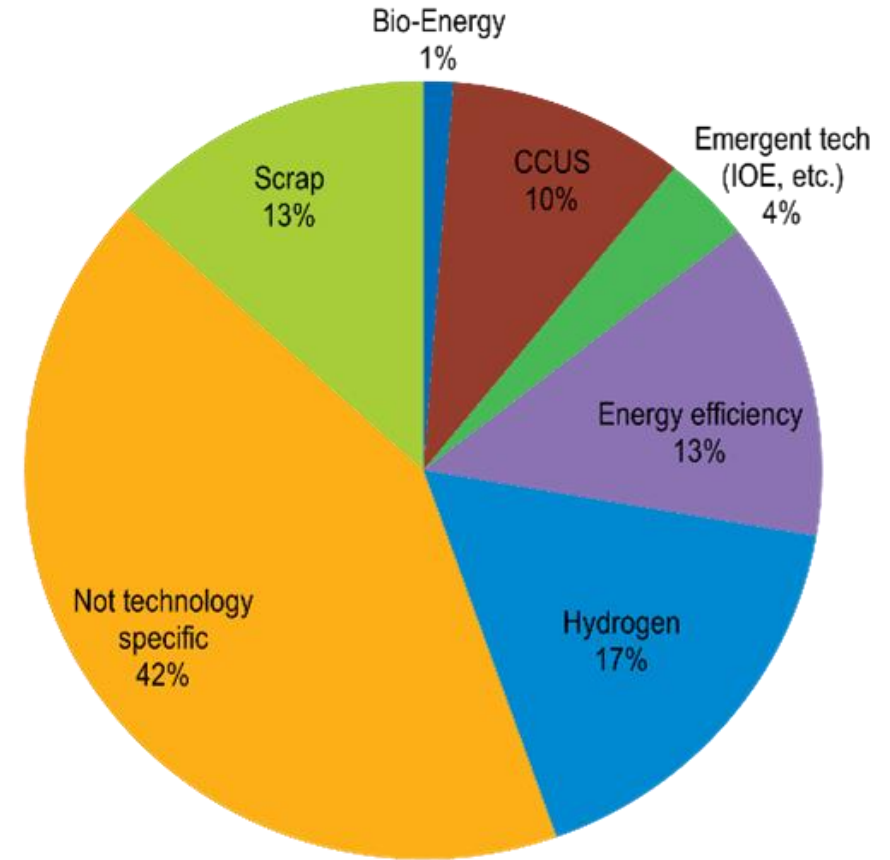


Figure 9. Technology profiles from policies in selected jurisdiction



Policy focus: Where are we paying attention?

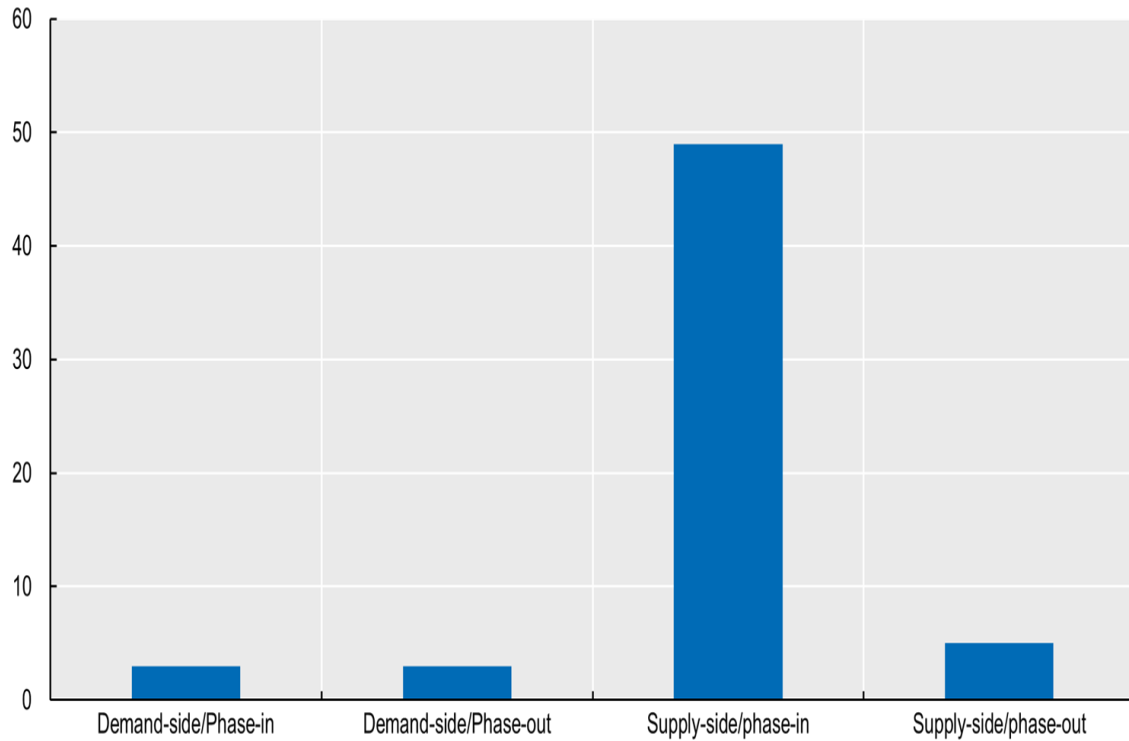


Figure 10. Orientation of policies in the selected jurisdictions

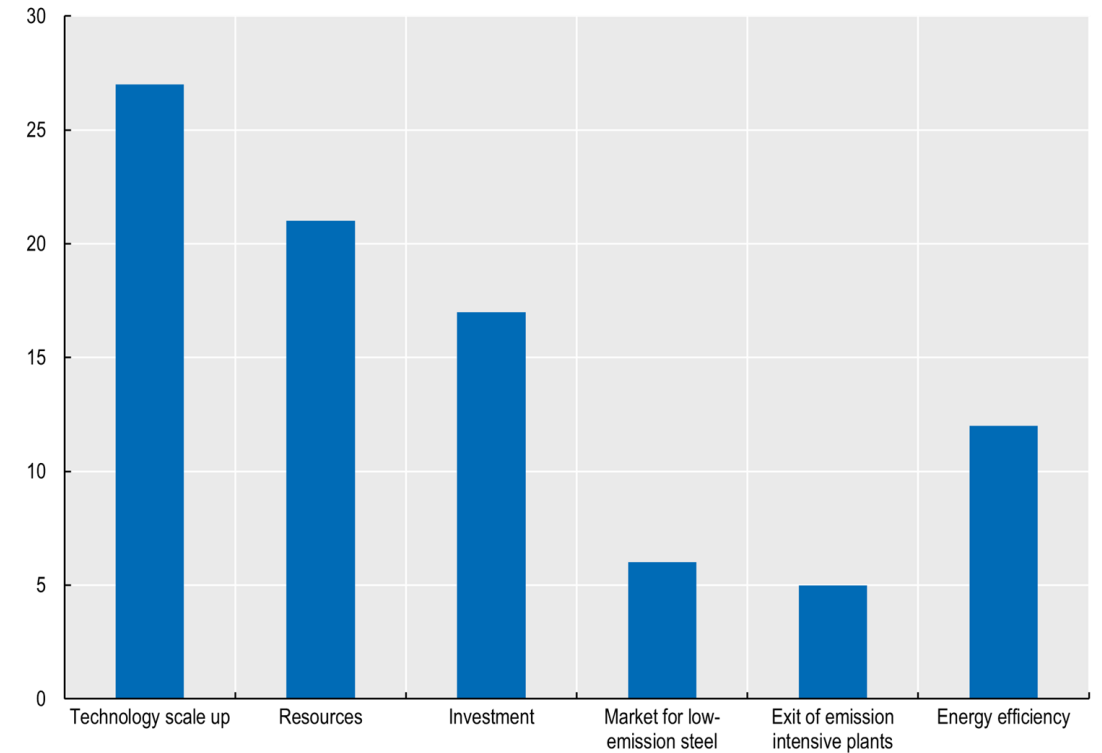
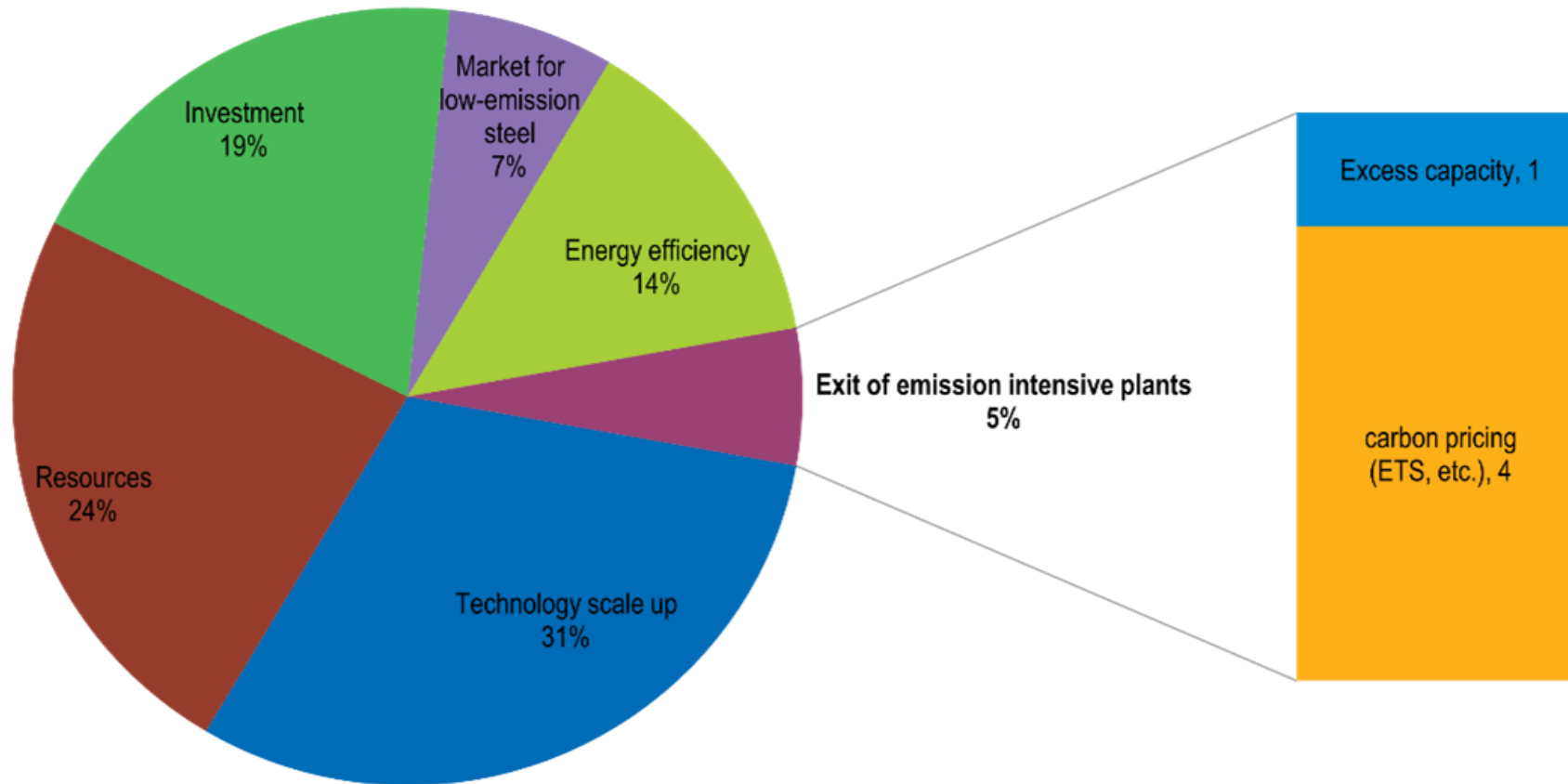


Figure 11. Challenges addressed by policies



Key findings: Distribution of policies addressing identified challenges (%)





What else is needed?

A net-zero steel value chain requires a set of **enabling conditions**:

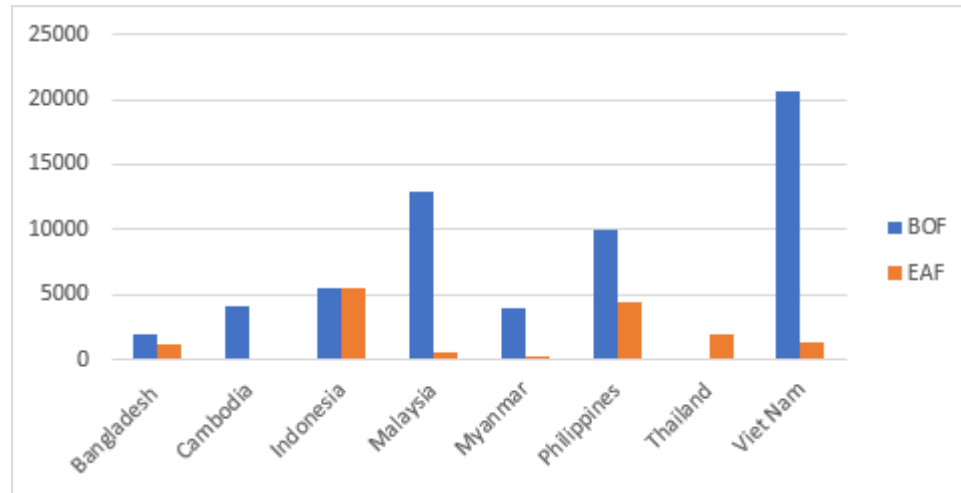
- A reliable system of renewables-based electricity generation
- An enabling infrastructure and a sufficient supply of hydrogen
- An hydrogen strategy that prioritises steel and other heavy industries as primary end users
- An enabling infrastructure for CO2 transport and storage (CCS)

Yet very few jurisdictions are providing for these



Capacity developments and decarbonisation in Southeast Asia

- Any sign of leapfrogging in capacity developments?
- Any decarbonization-oriented policy support?



Indonesia:

- Krakatau Steel to build a blue/green H2 plant, CCS and RES farm
- Pilot on green H2 and ammonia at GRP's steelmaking Bekasi

Malaysia:

- Esteel to pilot HBI production followed by DRI
- JFE to install CCS
- POSCO & Petros to collaborate on CCS

Thailand:

- Meranti steel to build DRI-EAF steelworks for flat products (2.5 mmt)



Summary of key findings & policy insights 1/2

Company's strategies:

- The majority of steel companies have set decarbonisation objectives with a decarbonisation roadmap
- Companies' decarbonisation plans would benefit from being **more detailed & comprehensive**
- **less than one third** have targets based on a climate change mitigation scenario analysis.

Policy-mapping:

- Much focus on supply-side/phase-in, **with insufficient focus on demand-side/phase-out is likely to hamper achieving net zero as well as create excess capacity.**
- Policy approaches will have to adapt with rapid advances in low-carbon steelmaking
- Competitiveness of low-carbon steel as well as rapid exit of emission-intensive plants require **carbon pricing, demand side interventions** and/or **direct market-shaping**



Summary of key findings & policy insights 2/2

Correlations between company's strategies & policy frameworks:

- the more ambitious a country's net-zero target, the more ambitious its companies' targets, often even more so
- **Energy Efficiency** has been and continues to be an important part in both company strategies and policy perspectives partly due to the still prevalent of BF-BOF
- Close coordination of value chains is needed
- Limited attention to **just transition** both from company's strategies and the policy perspective



THANK YOU