



What's the deal with **green** steel?

→ Threats and opportunities to
reach net zero

Dr. Zeynep Kurban

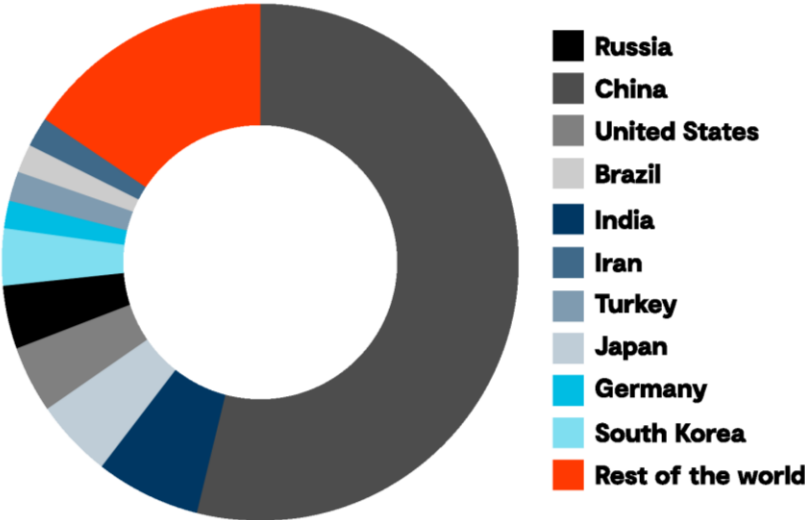
Technical Director – Future Energy



The decarbonisation challenge for steel



Crude Steel Production by country: 1.88 billion tonnes in 2022



Steel accounts for 7% of total global CO2 emissions

2.6% of all UK GHG emissions in 2020
 The UK has 0.4% of global steel production



30% GHG reduction by 2030

To put the sector on the trajectory for net-zero by 2050



Huge amounts of green electricity needed to decarbonise steel

EU: 94 Mt green steel, needs ~6.6Mt of H2 and 296 TWh of RES per year [1]
 UK: 11.7Mt green steel, needs 0.8 Mt of H2 and 36.8 TWh of RES per year



Large investments needed to decarbonize iron and steel

In the EU > €180 Billion investment in steel plants, electrolysers and RES is needed

[1] EU Parliament, Carbon free steel production, 2021

Global decarbonisation drivers



20% of world steel producers have committed to net-zero

45 green steel projects have been announced publicly across 17 countries ^[1]



Policy

- The EU's REPowerEU plan: 30% of the primary steel production in the EU to be decarbonised by 2030 using H₂
- EU Emission trading system (EU ETS) & Carbon Border Adjustment Mechanism (CBAM)

Funding (EU & UK)

- EU Clean Steel Partnership (CSP) and Research Fund for Coal and Steel (RFCS) – €600M.^[2]
- EU €500M support for Germany and Spain, UK: £250 million to help decarbonize steel ^[2]

Consumer Demand

- Demand for green steel is increasing (Toyota & Volkswagen)
- Increase in consumer willingness to pay 'green premium'

“Support is lacking for decarbonised industry in a new era of global competition. The UK Government has high ambitions for decarbonised steel production but has no clear policy to deliver it.”

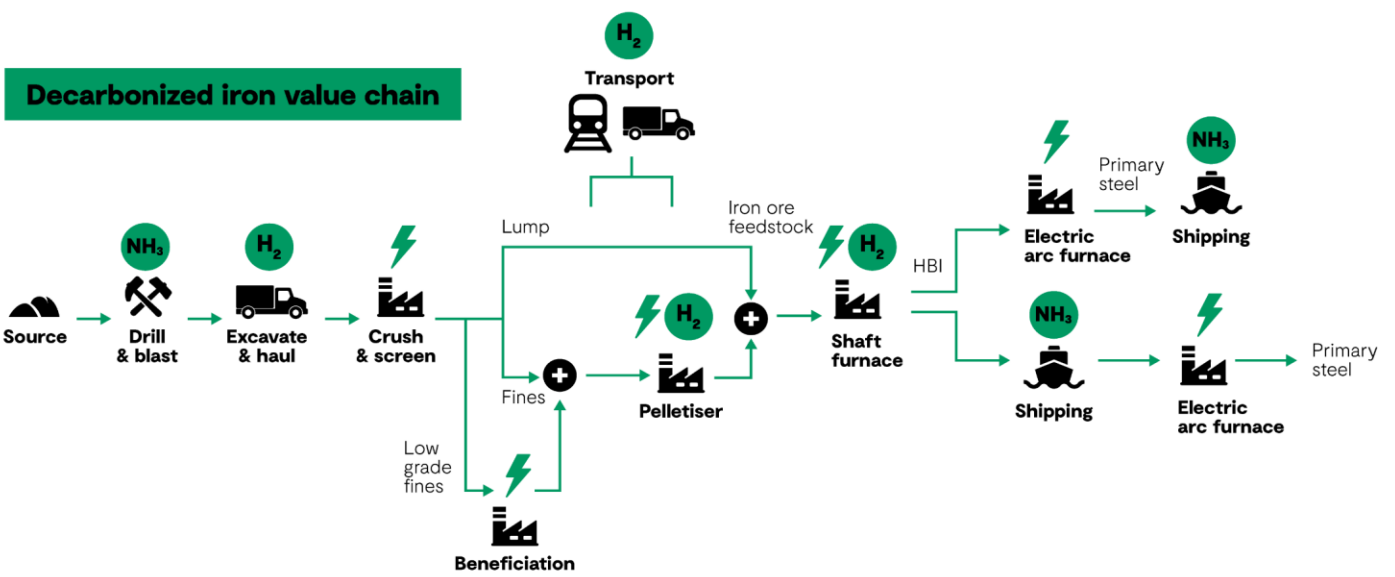
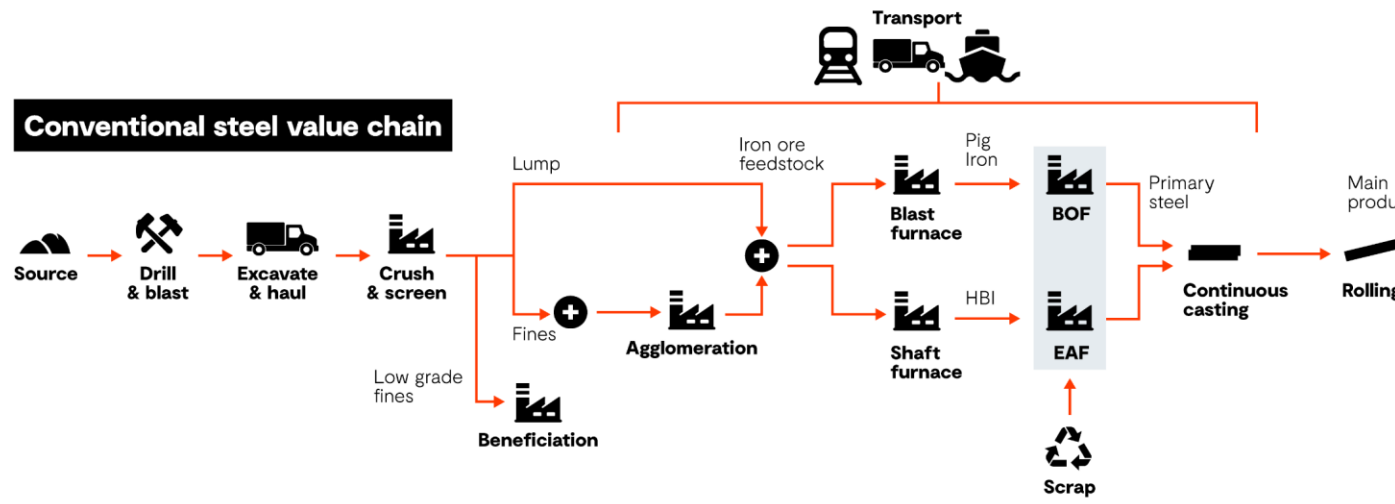
- GHD summary, Climate Change Committee Annual Report

[1] Green Steel Tracker - Leadership Group for Industry Transition

[2] Research Fund for Coal and Steel (RFCS) (europa.eu)

[3] Creating a Clean Steel Fund: call for evidence - GOV.UK (www.gov.uk)

The technology routes: conventional vs H2-DRI



Emission per ton of steel in each pathway

	Coal based BF-BOF: 2 tCO ₂ 80% of UK production
	Gas based DRI-EAF: 1.4 tCO ₂ (-30%)
	Scrap Steel: 0.4 tCO ₂ (-80%) 20% of UK production
	H ₂ -DRI-EAF: 0.19 tCO ₂ (-95%)

- Gas-fired power
- Solar wind power
- Diesel/bunker fuel
- Natural gas
- Green hydrogen
- Green ammonia
- Coal/coke

The location dilemma: supply of low-cost H₂

Of the nations producing steel today...

↳ **Almost 40%** will not have access to cheap RES and natural gas, or CCS capability ^[1]

↳ **Only 36%** will have access to natural gas or cheap renewable energy at scale

The location dilemma: supply of low-cost H₂



Single Average EU Steel Plant - 4Mt Green Steel/year



4.5-5.0 GW of solar power



1.2-1.3 GW of electrolyser, @ full load



€3.3B capital investment (assuming €1.2B for electrolyser unit)



10 – 22 hectares of land for the electrolyser plant + RES

Source: Hydrogen Europe, Steel from Solar Energy, 2022



What does this mean?

- As H₂-DRI will be more cost effective in countries with low-cost energy and H₂, there will be a shift in supply chains
- Steel producing countries must account for the macro-economic implications



Welcome

The case for **green steel** in the UK

In 2020 the UK steel industry contributed £2bn to the UK economy (GVA). UK imports ~60% of steel required nationally.



Challenges

- CCC's 6th Carbon Budget recommends for **all ore-based steelmaking** to be **net zero by 2035**
- Integrating H₂ in reduction of iron ore requires new plants – CCUs presents an **interim decarbonisation solution**
- High Grid Electricity Prices: UK steelmakers currently pay **almost 60%** more than their European counterparts ^[1]

Opportunities

- UK demand for steel is expected to grow by 2030, presenting an opportunity to **reindustrialise** and create **green jobs**
- Globally, **no steel sector has yet decarbonised** – the UK can secure a first-mover advantage ^[1]
- Potential for large amount of RES can be **coupled with H₂ production projects** to supply the demand for green steel

[1] Net Zero Steel - A Vision for the Future of UK Steel Production | Make UK

Going green: steering the UK industry for change

1. Policy

Learnings from the EU – CO2 standard to define ‘green’ steel & Carbon Border Adjustment Mechanism

Carbon pricing (domestically) – Internationally Harmonised

2. Low-cost RES/H2

Affordable low-carbon H2 – development of necessary infrastructure with access to large amounts of low-cost renewable energy for green H2 and CCUS for blue H2

3. Funding and Investments

Government and public sector funding to ensure competitiveness of H2-based steel production with acceptable cost premiums captured (for CAPEX and Revenue Support e.g. Contract for Difference)

Public and private sector investments that bring together renewable energy producers, H2 producers and green steel producers



Thank You

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zeynep.kurban@ghd.com