Global steel industry overview and expectations

OECD Steel Committee Meeting

March 25, 2024

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Disclaimer

Agenda

- Global steel demand outlook
- Global steel production structure
- Raw materials markets

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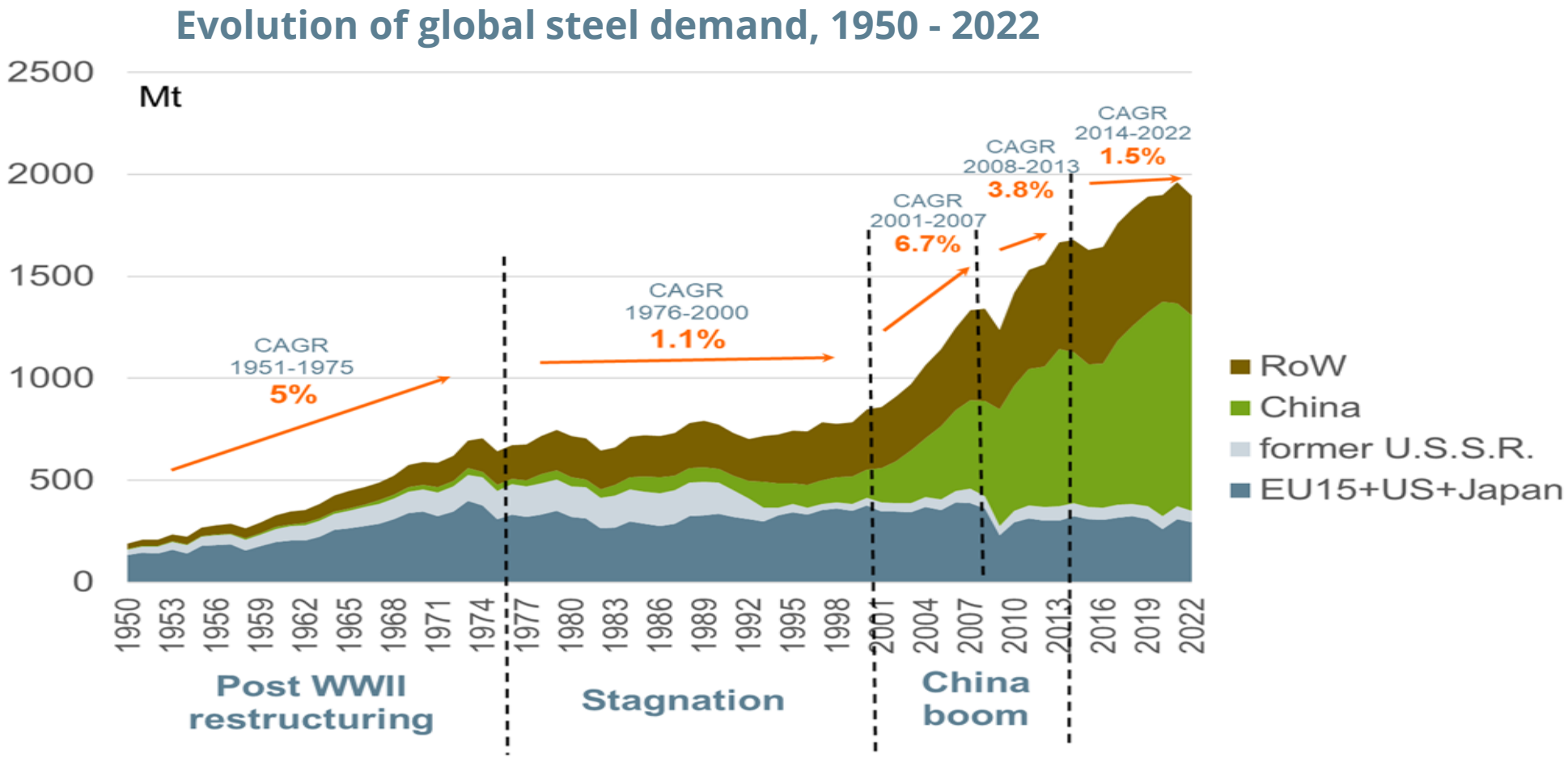
Global steel demand outlook

Global steel industry at another inflection point



Source: worldsteel, steel demand in crude steel equivalent terms

Chinese steel demand peaked in 2020 and will most probably show a declining trend over the medium term

Source: worldsteel

- Chinese economy's overdependence on investment in property and infrastructure driving a surge in country's debt burden since mid-2010's
- Property represents 30-35% of China's steel demand…
- China implementing measures to rein in property investment and replace it with investment in new tech & consumption, but it takes time to turn around a model that has been followed for 40 years….

Pockets of growth with particularly strong fundamentals in India & SEA…

	Population, Million		Urbanization %		GDP per cap th current US$		Steel use per cap kg
	2022	2030	2022	2030	2022	2028	2022
India	1,42	1,515	32.7	37.0	2.3	3.7	82
Mexico	127	134	79.2	81.8	10.9	14.7	196
Vietnam	98	102	33.6	39.9	4.1	7.0	226
Developing Economies excl. China	5,480	6,040	49	53	4.4	5,7	92
Developed Economies*	1,073	1,090	80	84	53.7	67	350
World	8,000	8,550	57%	60%	12.5	15.0	220

2/3 of world population with steel intensity < 100 kg

…but probably not big enough to result in another period of strong global steel demand growth

Outlook from megatrends window suggest strong infrastructure construction activity over the next 2-3 decades

Last 3-4 decades saw a persistent underinvestment in infrastructure

New development strategies in major economies showing major focus on infrastructure

Climate change: requiring an economic transformation of huge magnitude and scope

Shifts in global geopolitical landscape and supply chain structure underpinning infrastructure investment

Technological progress: building the digital infrastructure for the smart era

Demographic trends also supporting growth in global infrastructure investment

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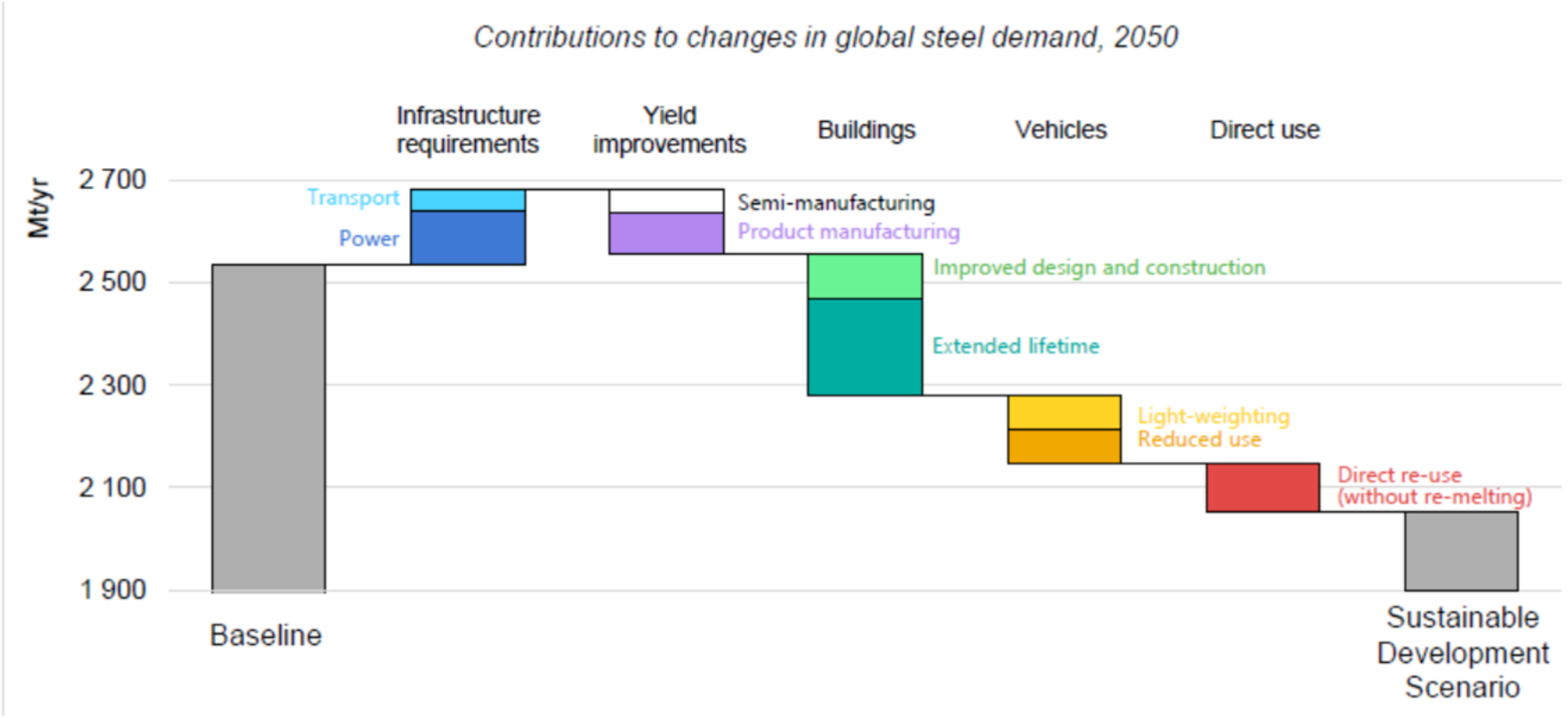
Circularity and efficiency gains in steel use



Source: IEA Iron and Steel Technology Roadmap 2020

IEA expects significant yield improvements and wide adoption of circular economy

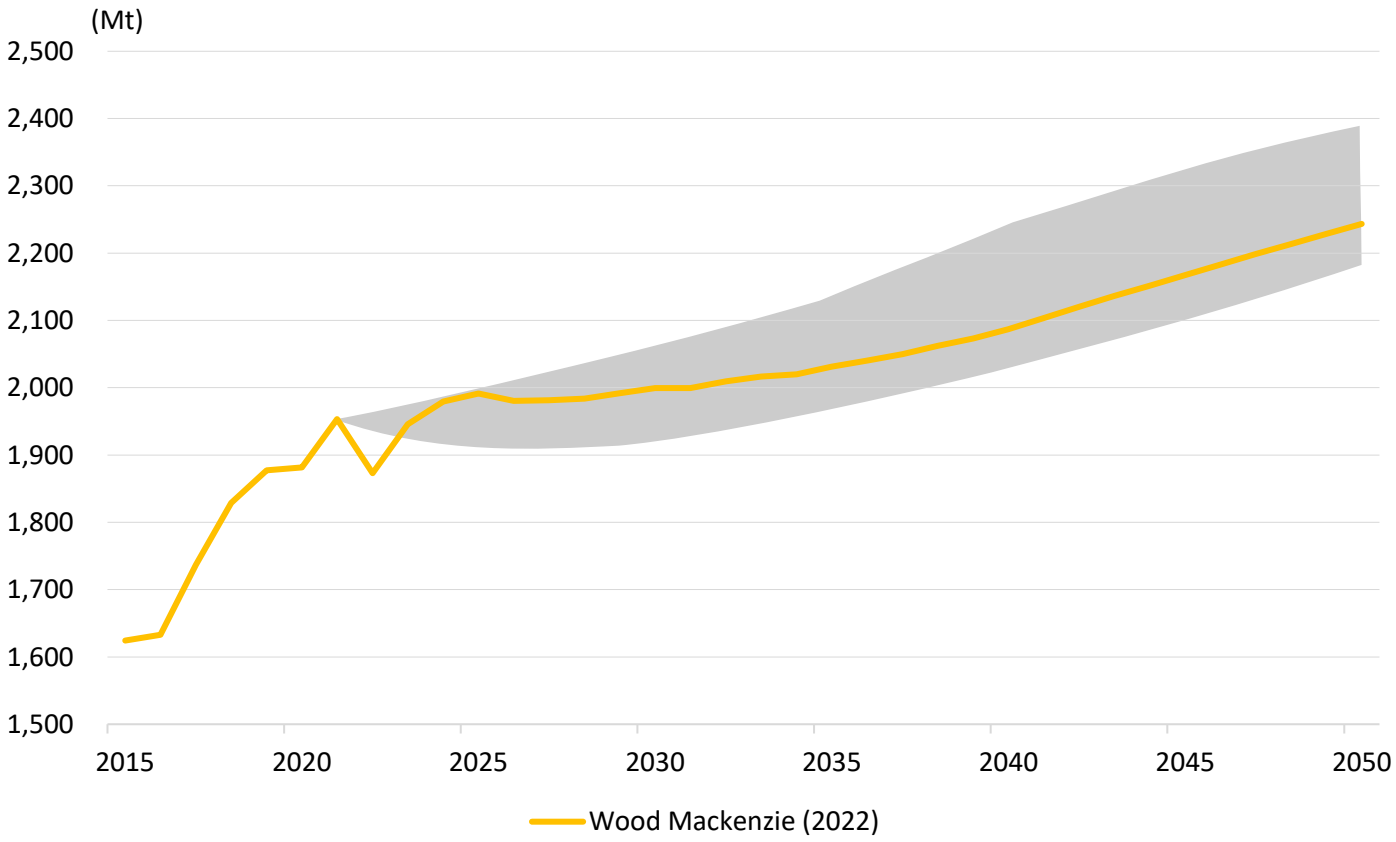
Inter-material competition

Steel using sectors require high-volume, low-cost, high-performance materials for most applications. While steel meets all these requirements, alternative materials are most often subject to severe volume, cost or performance limitations.

Moreover, steel is usually the material having the lowest environmental footprint amongst its alternatives for most applications. With a sensible decarbonization pathway, steel can easily maintain or even improve its environmental footprint vis a vis competing materials.

Long-term global steel production anywhere between 2-2.5 Gt

[Global crude steel production forecast]



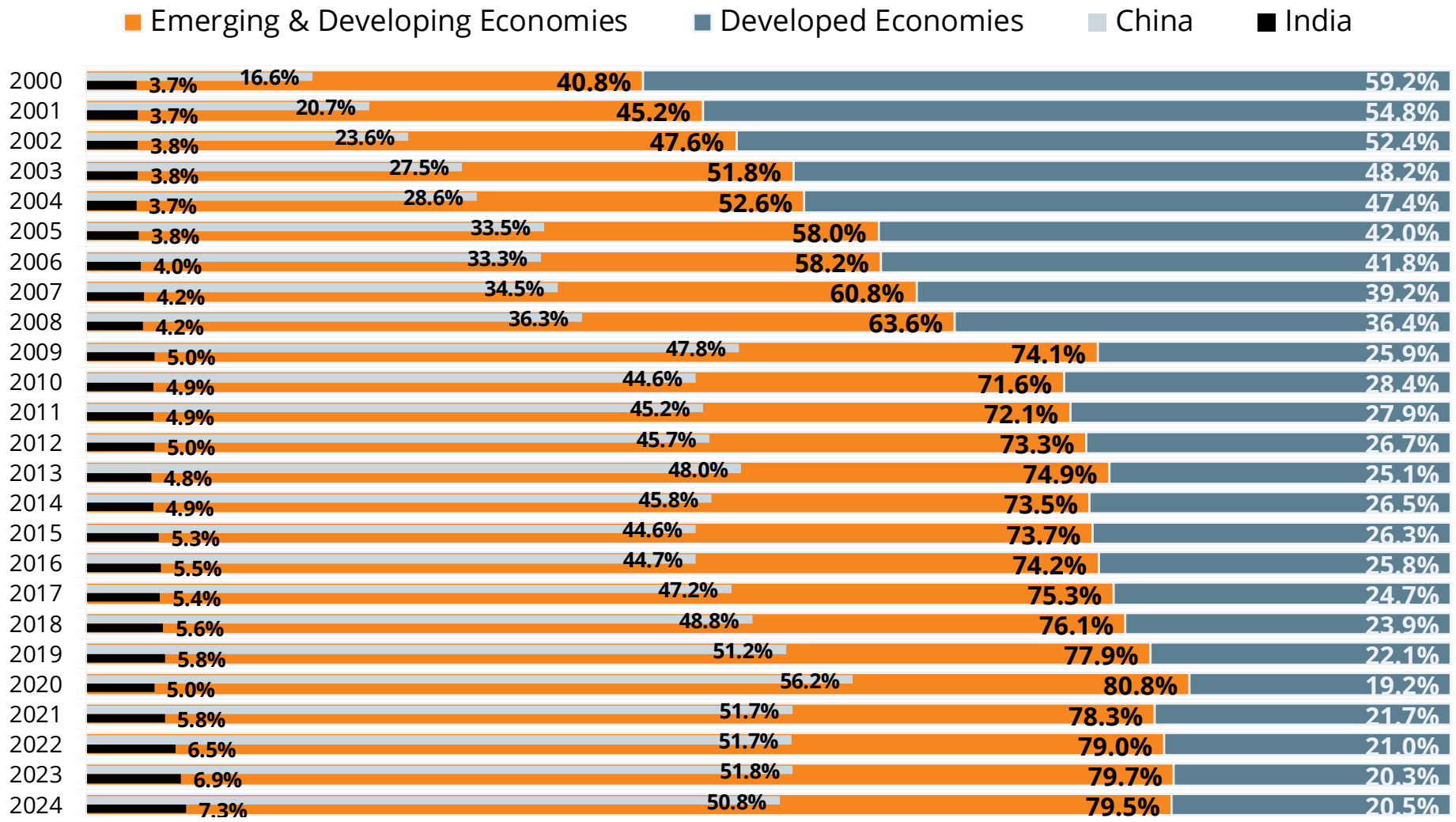
Source : Wood Mackenzie(‘22.6.)

Global crude steel production (’20-’50)

- **Various institutions :** Project modest growth of about 1% annually next 30 years to 2.2-2.4 billion tonnes in ‘50. China’s crude steel production to peak between ’20~ ’30
- **Wood Mackenzie** : Forecasts China’s crude steel production peaking in ‘20 to reach 804 Mt in ’50 under zero carbon initiative (‘70), and India and SEA’s production replacing China’s after ’40

Evolution of regional shares in steel demand

Steel demand, finished steel (SRO October 2023)



Low trend growth for global steel demand…

… **but many growth opportunities for steel business!**

- Developing economies other than China
- Electrical steels
- Infrastructure segment
- Energy applications
- Low carbon steel

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Global steel production structure

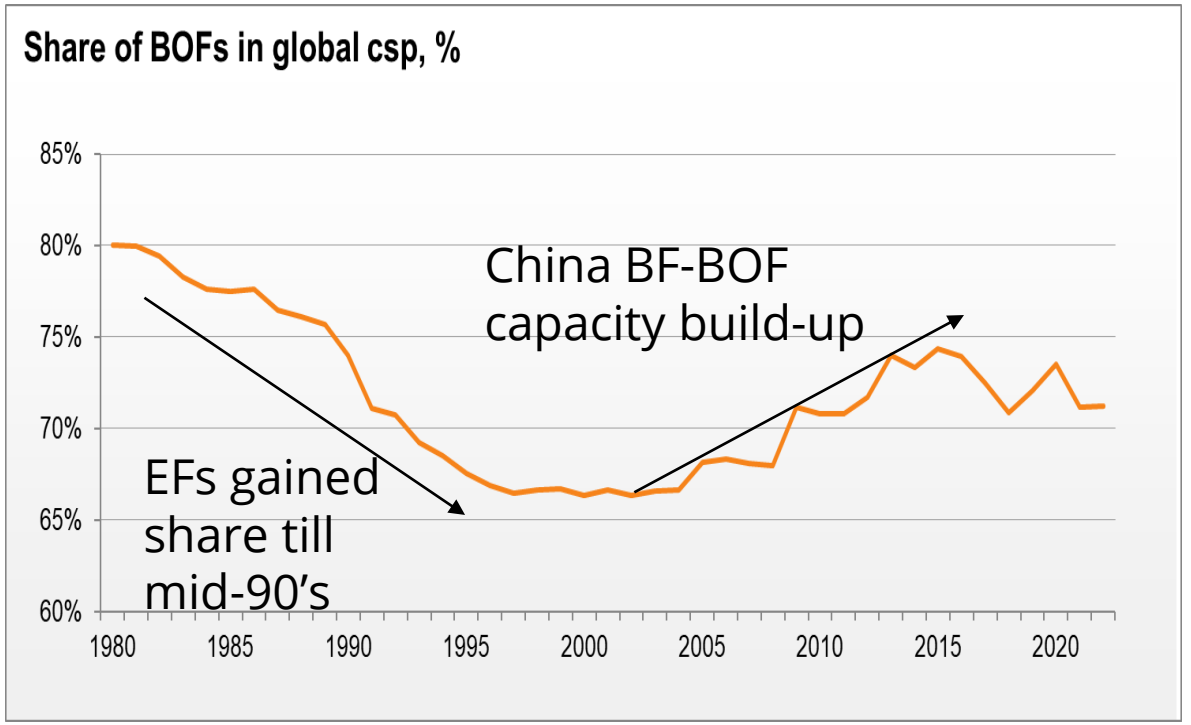
Global steel production and metallics demand

2022 world crude steel output	1,880	
BOF	**1,339**	**71%**
BF iron	**1,227**	**84%**
Scrap	**230**	**16%**
EF	**541**	**29%**
BF iron	**60**	**10%**
DRI	**123**	**20%**
Scrap	**420**	**70%**

2022 metallic demand for steelmaking, Mt		
BF iron	1,288	62%
Scrap	650	32%
DRI	123	6%
Iron ore	~2,250	
Coking coal	~950	
PCI	~200	

Source: worldsteel

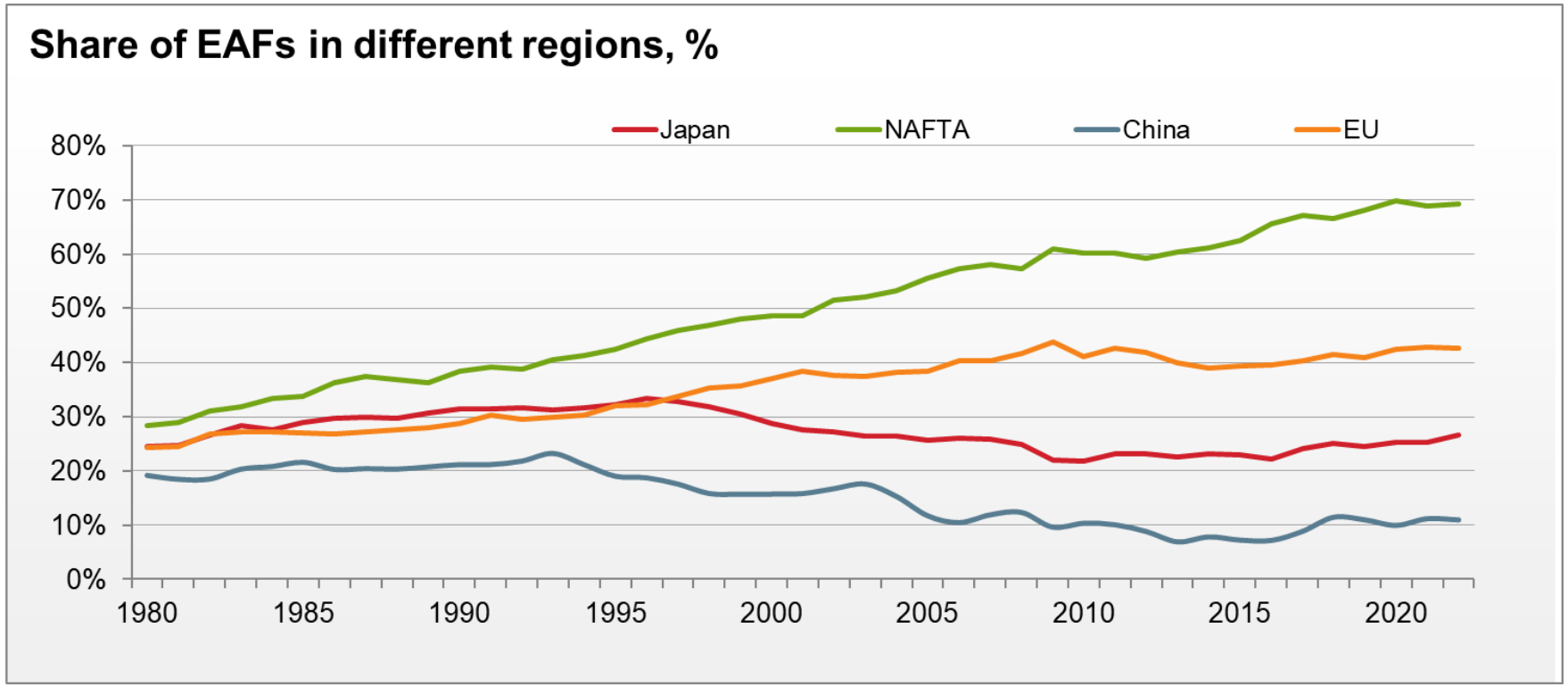
Global steel production structure have shown dramatic changes over the last three decades…



And will continue to change rapidly under increasing decarbonization pressures and as capacity in developing countries continue building up

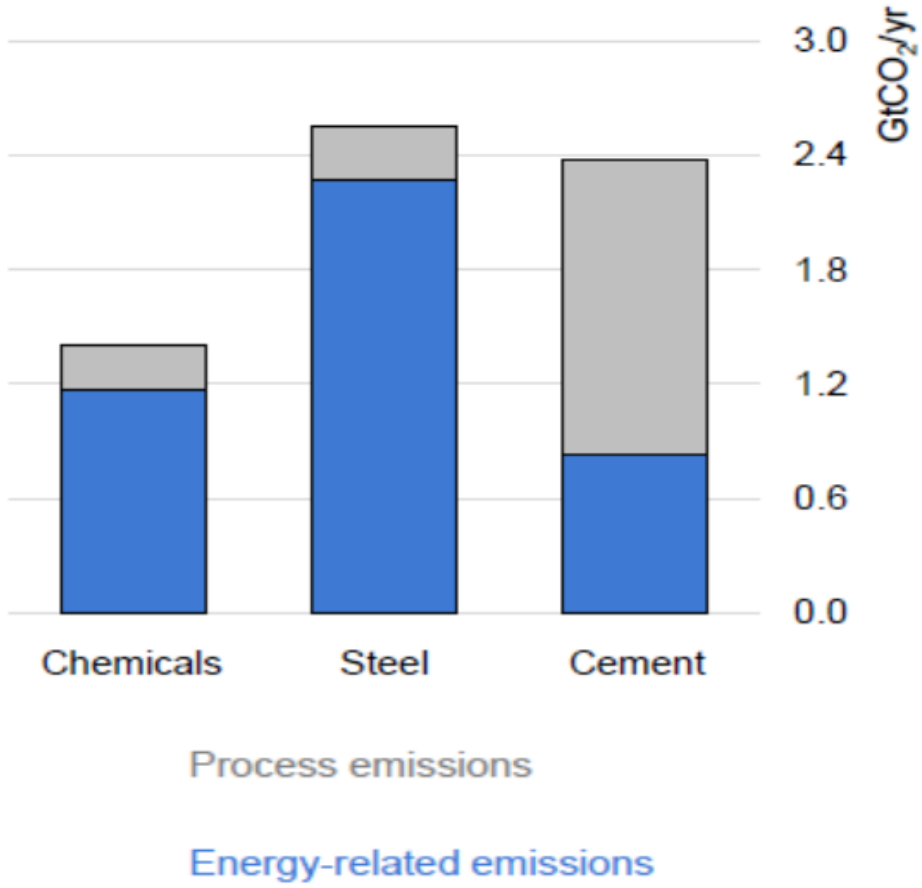
Source: worldsteel

Evolution of steel production structure heavily impacted by local conditions such as raw materials and energy availability and even mindset



Source: worldsteel

Global iron & steel industry - an energy & emissions intensive sector

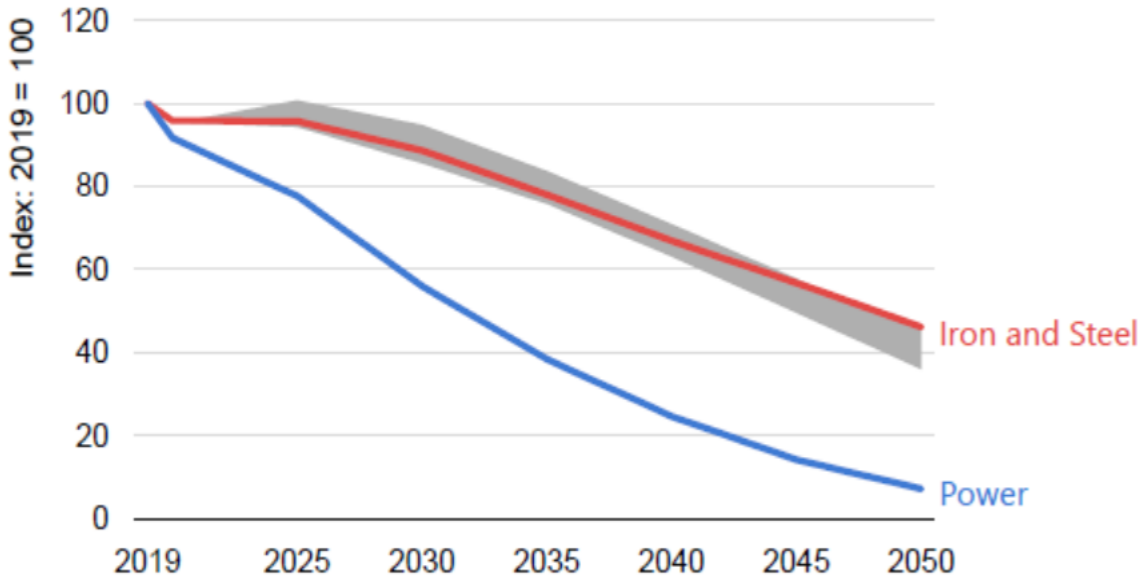


- Direct emissions of the sector account for about 7% of the global total and more than the emissions from all road freight
- Including indirect emissions from the power sector and the combustion of steel off-gasses, the share of energy system CO2 emissions attributable to the iron and steel sector rises to about 10%

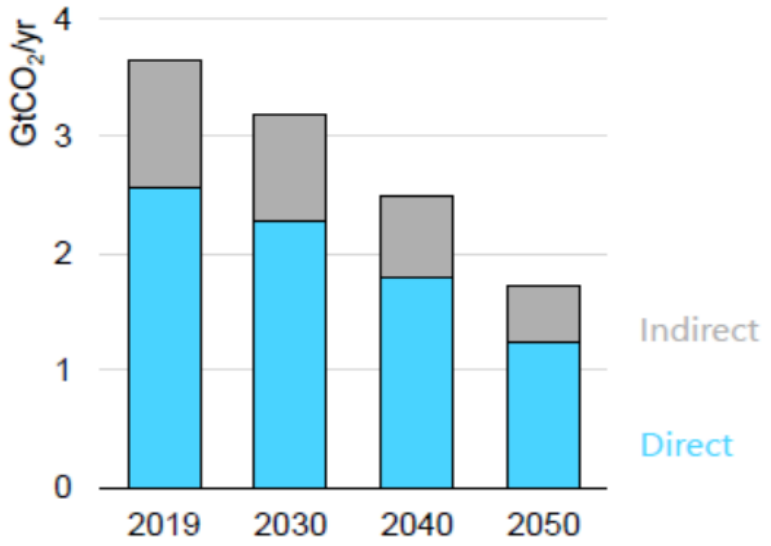
Source: IEA Iron and Steel Technology Roadmap 2020

IEA's CO2 emissions projection for the iron and steel sector

CO_2 emission trajectories in the Sustainable Development Scenario



Iron and steel sector direct and indirect CO_2 emissions in the Sustainable Development Scenario

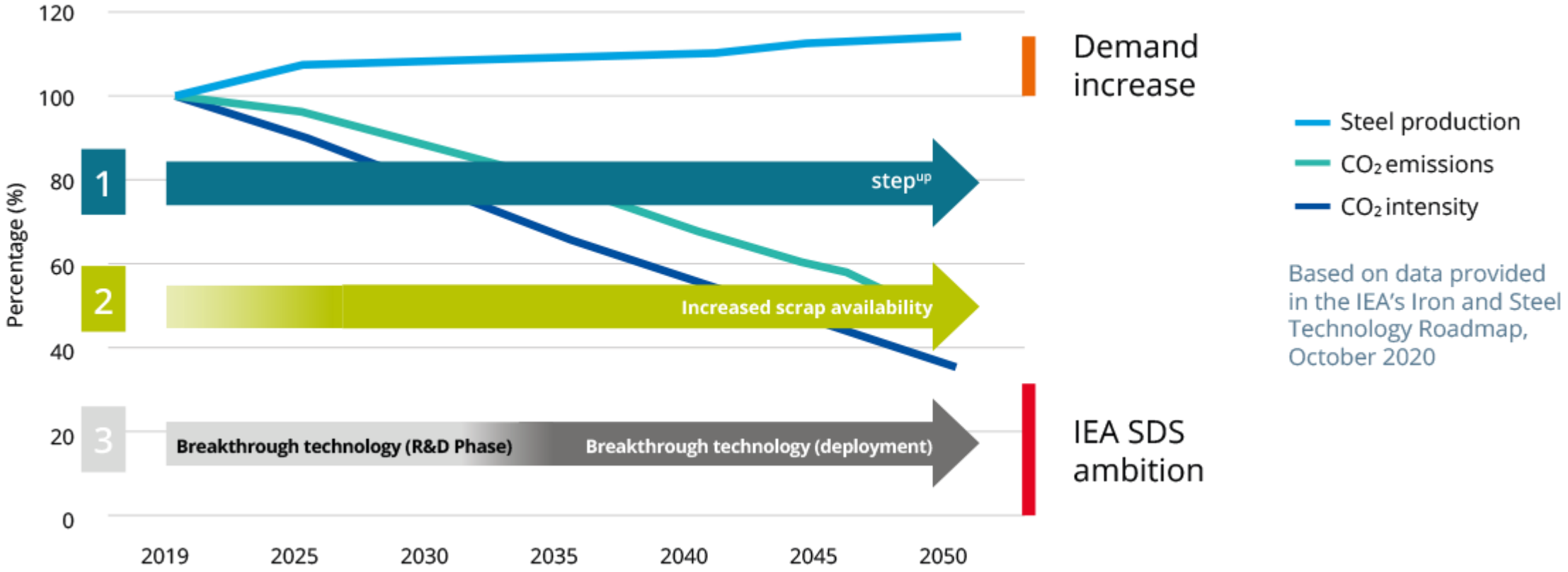


Source: IEA Iron and Steel Technology Roadmap 2020

IEA's SDS projection suggests a 55% in iron and steel industry's emissions in 2050. CO2 intensity of the sector should drop by about 60% from 1.4 tCO2/t of crude steel to 0.6 tCO2/t (direct emissions)

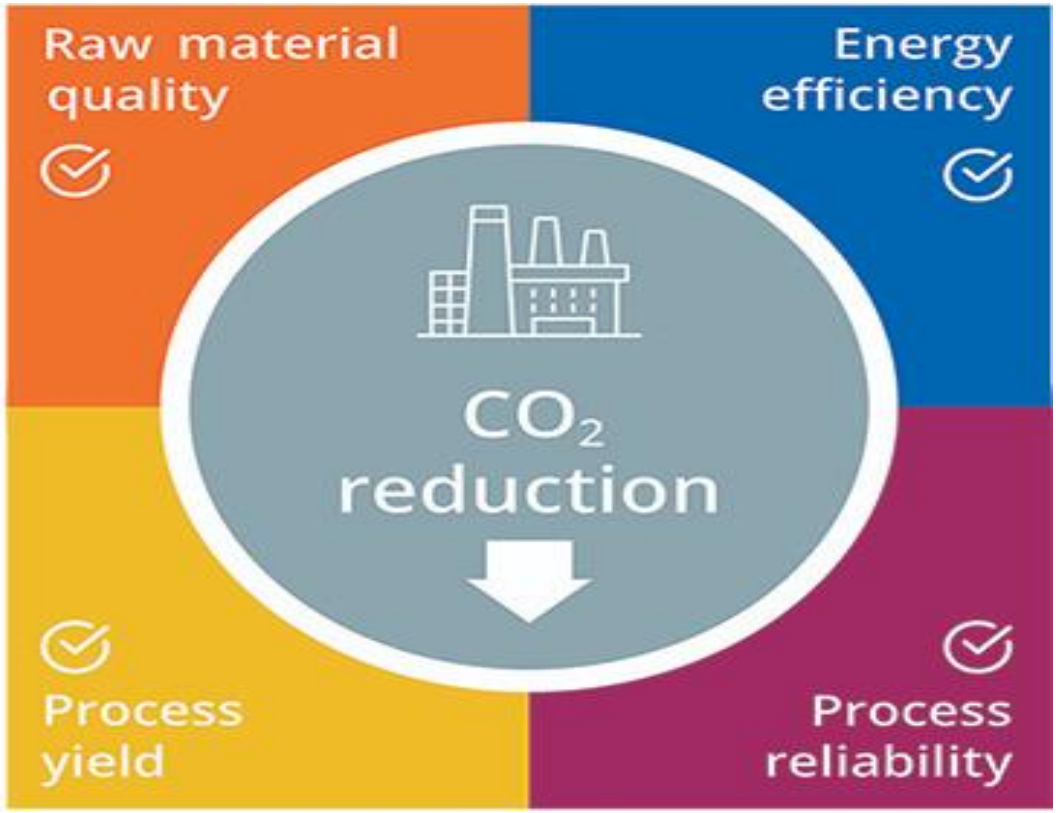
Reducing our impact: three components

Steel production, total CO_2 emissions and CO_2 intensity, 2019 – 2050 under the International Energy Agency (IEA) Sustainable Development Scenario (SDS)



Source: IEA Iron and Steel Technology Roadmap 2020

Efficiency improvements in steelmaking

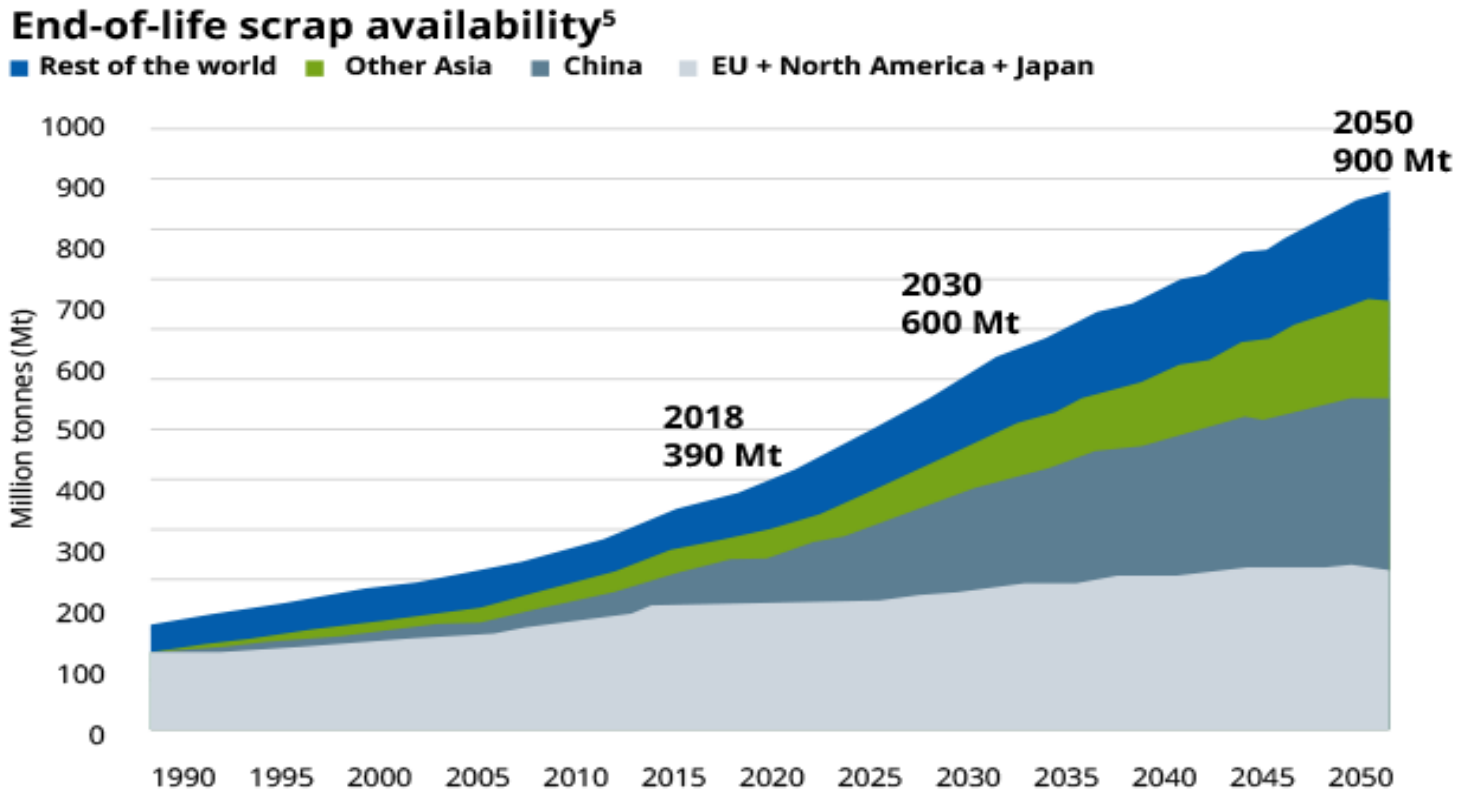


- worldsteel's Step-up programme shows there is about 15% improvement potential in energy use and CO2 emissions for many facilities around the world
- This potential can be achieved by using the existing technology in place on most sites, if the industry applies best practices from the better performing sites across the industry

Source: worldsteel Step-up programme link

About 15% improvement potential in energy use and CO2 emissions, which can be achieved by using the existing technology in place

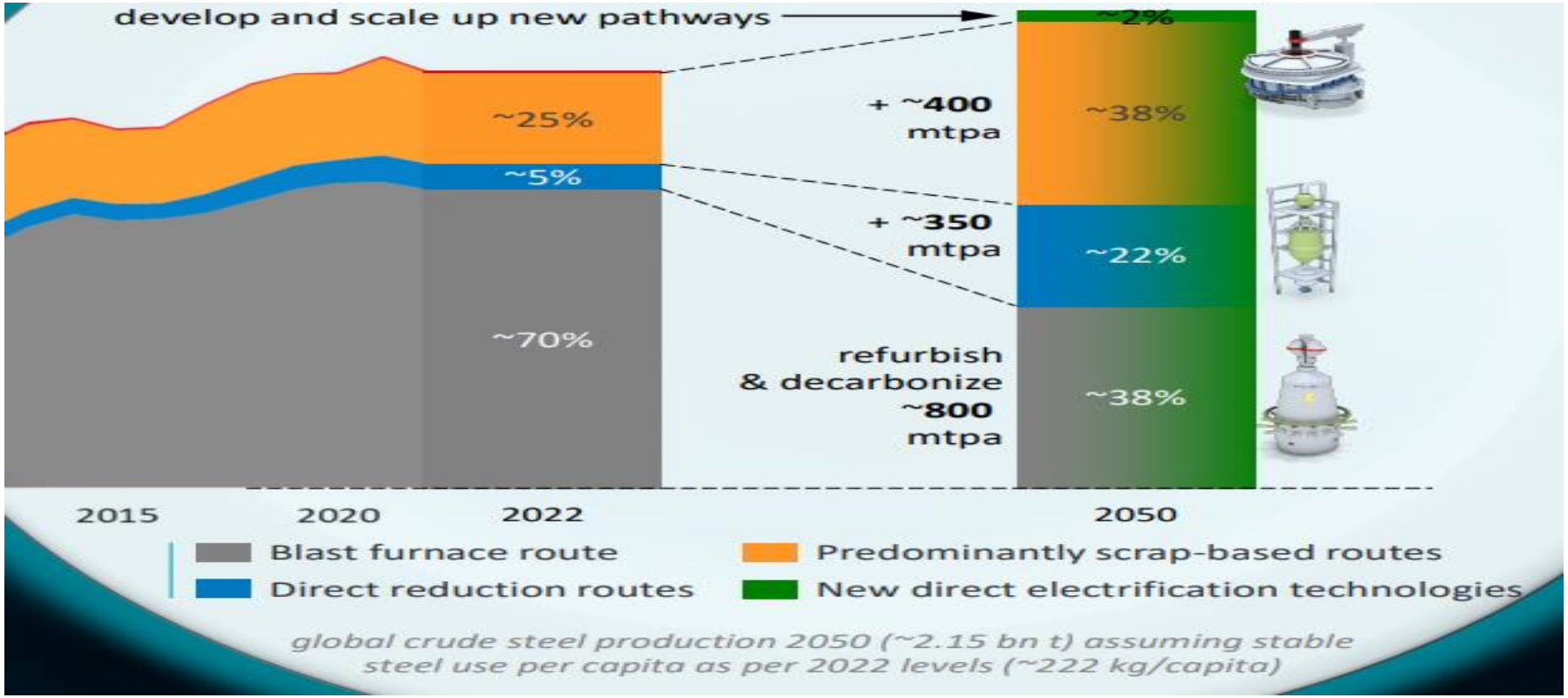
Growing scrap availability will be one of the biggest decarbonization levers for the industry



Source: worldsteel's scrap availability model

Highly uncertain outlook for evolution of steelmaking structure under decarbonization pressures

2050 Global crude steel production technology mix



Source: SMS Group presentation at worldsteel's Breakthrough Technology Conference 2023

Constraints that can slow down or even derail steel industry's decarbonization process

- Development & optimization constraints
- Financial constraints
- Construction & engineering constraints
- Labor & talent constraints
- Energy constraints
- Raw materials constraints

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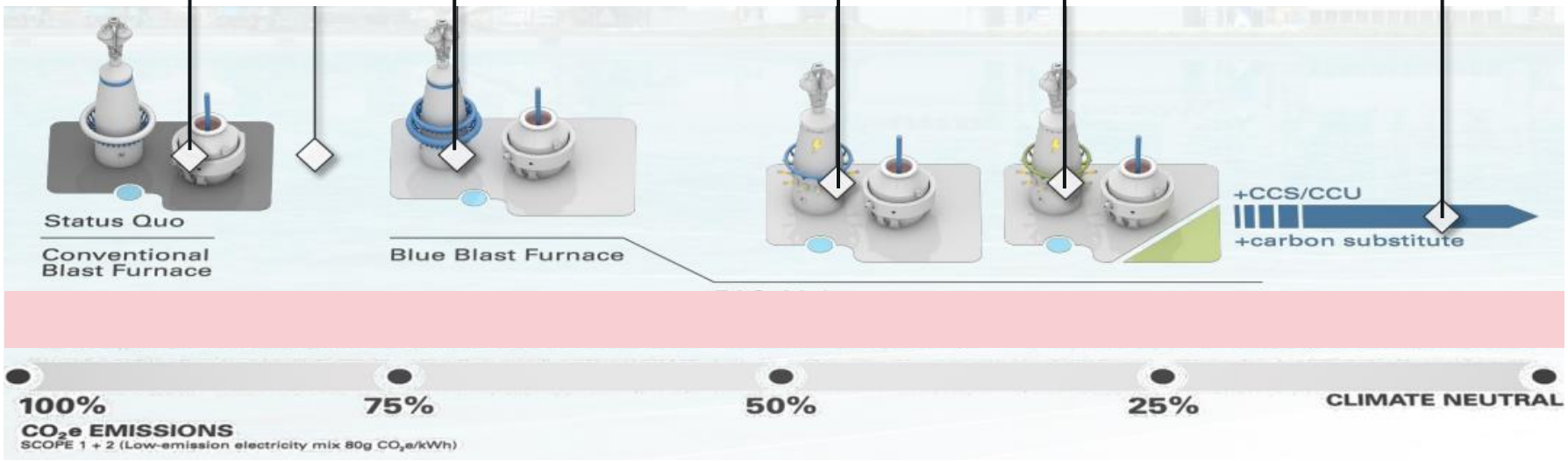
Blast furnace emissions mitigation approaches

1. Energy & process efficiency Tech upgrades
2. H2 / Syngas injection
3. H2 / Syngas injection & electrification of melting heat
4. Green H2 injection / enrichment of Syngas with green H2
5. CCUS & circular carbon



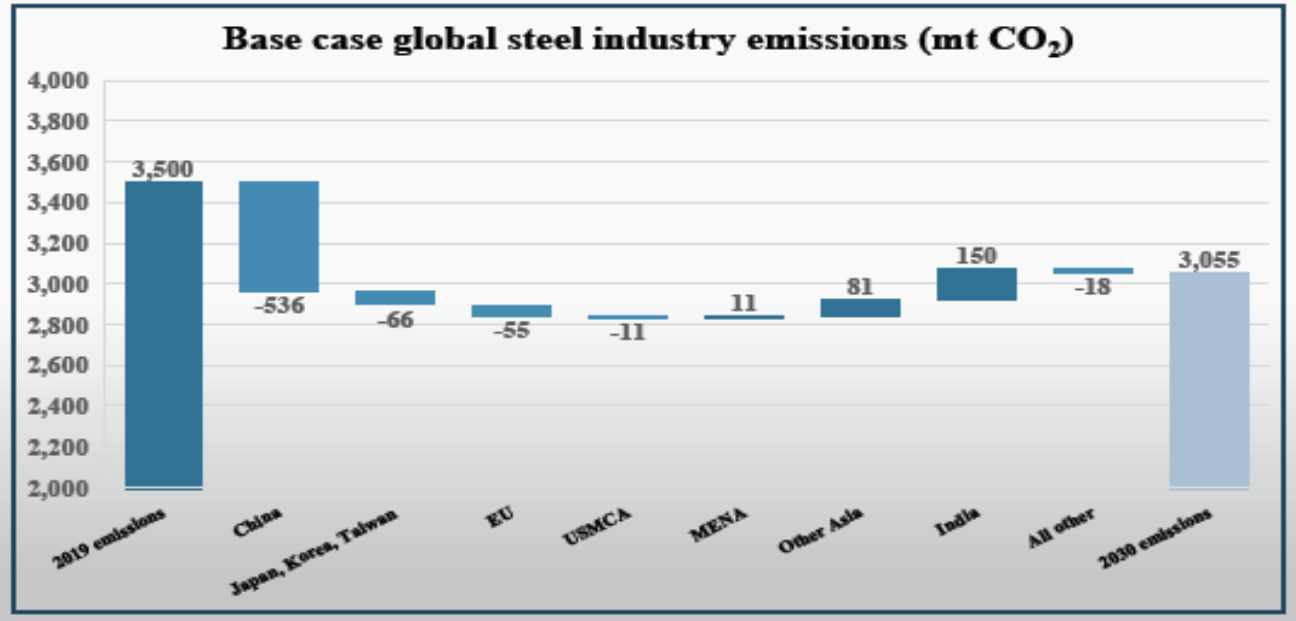
- Current mitigation attempts point to big potential for BF decarbonization
- BF fuel rates will trend lower on burden, efficiency improvements and technology

Source: SMS Group presentation at worldsteel's Breakthrough Technology Conference 2023, Decarbonization roadmaps of various steelmakers such as ArcelorMittal, Baowu, thyssenKrupp

Global steel industry can meet the 2030 targets

2030 global steel industry CO_2 emissions

WSD expects global steel production to increase from 1,875 mt in 2019 to 1,920mt in 2030, but global industry CO_2 emissions to decrease 13% from ~3,500mt to 3,055mt, led by a massive reduction in China.



	Change	% change
China	-536mt	-24%
Developed countries	-138mt	-22%
Developing countries	+230mt	+34%
World	- 445mt	-13%

Source: WSD Global Steel Decarbonization Report

Raw materials markets

Iron ore

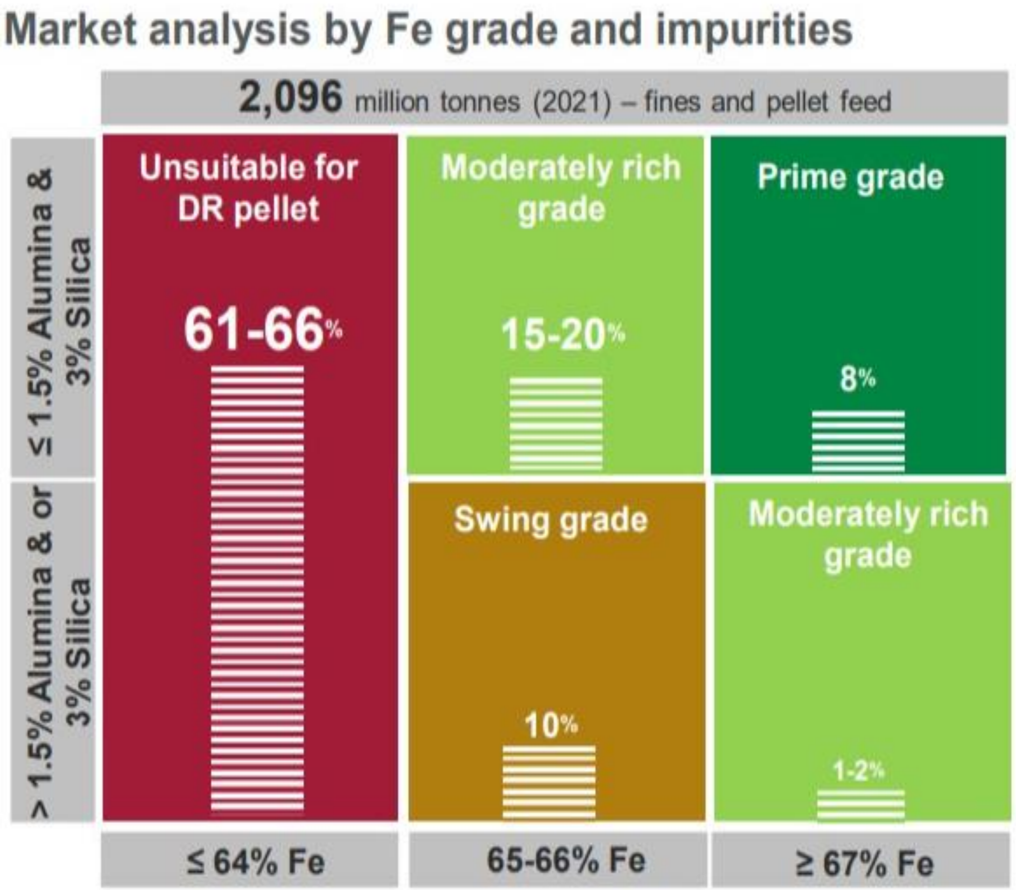
Overall, a balanced market. Changes driven by China steel market conditions and expectations

China peak demand vs growth in SEA

Growing interest in high grade, pellet feed, pellets

Geopolitics. Focus on development of new (high grade) reserves

Iron ore



- Only 8% of current production is ideal DR grade, while 15-20% will need minimal beneficiation or processing.
- **Swing supply**: Another 10% will need significant investments in beneficiation, processing, and grinding, and can swing to either side depending on the ore's mineralogy.

Explain and Send Screenshots

WoodMac estimates that only 8% of the current IO supply is ideal DR-grade. And another 15-20% can be used in DR with minimal beneficiation and processing

Many experts expect a DR grade material shortage to emerge as from late 2020's or early 2030's

WoodMac estimates that if steel mills can utilize moderately rich ore for DR, then there should be sufficient material for DR till 2040s

In any case, the already tight high quality, high FE, direct charge segment will remain tight or see shortages

Source: Wood Mackenzie

Potential solutions for DR grade material shortage

Use of BF pellets as DR feedstock to produce an intermediate quality DRI. Then beneficiating this DRI in a smelting furnace (an additional step between DR and steel plant and hence additional energy requirement) (Primetals, Outokoumpu, Miners – BHP & Hatch; Rio Tinto-Bluescope & Steel makers: ThyssenKrupp, ArcelorMittal, Ansteel, etc.)

Use of fines-based DR technologies (POSCO – HYREX , Voestalpine – HYFOR)

Scrap

Increasing interest in scrap as a green raw material

Growing availability

Trade restrictions

Quality deterioration, impact from circular economy, increasing pressure on high quality segments

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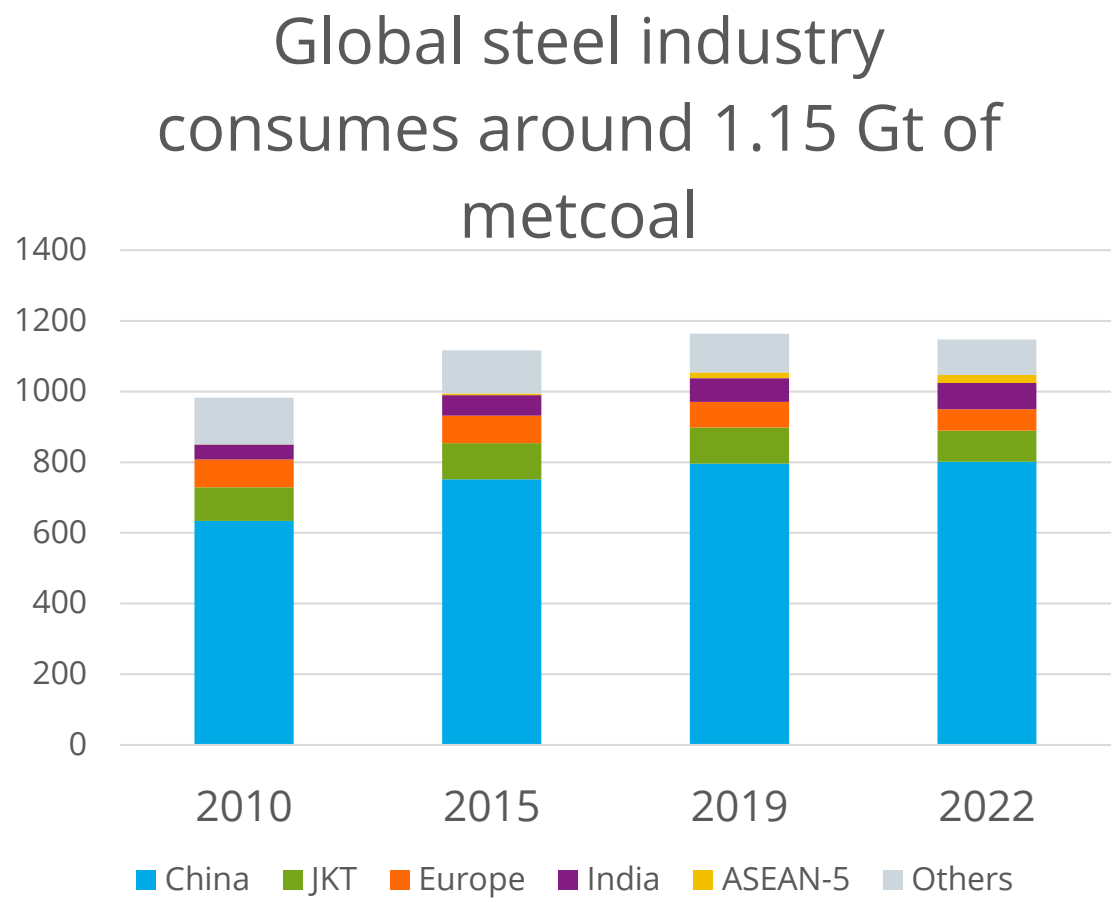
Global metcoal demand growth driven by India and SEA countries such as Vietnam and Indonesia



- Global steelmaking requires around 950 Mt of coking coal and 200 Mt of PCI coal
- About 320 Mt (~30%) of this demand is met by imports, as several major steelmaking countries are either totally or largely dependent on imports
- Demand growth used to be driven by China
- More recently India and SEA countries (e.g., Vietnam & Indonesia) have become the main drivers of growth

Source: CRU. Note: JKT stands for Japan, Korean and Taiwan

Tight supply and severe short-term volatility to remain as major issues

- India's and SEA's metcoal demand growing rapidly
  - large room for increasing PCI rate in India
- New capacities coming online but insufficient to mitigate increasing risks of supply disruptions
- Some companies avoiding coal investments, some financial institutions ceased support for coal investments
- Severe price volatility, increasing trade frictions, and uncertainty stemming from steel industry's green transition might also be taking a toll on interest in project development
- High utilization rates of some Australian port and rail logistics along with low inventory holding capacity…. Causing short term volatility risk
- Increasing impact from climate change (cyclones, rainfall, bush fires etc)
- Declining global premium HCC reserve availability

Conclusions

- Metallurgical coal is a critical raw material for steelmaking and is likely to remain so for the considerable future
- The seaborne metallurgical coal market is undersupplied, and this might increase toward 2030
- Bringing additional supply is becoming more difficult as environmental pressures increase, limiting the availability of capital and restricting permitting
- This potential supply gap is a major challenge facing today's steel industry

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