

GLOBAL GREEN IRON DEVELOPMENTS AND IMPLICATIONS FOR AUSTRALIA



Australian
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University

Institute for
Climate, Energy &
Disaster Solutions



Global green iron developments and implications for Australia

Australian National University

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Outline of the presentation

1. **Who we are, what we do**
2. **The twin transitions:**
 - **Rising steel excess capacity**
 - **The steel decarbonisation imperative**
3. **The OECD Green Iron Revolution project**
4. **Case study on Australia: Initial findings**



Introducing OECD work on steel



OECD: Supporting the global steel agenda



Global Forum on Steel Excess Capacity

- A multilateral platform to address global **excess-capacity**
- Established by the **G20**, facilitated by the OECD
- Brings together **more than 30** major steel-producing economies (Australia chair in 2025)

www.steelforum.org

OECD Steel Committee



- A unique forum for governments to address the **evolving challenges** facing the steel industry
- **30 Members & 7 Participants**, strong engagement with **steel associations**
- **Areas of work:** steel market developments, steelmaking capacity, trade policies, decarbonisation...

[Steel Committee - OECD](#)

Climate Club



- An inclusive forum for governments to accelerate industrial decarbonisation, including for steel
- **43 Members** including Australia. Interim Secretariat by OECD and IEA
- **Areas of work:** carbon leakage, green steel standards, policies, Global Matchmaking Platform

www.climate-club.org

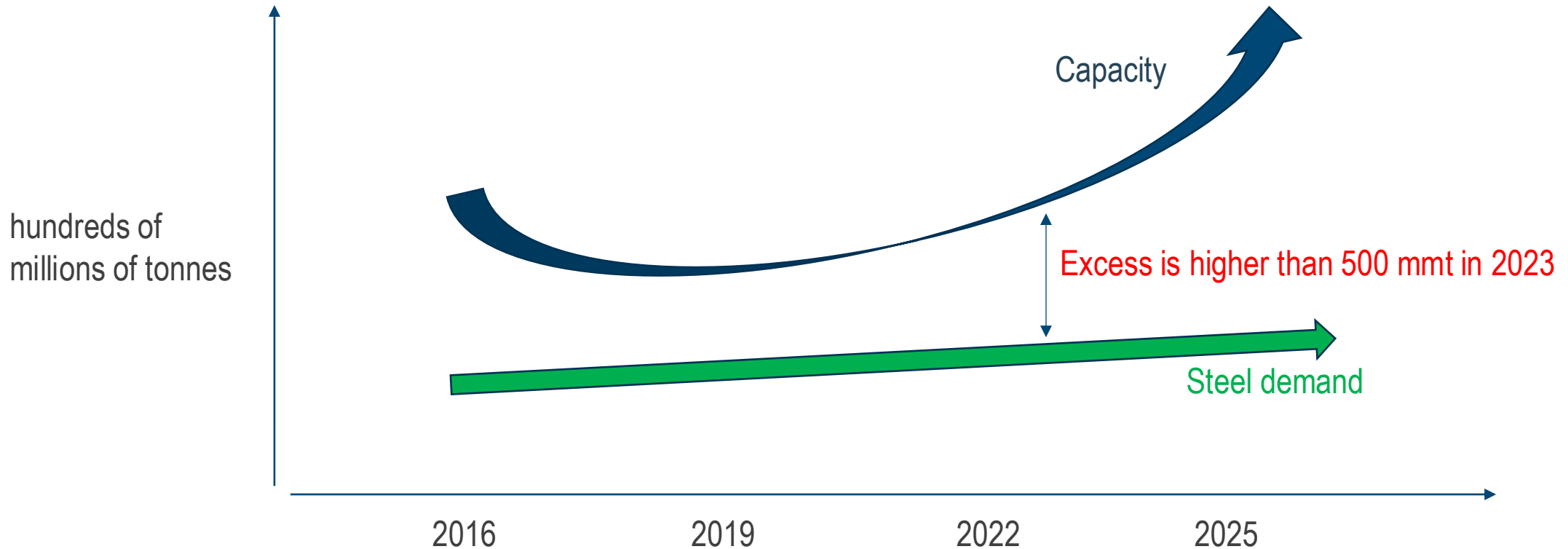
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**The twin transition:
rising excess capacity**



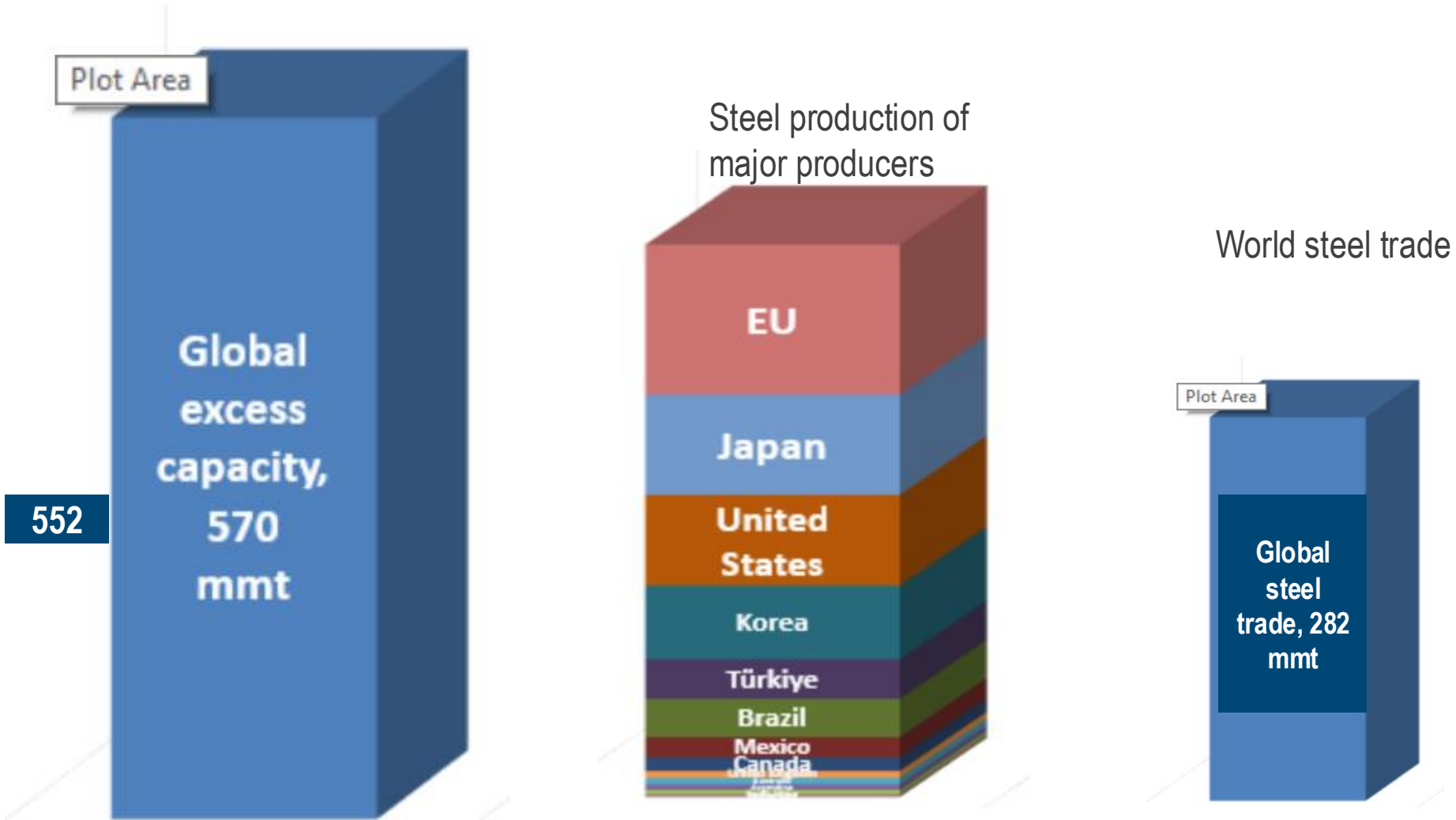
Excess capacity already exceeds 500 mmt and is growing

- World capacity at **2,440 mmt** in 2023
- Potential increase in capacity by **158 mmt** in 2024-26
- The gap between capacity and demand was more than **500 mmt in 2023** and rising
- Some excess capacity cyclical but **structural excess capacity** is the most problematic



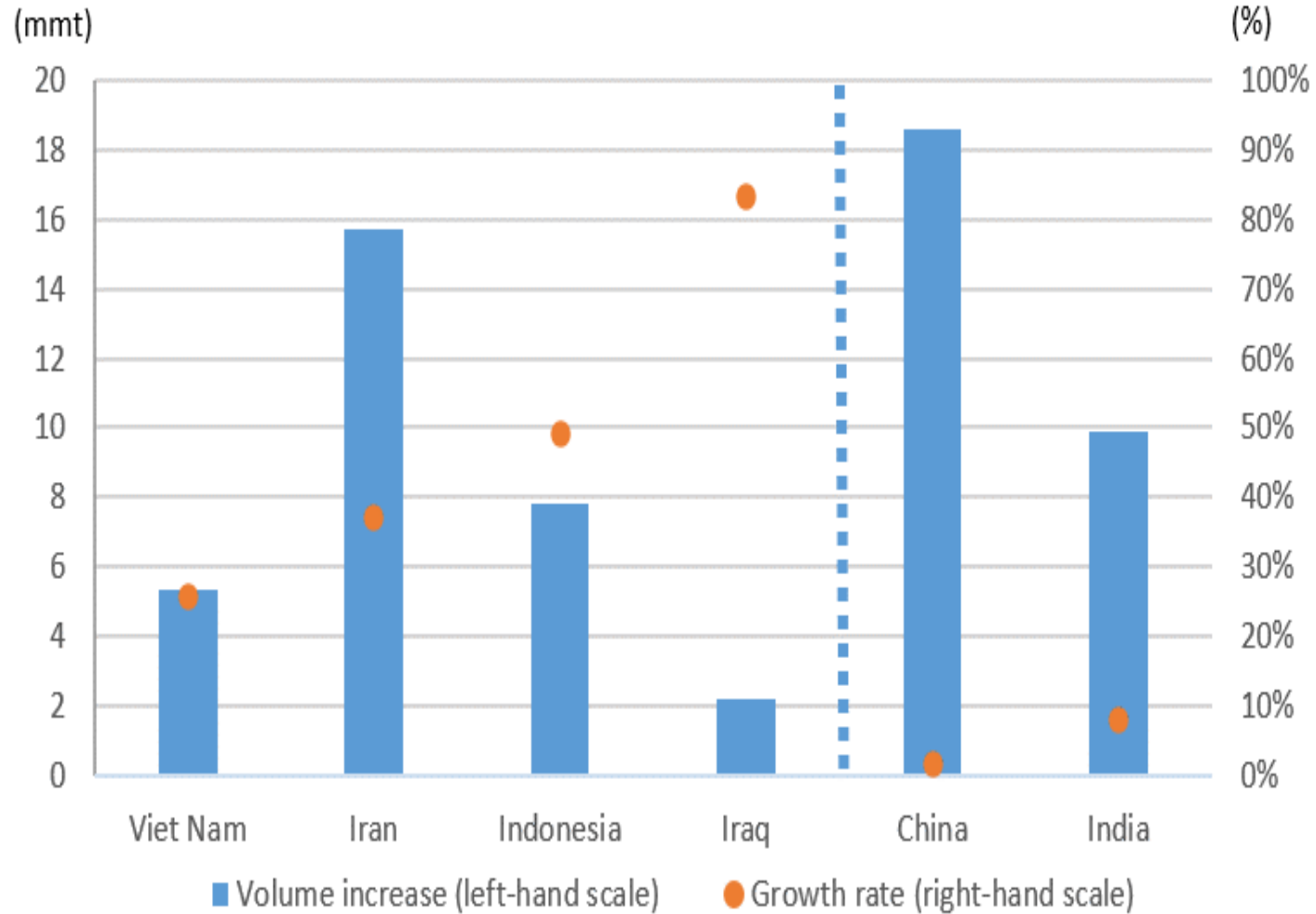


Global excess capacity in perspective: huge compared to global production and trade of steel





Significant capacity expansions over last 5 years in developing Asia and the Middle East...



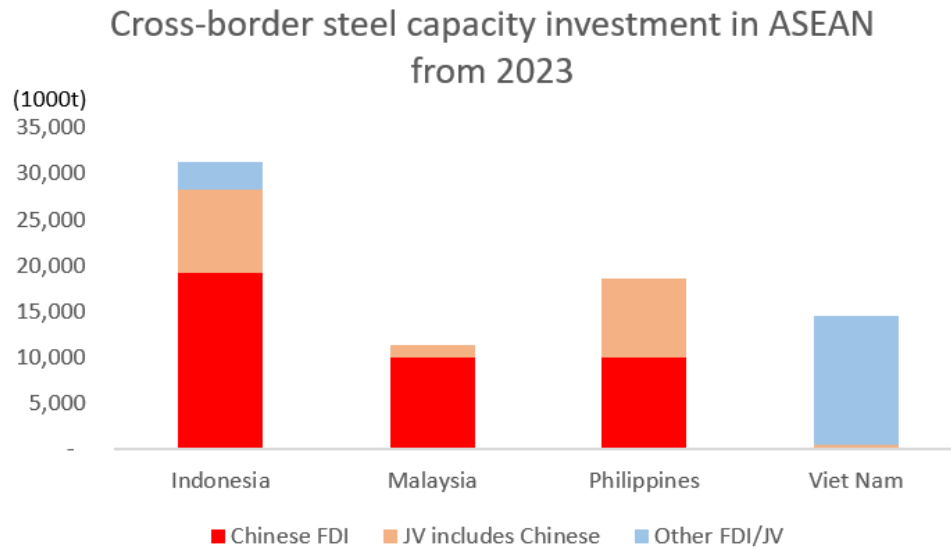
Trends:

- Smaller players are getting big
- But continued strong rise China in volume terms

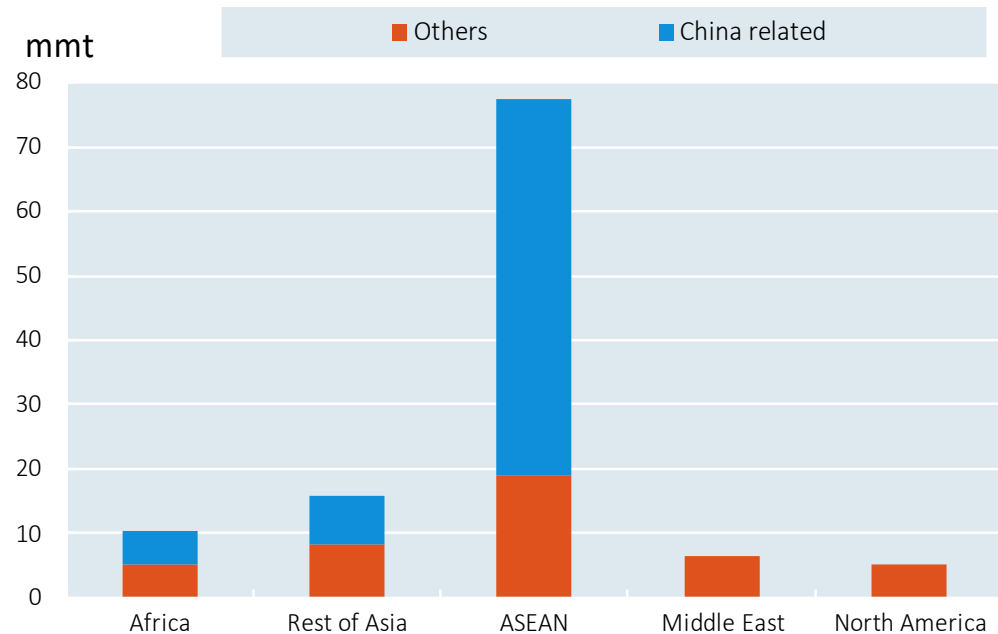


Capacity increases in ASEAN driven by a new wave of cross-border investment in steel...

...primarily from China



Cross-border investment in new steelmaking capacity by Chinese and other companies starting in 2023 or later (mmt)



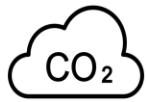
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**The twin transition: the
steel decarbonisation
imperative**



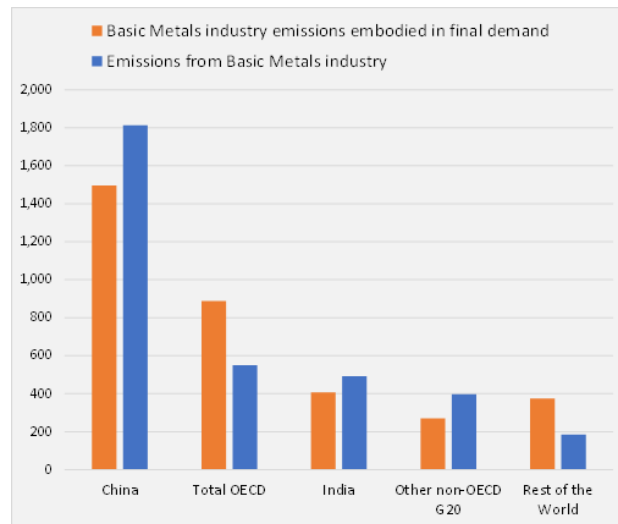
Steel producing economies face common challenges to decarbonise

STEEL & EMISSIONS

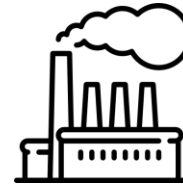


8% of global emissions,
30% of global industrial emissions

Basic metal industry CO₂ emissions, 2018, million tonnes



A CRITICAL DECADE FOR IMPLEMENTATION

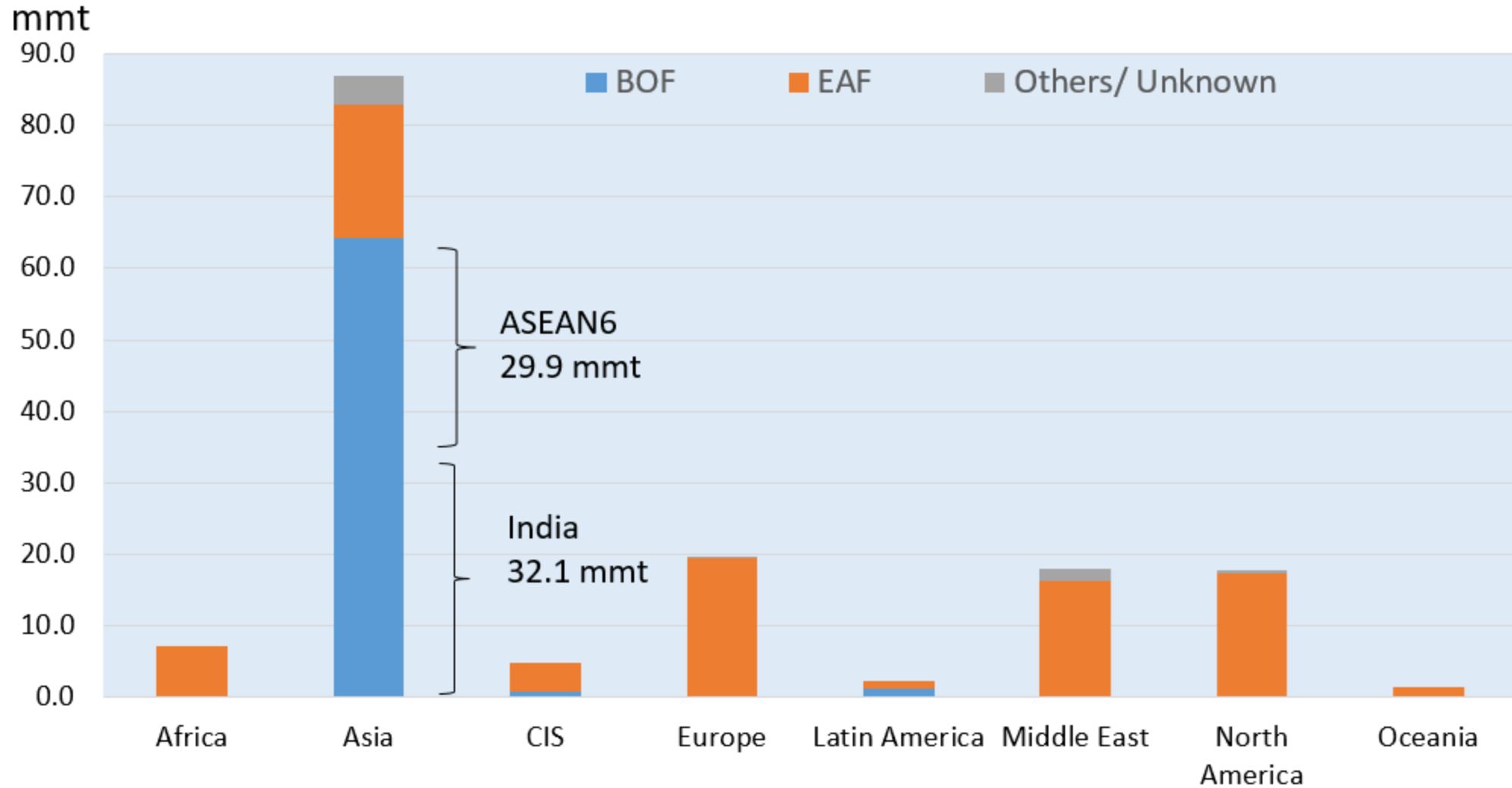


A deep **transformation** required...

...with an essential role for policy

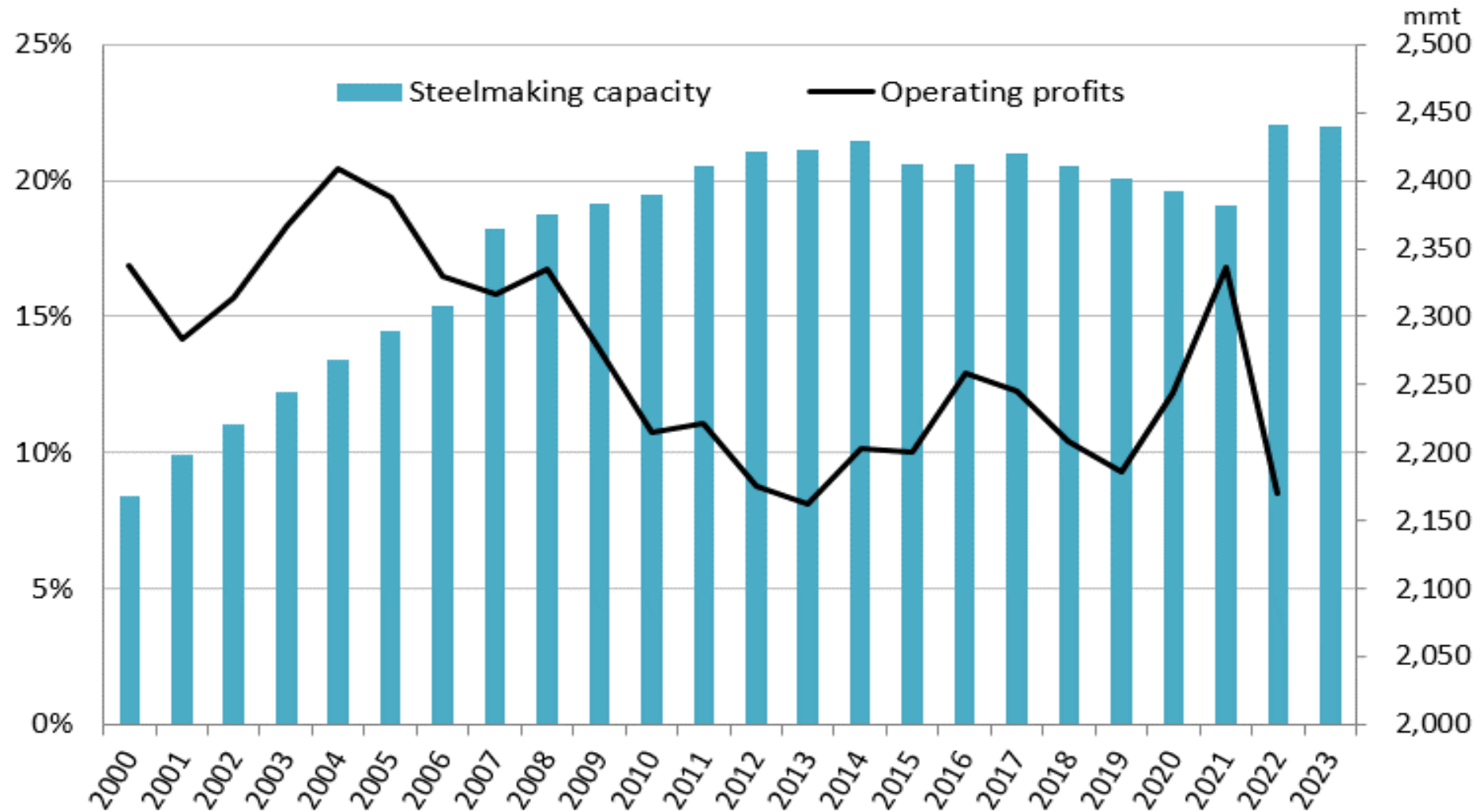


Capacity increases have a direct impact on emissions by growth in BOF...





...as well as indirectly via reduced profitability, and lower investment and innovation for green steel





Implications of the twin transitions for steel raw material markets

- Both excess capacity and decarbonisation increase demand for raw materials for steel making...
- ...leading to expected higher prices and more competition in upstream markets...
- ...and the need to better understand and forecast these at granular level.
- Countries and companies move upstream and try to safeguard access to raw materials...
- ...and/or move downstream to increase value added from raw materials (in particular iron ore) to green iron making...
- ...risking undesirable policy competition and market fragmentation...
- ...and changing fundamentally steel global supply chains...
- ...underlining the need for global cooperation.



The OECD Green Iron Revolution project



Why is a focus on green iron production and trade developments important?

Green iron revolution will mean:

Steel industries across the world face the **need to decarbonise...**

...but differ significantly in terms of **industry structure**, access to resources and policy settings

The **greening of iron production** is of pivotal importance in this...

...with iron and steel production becoming increasingly **separated geographically...**

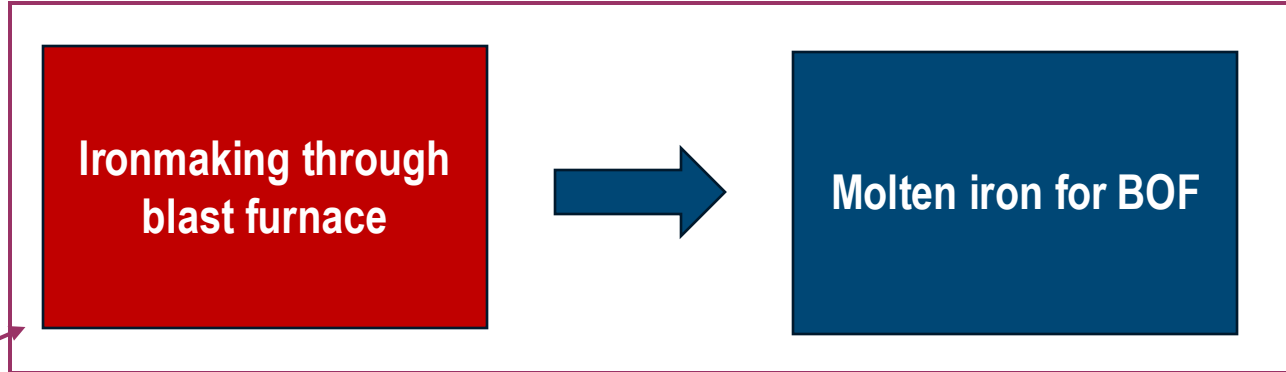
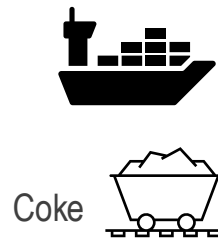
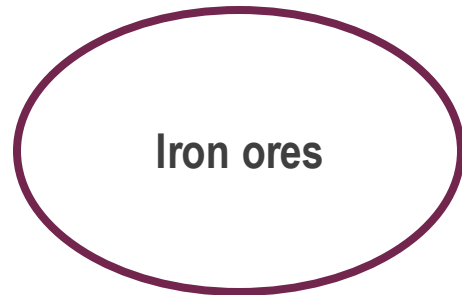
...and green iron production taking place at those **locations offering the most favourable circumstances.**



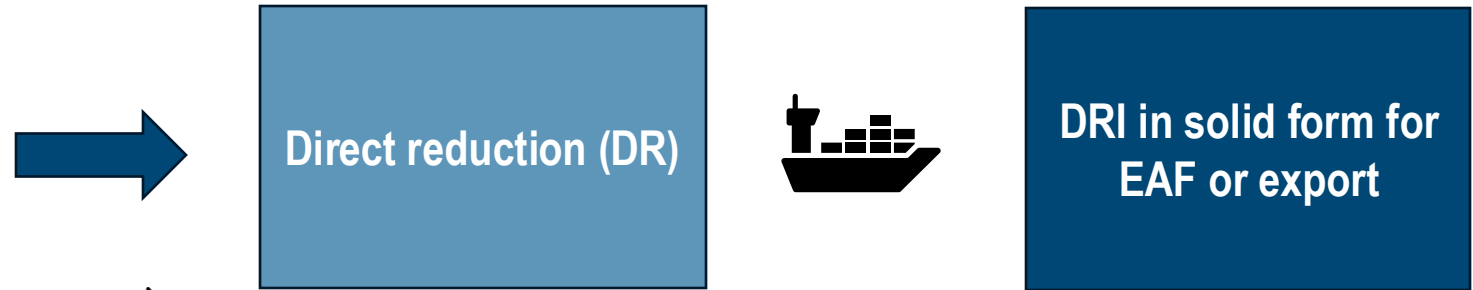
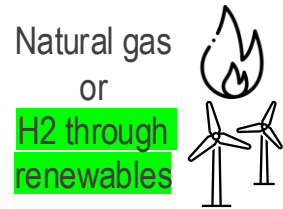
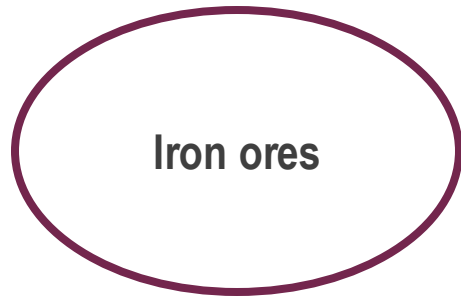
Why is a focus on green iron production and trade developments important?

What is **green** iron? Let's review the two main ironmaking processes:

Traditional integrated steelmaking



Direct reduction and green iron

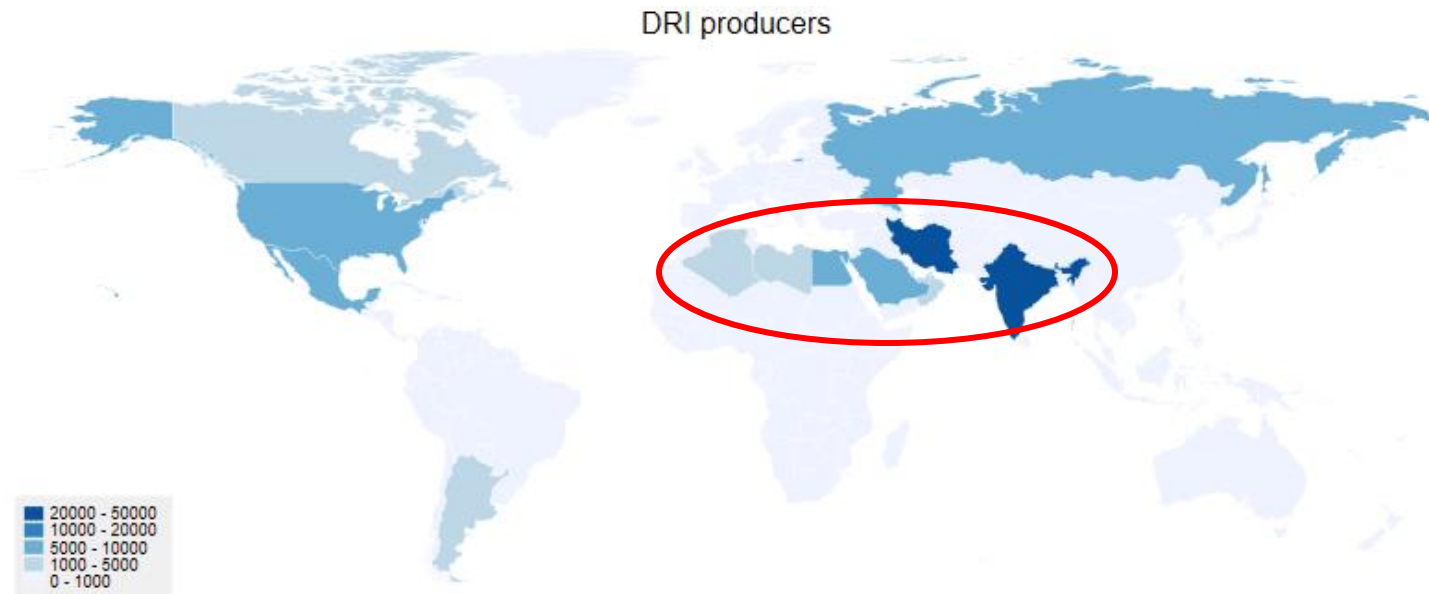


- DR is less carbon intensive than traditional methods.
- DR can be geographically separated from further steelmaking processes.
- DR obtained from renewable resources significantly abates carbon emissions.



Why is a focus on green iron production and trade developments important?

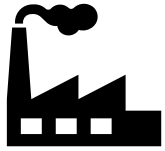
- **Australia** and **Brazil** are by far the largest producers and exporters of iron ores.
- But moving along the iron ores value chains, **other actors including MENA countries**, are playing a significant role in the **DRI production space**.



DRI production in volumes, '000 tonnes. Worldsteel.



Risks and opportunities of green iron



Transition to green iron may lead to a fundamental **transformation** of the entire global steel value chain...



...and to complex policy dilemmas that require **global cooperation and dialogue**.

Risks and opportunities

- Significant opportunity for iron producing economies.
- Support global decarbonisation efforts.
- Impacts on existing steel operations, governments and societies.
- Creation of newer business models.
- Unnecessary company and policy competition can further delay decarbonisation efforts.

- **Need for strong evidence base.**
- **Global cooperation and proper policy dialogue.**



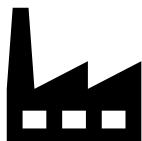
Governments and companies' actions

How are governments and companies positioning themselves in this scenario?



Government perspective

- What investments are needed to support green iron?
- Which segments of the steel/iron value chain need to be supported?
- How can international agreements with other countries help in this context?
- What are the economic and societal impacts of this transition?



Companies' perspectives

- **Iron ore producers:** either move to green iron production themselves or establish and strengthen relationships with steel companies?
- **Steel companies:** investments upward the value chain to safeguard access to critical resources and technologies?
- **Tech companies:** Ensure scalability of R&D investments to be able to compete.



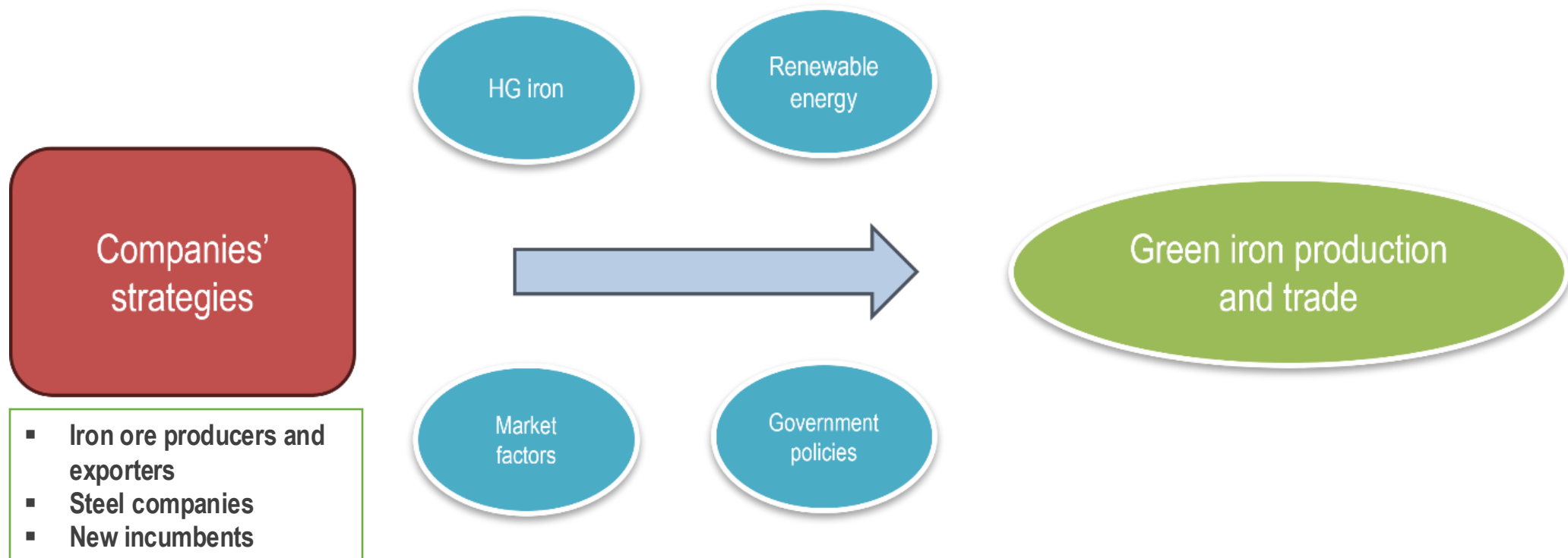
Objectives

- **Strengthening the evidence base** of current developments in green iron and iron ore markets to support more effective policymaking across industrialised, emerging, and developing economies.
- **Focus on key countries/players across the iron and steel value chain** to understand their roles and strategies in the transition to green iron.
- **Provide a platform for strategic dialogue**, fostering collaboration, and addressing challenges within the green iron landscape.



The underlying economic model

- Developments in green iron production and trade are the result of strategies and actions undertaken by companies across the steel value chain.
- These company actions do not take place in a vacuum but are driven by four main elements: access to renewable energy, availability of high-grade iron ores, market factors and government policies.
- Each of these elements is crucial for better understanding the future directions of green iron production and trade globally.





Case on Australia: Initial findings



Testing first case study results

- **Australia is uniquely positioned to play a leading role in the emerging green iron markets** thanks to its abundant iron ore reserves. Not yet clear whether Australian iron ore producers will prioritise green iron production over traditional iron ore exports.
- **The country also has vast potential for renewable energy and hydrogen development**, but current investment speed and quantity may not be competitive enough. Hydrogen incentives are being implemented, but there may be competition with other regions.
- **The infrastructure needs will be vast** (transport of the DRI/HBI, energy grids and transmission, pipelines, but also ports that are export-ready) and there have been some developments on energy transmission
- **Securing export markets for green iron remains a challenge, but cost competitiveness has high potential.** There is potential in markets like Korea and Japan, though access to China and Europe is more uncertain. Strengthening partnerships with potential buyers is critical, especially given the proactive efforts of other countries in the green iron space.



Testing first case study results

- **Australia has implemented supportive industrial policies for green iron production and exports, but the rapid development of necessary infrastructure remains a challenge.** Although ambitious policies have been introduced at both the federal and state levels, significant disparities exist between states, indicating a need for a more coordinated, comprehensive approach across all levels of government.
- **Australia's policy landscape is unique regarding steel decarbonisation,** compared to other OECD countries there is less emphasis on R&D funding, a much stronger focus on labour and skills, and with the Safeguard Mechanism.
- **The policy environment in Australia is unique because of the amount of leadership from states with regard to the electricity generation mix.** Although ambitious policies have been introduced at both the federal and state levels, significant disparities exist between states.
- **Ensuring a just transition is key:** in Australia more than elsewhere has a need for ensuring that skills and people are available at the right places. There are policy efforts in place to support this labour transition, and taking into account first nation land ownership is another important policy area.

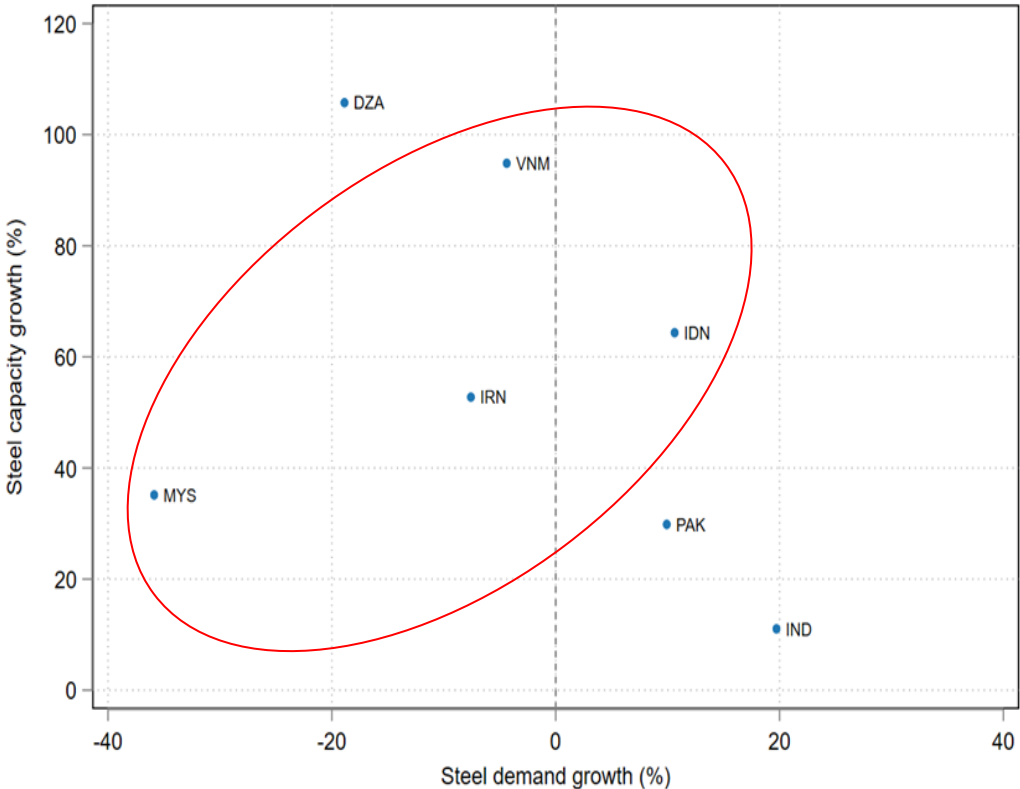
Thank you for your attention



Background slides

Excess capacity growth in a context of slow/negative domestic steel demand growth

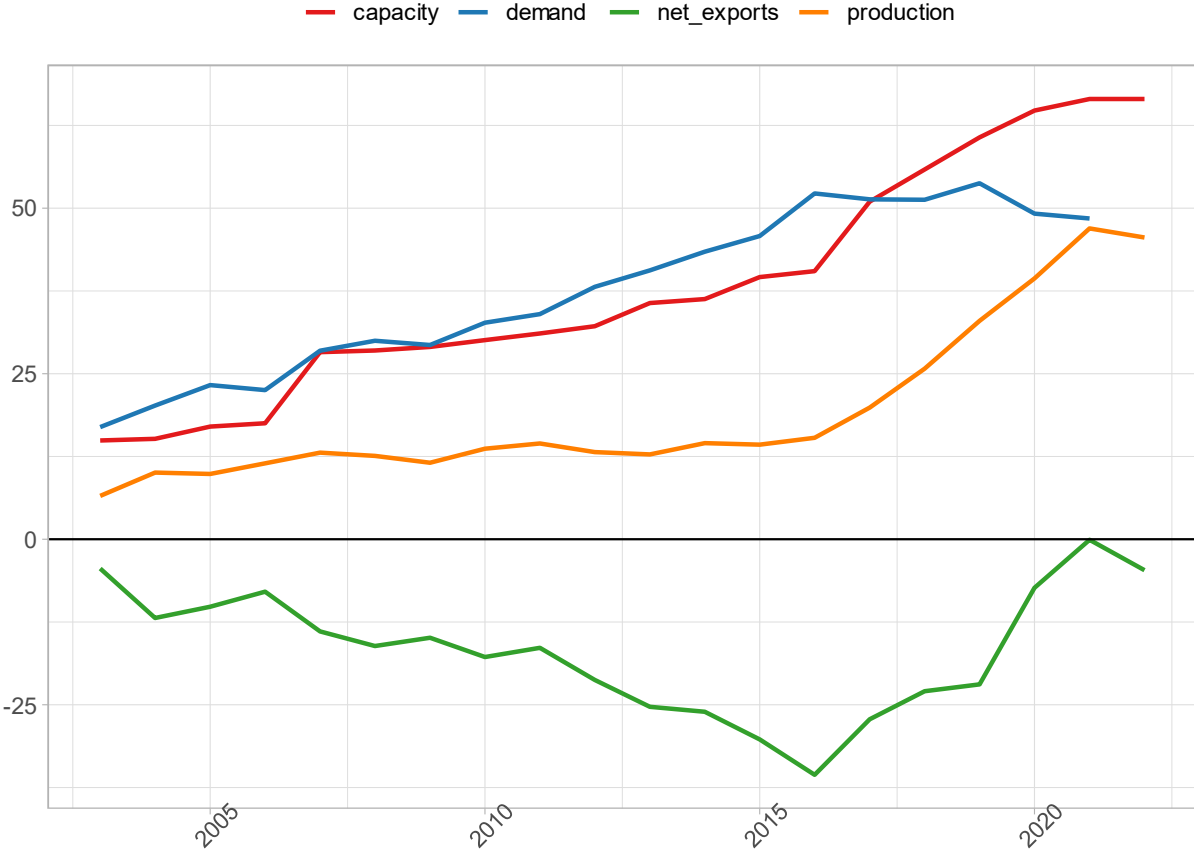
Capacity growth versus steel demand in selected economies (five-year growth to 2021)



Source: OECD

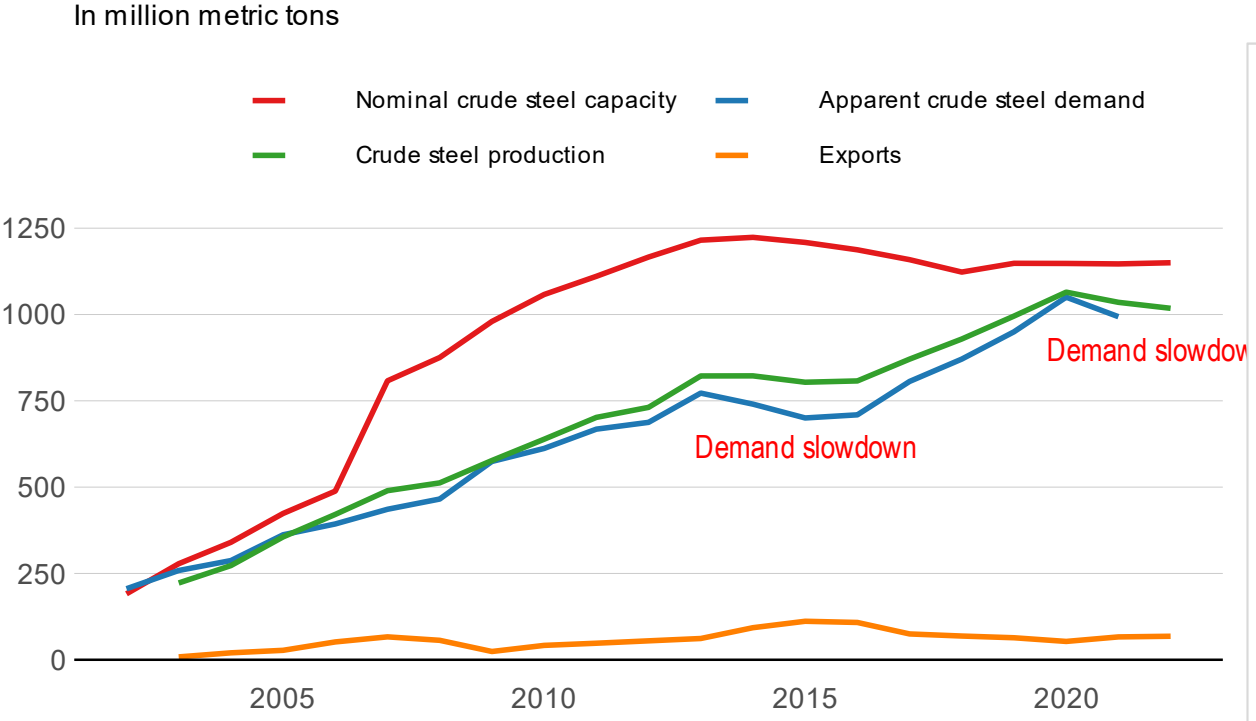
Capacity, production, demand and net-exports in 3 ASEAN economies (VNM, IDN and MYS)

In million metric tonnes

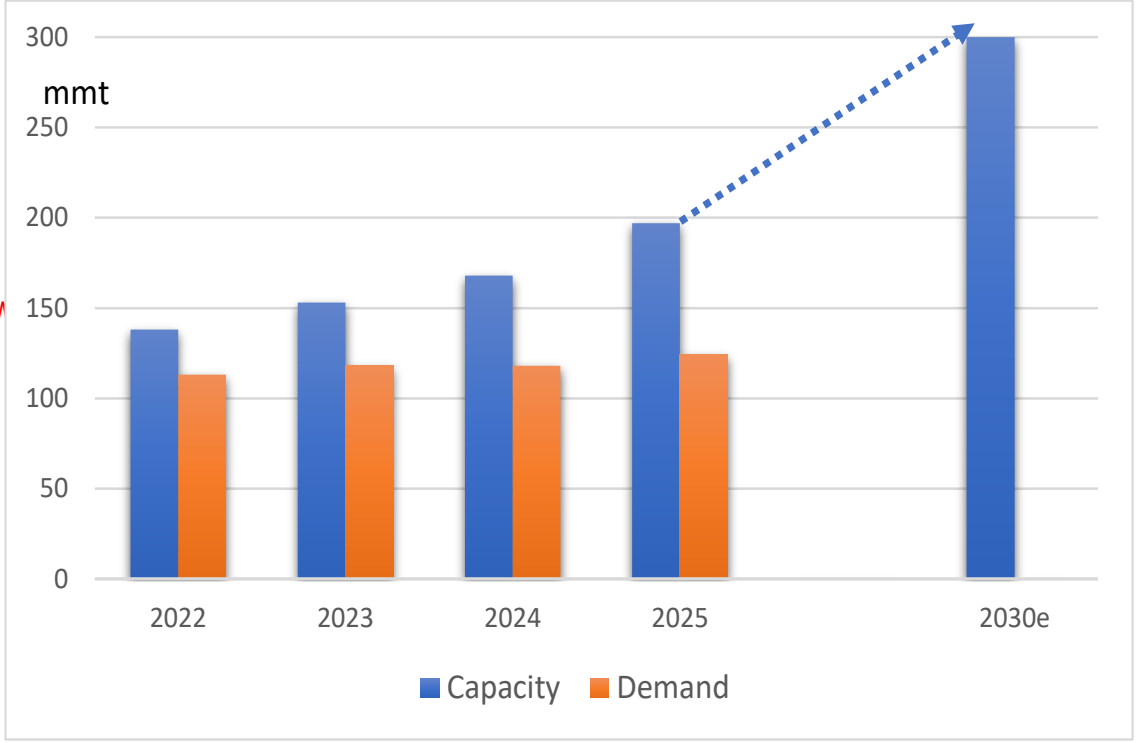


Risks ahead: weaker-than-expected steel demand in key countries would create oversupply problems

Capacity, production, demand and exports in China



Capacity vs demand in India



Source: OECD



Challenges and opportunities

- > Are Australian iron ore exports safe when China moves to greener steel production?
- > Would Australia's production of intermediary products be competitive versus South America and Africa?
- > Australia has an opportunity to shift towards onshore processing of iron ore using green hydrogen to produce low-carbon iron for export.
- > Green iron – made via DRI and exported as hot briquetted iron (HBI) – is now being considered for import by major global steelmakers instead of importing both iron ore and green hydrogen, as part of decarbonisation plans for an industry currently based on the import of iron ore and metallurgical coal. In its assessment of options for Western Australia's iron ore industry to position itself for a decarbonising steel sector, the MRIWA found that, “pathways which involve the development of intermediate iron products, such as HBI, are the most prospective for Western Australia.”
- > South Korean steel giant POSCO is considering a US\$40bn investment in Australia with US\$28bn earmarked for green hydrogen production and a further US\$12bn for the production and export of green HBI. Japan's largest steelmaker, Nippon Steel, is considering a US\$700m investment in hydrogen-based green steel outside Japan with Australia a possible location. In addition, China Baowu Group – the world's largest steelmaker – is considering a major green iron project in Western Australia.
- > However, in a sign of the growing competition Australia faces as steelmakers start thinking about the offshoring of green iron production, both China Baowu and Nippon Steel are considering other locations. China Baowu is also looking at South America, Africa and the Middle East as possible green iron/steel investment locations and has signed an agreement with Aramco and the Saudi Public Investment Fund to set up a DRI-based steelmaking plant in Saudi Arabia to supply the domestic and regional market. Nippon Steel is considering Brazil – with its high-quality iron ore reserves – in addition to Australia.



- > “Australia has the world’s best iron ore resources and supply chains, highly innovative minerals processing expertise and some of the world’s greatest renewable energy potential – so we have a unique opportunity to reduce the emissions associated with steelmaking,”
- > “The green steel story for Australia, is not just about making green steel onshore here - but about our much bigger role in the international steel supply chain,”
- > The recently-announced India-Australia Green Steel Partnership is a five-year program funding CSIRO research to support commercialisation of technology that will help reduce global greenhouse gas emissions in steel production and mutually benefit India and Australia.
- > Western Australia accounts for 38% of the global supply of iron ore and is the leading Australian state in iron ore production – 934 million tonnes (mt) in 2022 – according to the Australian Government’s Office of the Chief Economist. Brazil, our major competitor, accounted for only 17% of the global supply.
- > Technology-driven decarbonisation of heavy industry (i.e., steel production) can help maximise export opportunities beyond iron ore and can build resilience in Australia’s major international supply chains. Advances in “green” steel production can also support establishing a commercial hydrogen industry.
- > Going forward green iron and steel plants will need to be placed in regions with low-cost renewable energy sources. Australia could become a leading green iron hub by developing dedicated renewable energy infrastructure close to iron ore production centres.

Evolution of Australian iron ore value chain & partnership

POSCO

Hancock (Roy Hill)

- 2010: POSCO's first investment on iron ore mining project in Pilbara
- 2012: Equity agreements with POSCO with its 12.5% stake in the Roy Hill Consortium
- 2015: First shipment of iron ore delivered to POSCO in Korea
- 2021: Partnership on GHG emissions reduction technologies on CCUS & green hydrogen
- 2022: MOU for strategic cooperation in developing metals, e.g. lithium, nickel, copper, iron ore & HBI
- 2023: POSCO fully recovered initial investment of \$962 million on mining project in 2010

Rio Tinto

- 1973: the 1st shipment of Pilbara iron ore to Korea
- 2021: MOU with POSCO on decarbonisation across the entire steel value chain

Fortescue Metal Group (FMG)

- 2020: Agreement on POSCO participating Green hydrogen production project



Resources

- > [Green Steel WA – Bringing Green Steel Manufacturing to WA](#)
- > [FLASH: Australia grants \\$200 mln for greener steelmaking | Mysteel](#)
- > [CSIRO, Swinburne to study steel, metals decarbonisation - Australian Manufacturing Forum \(aumanufacturing.com.au\)](#)
- > [ASEAN-Australia cooperation in the clean energy transition | Lowy Institute](#)
- > [Australia's Green Revolution: A Zero-Carbon Economy and Industrial... \(bnnbreaking.com\)](#)
- > [Green steel: Synergies between the Australian iron ore industry and the production of green hydrogen – ScienceDirect](#)
- > [Australia faces growing green iron competition from overseas | IEEFA](#)
- > [BHP, Rio Tinto, BlueScope Steel: Australian 'green' steel a step closer as iron ore rivals team up \(smh.com.au\)](#)
- > [Rio Tinto, BHP, BlueScope: Green steel push unifies rivals \(afr.com\)](#)
- > [Steeling ourselves: How Australia can support the transition to net-zero steel – CSIRO](#)
- > [India-Australia Green Steel Partnership – Towards Net Zero Mission \(csiro.au\)](#)
- > [Green Steel - Minerals Research Institute of WAMinerals Research Institute of WA \(mriwa.wa.gov.au\)](#)
- > [Green Steel Resources - Minerals Research Institute of WAMinerals Research Institute of WA \(mriwa.wa.gov.au\)](#)
- > [MRIWA Final Reports - Final-Report_10471_MRIWA_M10471 - Part 1.pdf - All Documents \(sharepoint.com\)](#)
- > [Opportunity and Challenges for Australian Green Steel – HyResearch: Australian Hydrogen R&D Portal \(csiro.au\)](#)
- > [The iron throne: Will green steel threaten Australia's iron ore fairytale? — Capital Brief](#)
- > [Competing for Green Steel: National advantages and location challenges | IEEFA](#)



Australia needs to step up if it wants to compete in the green steel race



IEEFA