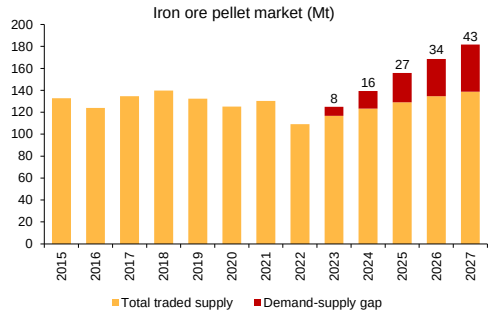
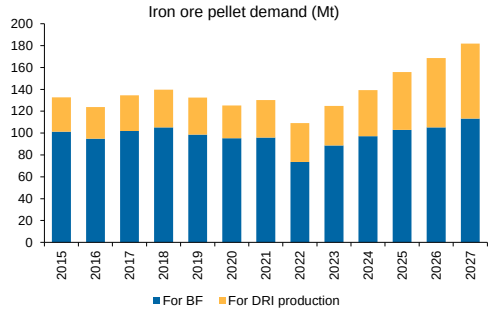
METALS AND BULKS

Large pellet supply gap ahead as demand surges



Note: traded pellet market. Source: Company reports, TDM, Macquarie Strategy, Feb 2023

DRI drives new pellet demand



Source: Company reports, TDM, Worldsteel, Macquarie Strategy, Feb 2023

Commodities Comment
The looming iron ore pellet supply gap

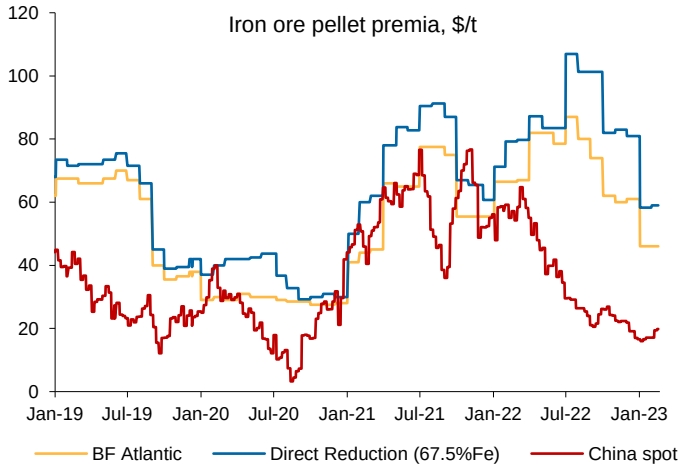
Feature Article

- The iron ore pellet premium collapsed almost 50% since July 2022 to $46/t largely driven by cuts to pig iron production in Europe (the world's largest pellet importing market).
- The return of European blast furnace capacity in 2023 (13Mt announced so far) along with improving Chinese demand amid sintering restrictions in some parts of the country back our view that pellet premiums have bottomed and are likely to rise this year.
- Another supportive factor is the loss of CIS supply – with exports from both Ukraine and Russia unlikely to normalise in the near term.
- We now expect the Atlantic BF 65% Fe pellet premium to average $59/t over 2023 (prev. $50/t), and eventually reach $85/t later in the decade.
- Beyond 2023 we continue to see significant global pellet demand growth, reaching 182Mt by 2027 (vs. 109Mt in 2022).
- Demand growth is largely driven by expansions of direct reduction iron (DRI) plants as efforts to decarbonise steel production gather momentum, especially in Europe. By 2027 we expect DR pellet demand to reach 69Mt, almost double current volumes.
- On the other hand, supply growth of direct charge ore is constrained by the high capital requirements of both pellet and pellet feed production, with availability of DR-pellet feed (high Fe, low impurities) particularly limited. We forecast total pellet supply to increase to 139Mt by 2027 (vs. 109Mt in 2022).
- Currently, the only significant volumes of supply growth expected to come to the market is from Vale, which aims to increase its production of agglomerated iron ore products to ~100Mt by the end of the decade (vs. 32Mt in 2022).
- This includes both pellet and its new iron ore 'briquette' product scheduled to start being produced later this year. We have included Vale's briquette in our pellet S&D but flag there remains risks around both the volumes and timeline of expansion presented by the company.
- Alternative production hubs are Sweden and Canada, both of which have large, established pellet/pellet feed operations. However, planned DRI plants in both countries will likely start to limit available volumes of pellet for exports.
- Our pellet S&D balance points to large deficits starting to materialise later this decade (43Mt by 2027). We suspect such large gaps will be closed via demand destruction given the challenges in bringing on new supply – for example, a sustained period of elevated pellet premiums could incentivise blast furnaces to substitute pellet for other products (lump, sinter, scrap where possible) freeing up material for DRI producers (although quality considerations will play a role here).

The looming pellet supply gap

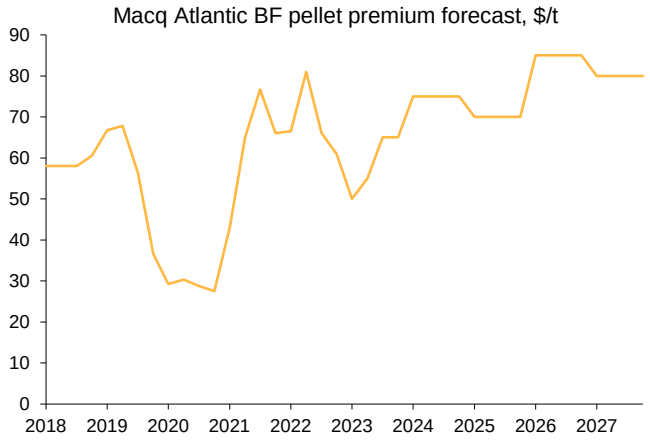
- The iron ore pellet premium collapsed in H2 2022 to $46/t[1] (-47% from July-22) as pig iron production cuts in Europe, the world's largest pellet importer, hit demand.
- We believe that the outlook for pellet is now turning more positive and have revised up our price forecasts to reflect this.
- In the near term, the return of European blast furnace capacity (see fig. 6), along with improving demand in China amid sintering restrictions, back our increasingly bullish view. We have revised up our pellet premium forecasts: we now expect the Atlantic BF 65% Fe pellet premium to average $59/t over 2023 (prev. $50/t).
- In the longer term, our updated pellet model shows sizeable gaps between supply and demand in the global traded market resulting in deficit of over 40Mt by 2027. The bulk of new demand growth is driven by the DRI segment.
- We expect premium to rise towards $85/t (Atlantic BF pellet) by the end of our forecast period to close the supply gap. Giving the challenges in increasing supply of pellet/pellet feed, we expect some demand destruction will be needed.

Fig 1 Atlantic BF pellet premium down almost 50% since July, but at a turning point in our view…



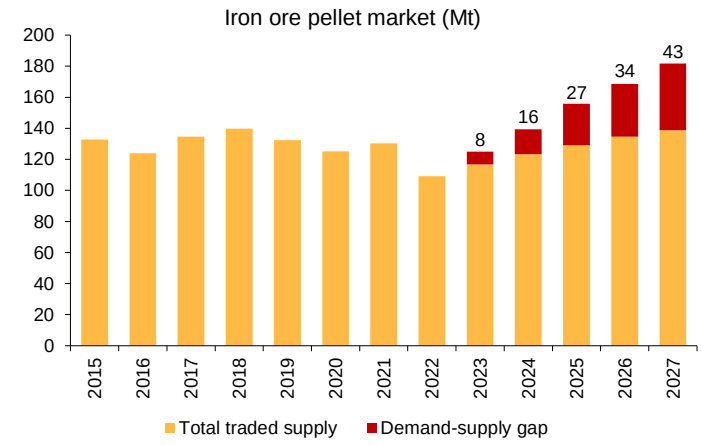
Source: Platts, Macquarie Strategy, Feb 2023

Fig 2 and we have raised our forecasts



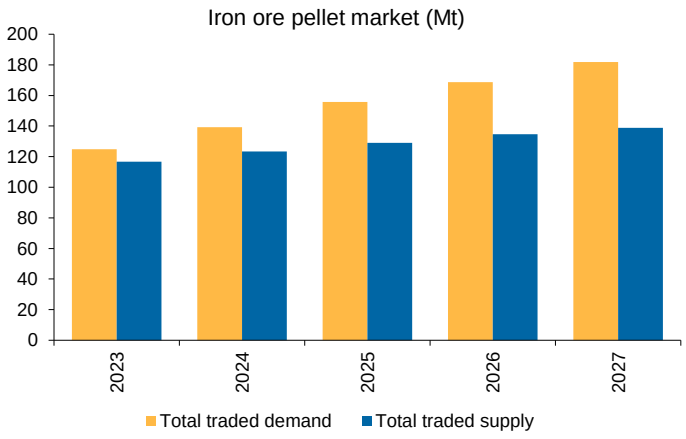
Note: Atlantic BF 65% Fe pellet premium (over 62% Fe iron ore benchmark index). Source: Platts, Macquarie Strategy, Feb 2023

Fig 3 Significant deficits ahead…



Note: traded pellet market. Source: Company reports, TDM, Macquarie Strategy, Feb 2023

Fig 4 as demand outpaces supply growth



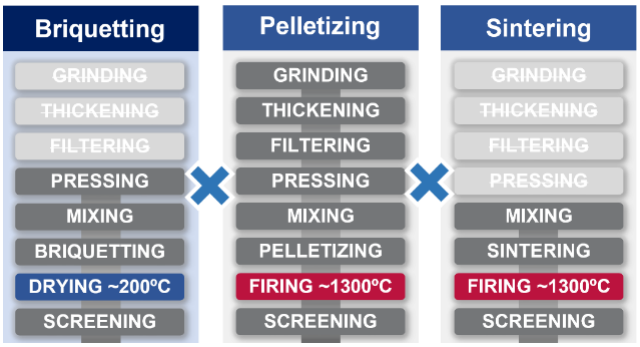
Source: Company reports, TDM, Macquarie Strategy, Feb 2023

[1] Over 62% Fe sinter fines index, Atlantic basin.

Pellet 101

- Pellet is a direct-charged form of iron ore produced from the agglomeration of fines (see here for detailed explanation of iron ore products).
- There are two major types of iron ore pellet, although in practice a variety of pellet products exist, depending on both chemical and physical characteristics of the products:
    - **BF pellet** – used in hot metal production by integrated steel producers (BF/BOF route). These typically have an average grade of ~65% Fe.
    - **DR pellet** – used as feedstock for direct reduced iron (DRI) production. Higher grades (~67% Fe) and lower impurities (esp. for silica and alumina) are required for DR pellets, which tend to attract an additional premium vs BF pellet).
- In this note, we also refer to Vale's new iron ore '**briquette**' product as another agglomerated product included in our pellet S&D due to its similar characteristics, and on the expectation that it will be used to meet some of the increase in pellet demand. According to Vale, briquette will be produced using a cold agglomeration process (making it less energy intensive than pellet therefore contributing to Vale's emissions reduction targets) with the aim to produce both BF and DR grade briquette. Vale states the briquettes can be produced using sinter-grade fines. The first plants are scheduled to come online in Brazil this year.

Fig 5 Vale's new "briquette" product



Source: Vale, Macquarie Strategy, Feb 2023

European BF restarts support near term premiums

- Our pellet price outlook for 2023 has improved on the back of an improving demand outlook, while supply constraints persist.
- The collapse in the Atlantic premium in H2 2022 was largely due to contracting pig iron production in Europe (Fig 7) although higher gas and heavy fuel oil prices (a key driver of pelletising costs) and supply disruptions in Ukraine and Russia have supported the premium to an extent.
- The demand outlook has brightened: 13Mt of BF capacity has been (or is scheduled to be) restarted in Europe (we forecast 5% growth in EU+UK pig iron production this year).

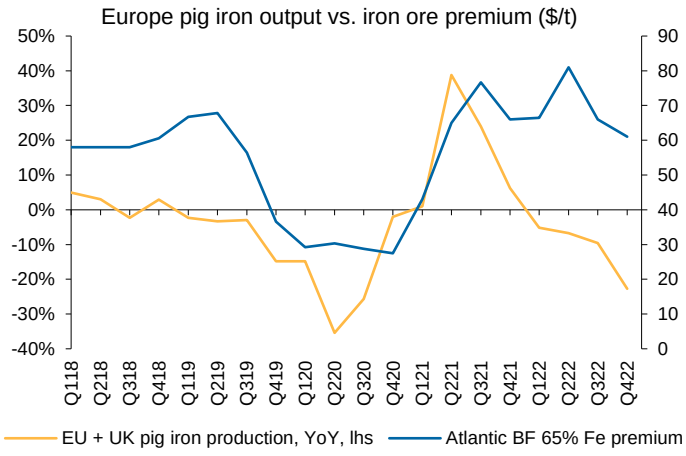
Fig 6 European BF restarts, 2023

Country	Company	Plant(s)/Location	Plant Capacity (Mt/yr)
Germany	ArcelorMittal	BF #3 at Bremen site	1.2
Spain	ArcelorMittal	BF A at Asturias site	2.3
Hungary	Dunaferr	Dunuajvaros	0.6
Poland	ArcelorMittal	Dabrowa BF #3	2.2
Sloviakia	US Steel Kosice	BF #1	1.3
Finland	SSAB	Raahe	1.3
France	ArcelorMittal	BF #2 at Foss-sur-Mer	2.0
Romania	Liberty Galati	BF #5	2.0
Total			***12.9***

Note: Includes plants restarted and announced planned restarts. Source: Company announcements, Macquarie Strategy, Feb 2023

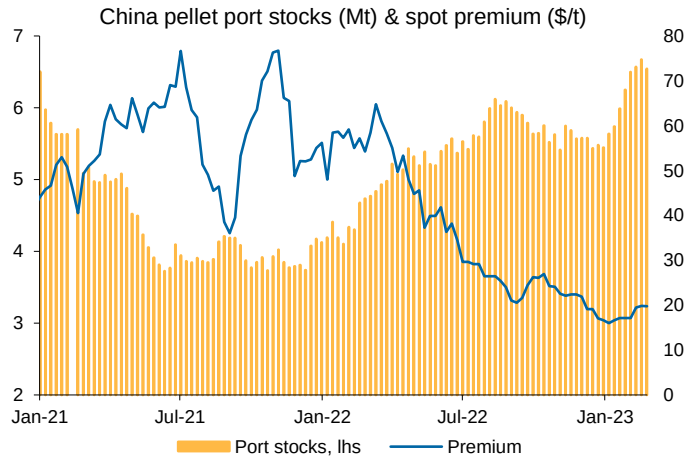
- Spot pellet premiums declined in China last year as low/negative steel margins reduced the value placed by steelmakers on productive products like pellet. Spot 65% Fe pellet CFR China reached $16/t in January (-72% YoY), the lowest price since 2020 with the pellet burden ratio in China declining to 15.8% in 2022 from 16.5% in 2021 according to Mysteel data.
- Going forward, while we only expect narrow growth for pig iron production this year (+0.3% YoY), an improvement in steel margins should be supportive of direct-charge ores, while a short-term boost to pellet demand could come from sintering restrictions in Northern China around the 13th National People's Congress (NPC; which convenes on March 5th).
- In total, we forecast global traded pellet demand growth to increase this year by 16Mt.
- The main risk to our 2023 view is a slower steel production recovery than we currently forecast –in Europe for example, the pace of the blast furnace restarts has surprised us and appears to be strong compared with underlying demand/macro indicators such as PMI new orders.

Fig 7 Atlantic premium closely follows European BF output



Source: Worldsteel, Platts, Macquarie Strategy, Feb 2023

Fig 8 Sintering restrictions could draw down China stocks in near term



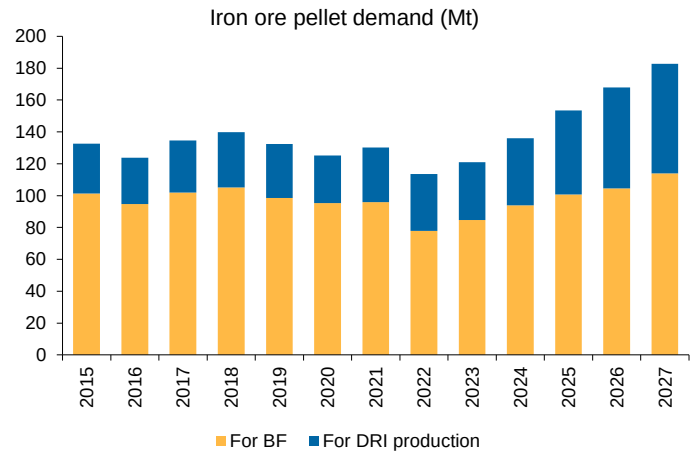
Source: Mysteel, Platts, Macquarie Strategy, Feb 2023

DRI drives long-term demand growth

- We see significant growth in pellet demand in the coming years and forecast global traded pellet demand to reach 182Mt by 2027 (vs. 109Mt in 2022).
- Notably, almost all *new* pellet demand volumes will come from the DRI segment, which typically requires higher grade and lower impurity pellets than blast furnaces. This highlights the need of investment in new, higher grade pellet feed supply although research is being conducted to utilize higher blends of lower quality pellets in the production of DRI.
- In our recent note on decarbonising steel, we estimated that there is 50Mt of new DRI capacity planned to come online this decade, marking an increase of over 40% on 2019 DRI production (113.9Mt[2]).
- We calculated that the additional 50Mt of DRI capacity would equate to ~50Mt increase in pellet demand by 2030 from DRI alone[3] (excluding additional demand from blast furnaces).
- In our pellet model, we forecast 33Mt of demand growth by 2027 to be for DR pellet doubling the size of the existing market (lower than in DRI capacity note due to the shorter forecast period, and assuming not all this capacity comes online by the scheduled date)

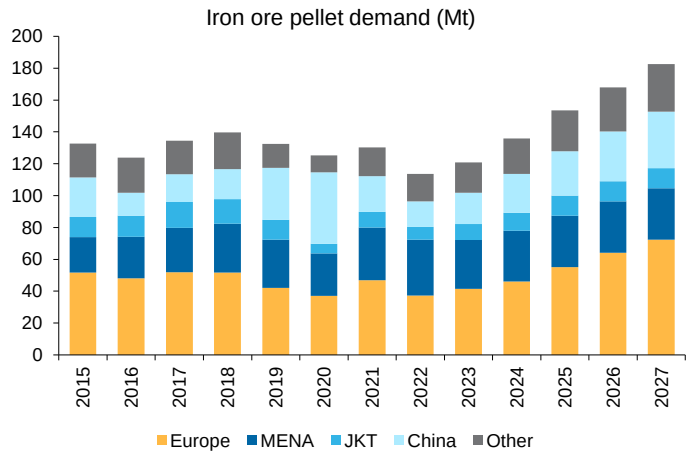
[2] according to Worldsteel
[3] This assumes 1.3Mt of iron ore pellet is used to produce 1Mt of DRI, and an average DRI plant utilisation rate of 80%.

Fig 9 DR-grade drives long new term pellet demand growth



Note: Of traded demand. Source: Company reports, TDM, Worldsteel, Macquarie Strategy, Feb 2023

Fig 10 … most of which is coming from Europe

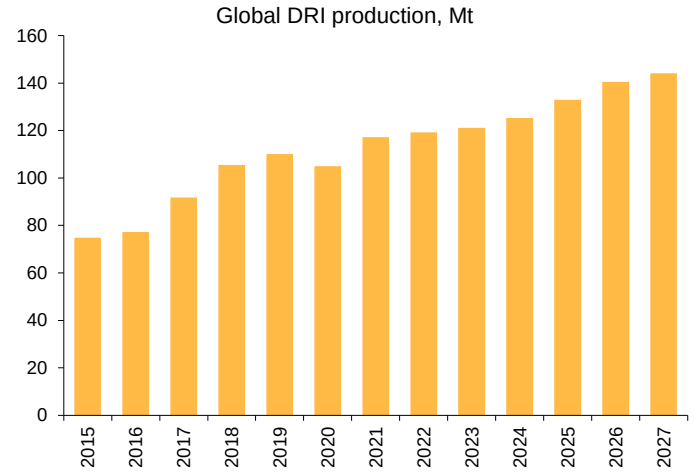


Note: of traded demand. Source: Company reports, TDM, Worldsteel, Macquarie Strategy, Feb 2023

Europe's DRI shift

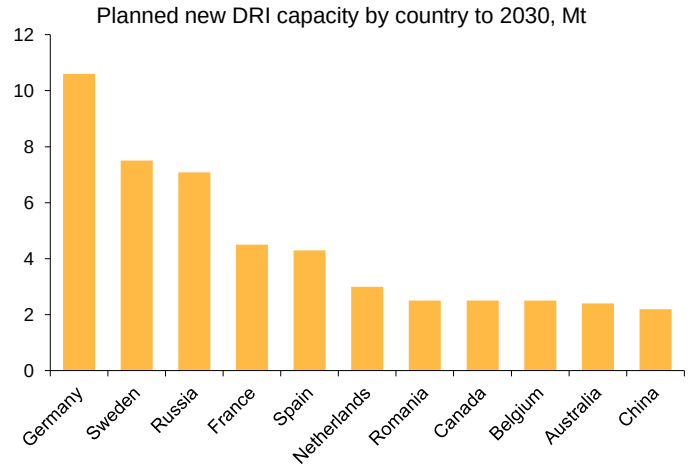
- Most of this growth in DR pellet demand should come from Europe, where most new DRI projects are located (fig. 12). We forecast a 26Mt increase in pellet demand from DRI production in Europe by 2027, just under 80% of the global increase in DR pellet demand.
- Notable projects include ArcelorMittal's projects in Germany, France, and Canada (although the Hamilton, Ontario project does not feed into our modelled numbers as the start is scheduled for 2028), H2 Green Steel in Sweden and various Liberty Steel projects (see here for full list of DRI projects).
- There remain significant risks of delays to planned DRI capacity in Europe - projects are in the early stages of development (especially those that plan to use hydrogen as reducing agent, which is not yet done on a commercial scale) with availability of renewable power also a major constraint.
- Of the remaining new traded DR pellet demand out to 2027, small volumes come from China (+2Mt), MENA (+2Mt) and 'others', including Australia.
- An additional 40Mt (vs. 2022) in demand growth is BF pellet. Most of this however is driven by a recovery in blast furnace output in 2023 and 2024, with our BF pellet demand forecast of 113Mt in 2027 marking growth of just 7.5% vs. 2018 (105Mt).

Fig 11 DRI driving new demand



Source: Company announcements, Green Steel Tracker, TDM, Worldsteel, Macquarie Strategy, Feb 2023

Fig 12 Most planned DRI capacity is in Europe



Note: New capacity includes NG or H-based only, not thermal coal. Source: Green Steel Tracker, Company announcements, Macquarie Strategy, Feb 2023

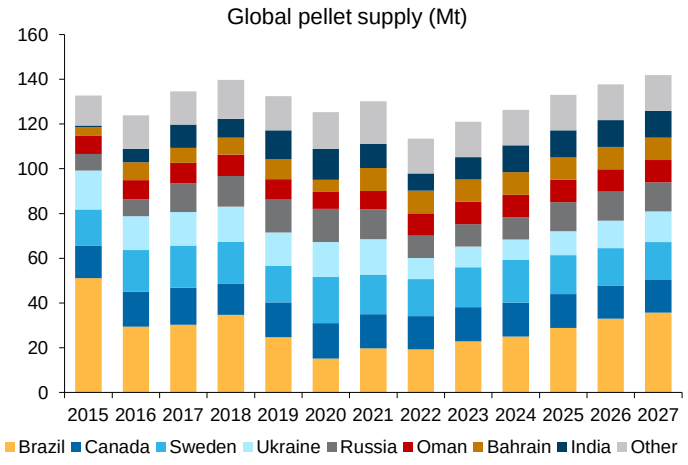
Market to balance via demand destruction

- While planned DRI expansions imply significant pellet demand growth over the coming years, it is possible demand will be constrained in practice by available supply (see below) with the projected deficit (43Mt by 2027) closed via demand destruction.
- We suspect a period of elevated pellet premiums would incentivise product substitution in blast furnaces where possible (towards lump, sinter, or scrap) freeing up material for DRI plants, but quality constraints would need to be overcome for this to occur in a large scale.

CIS supply hit

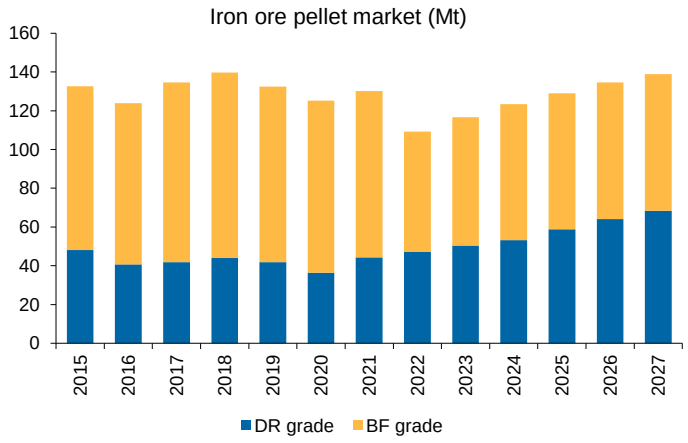
- Meanwhile, we do not see any sizable volume of pellet supply coming online in the near term, with just 8Mt of growth in 2023. At 113Mt forecast for this year, supply remains well-below pre-2022 volumes as supply constraints of CIS products continue.
- Using import data (as Russia stopped reporting trade data in Jan 2022), we estimate that Russian pellet exports halved last year, to ~6Mt. While EU sanctions were not imposed on Russian iron ore pellets, exports to the EU + Turkey fell from 12.2Mt in 2021 to just 3.0Mt in 2022. With China a relatively small player in the traded pellet market (accounts for ~15-20% of traded pellet demand), flows from Russia to China increased by just 0.9Mt in 2022. A lack of alternative markets from Europe will likely keep a chunk of Russian supply out of the market over the coming years.
- Ukrainian pellet exports also declined significantly last year, from 16Mt in 2021 to 9Mt in 2022, almost all of which was exported to Europe. High costs and logistical difficulties will likely continue to limit Ukrainian exports in 2023.
- For supply growth this year, this will mainly come from India as volumes recover following the removal of higher export tariffs on pellet (and other iron ore products) exports that were in place between May and November 2022, as well as increased volumes from Brazil, specifically Vale.
- This leaves a supply gap of 8Mt in 2023 in the global traded pellet market, justifying in our view higher premiums in the coming months.

Fig 13 Supply growth, but much is recovery



Note: Traded supply only; Includes Vale's briquette product. Source: Company reports, TDM, Macquarie Strategy, Feb 2023

Fig 14 Focus on increasing DR-grade supply

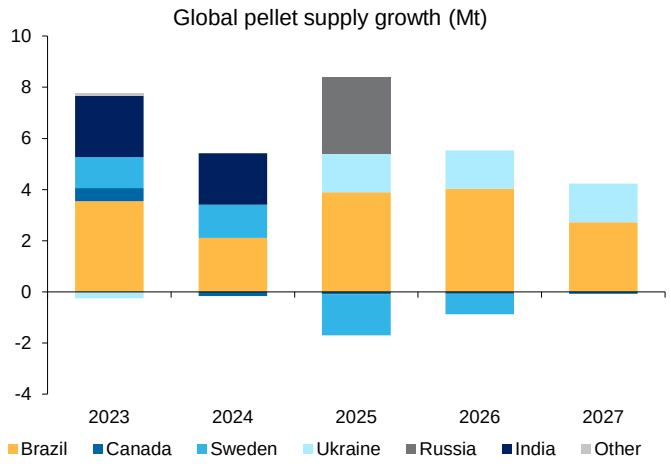


Note: Traded supply only; Includes Vale's briquette product. Source: Company reports, TDM, Macquarie Strategy, Feb 2023

Supply growth is concentrated in Brazil – but comes with risks

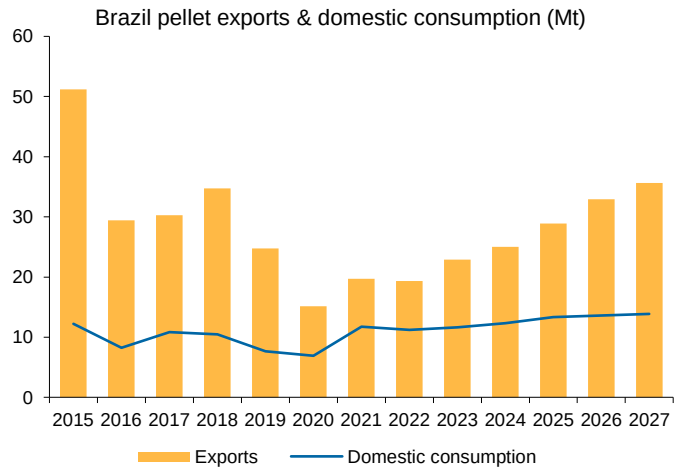
- Out to 2027, we forecast 30Mt of supply growth (from 2022 volumes), reaching 139Mt.
- Of this, we see the majority being of DR-grade agglomerated product (22Mt), and the remainder BF pellet.
- Like with demand, the increase in BF pellet is almost all recovery volumes, with supply not reaching new highs.
- However, for DR-grade products, we do see substantial growth relative to volumes of the past seven years. Our forecast of 68Mt of DR-grade product in 2017 would mark an increase of 45% on 2022 volumes – which were the highest since 2015.

Fig 15 Brazil drives pellet supply growth…



Note: Traded supply only; Includes Vale's briquette product. Source: Company reports, TDM, Macquarie Strategy, Feb 2023

Fig 16 … but still below historical volumes



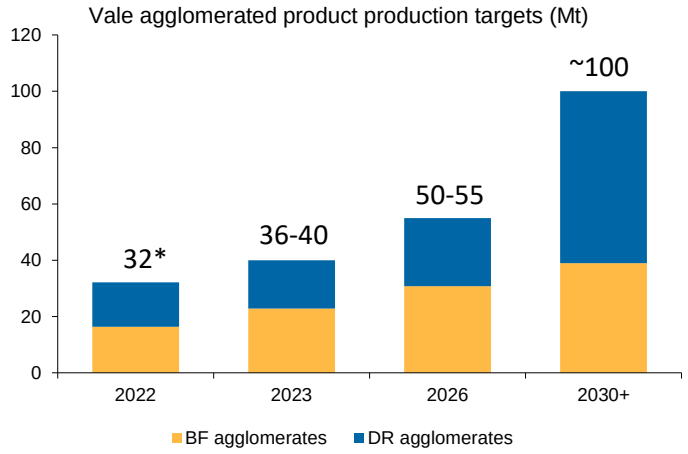
Note: Includes Vale's Briquette product. Source: Company reports, TDM, Worldsteel, Macquarie Strategy, Feb 2023

- We see most of this pellet supply growth coming from Brazil, with exports of 54Mt by 2027, marking an increase of 24Mt from 2022 levels. This accounts for a 3Mt increase in domestic consumption, based on our pig iron production outlook.
- We note that even with this growth, we do not see Brazil's pellet exports returning to volumes prior to Samarco's dam failure in 2015 and Vale's Brumadinho dam disaster in 2019.

Vale's "briquette ambitions"

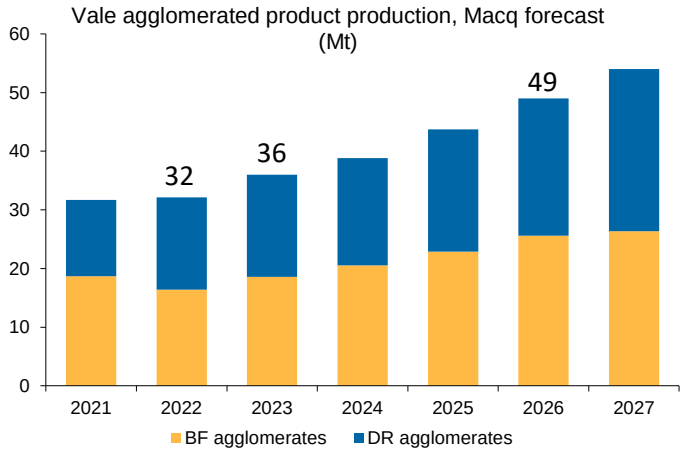
- Vale is targeting significant growth in its agglomerated product business, aiming to increase production from 32Mt in 2022 to ~100Mt by the end of the decade. In our S&D, we account for Vale achieving the lower end of its agglomerated production targets.
- In 2023, we forecast growth of 4Mt in Vale's agglomerated product production, reaching 36Mt (guidance of 36-40Mt). Almost all of this will be BF-grade volumes.
- While we are cautious over Vale's export volumes this year as supply has so far been relatively weak and see total iron ore production ending 2023 below current guidance, we note that the lower volumes have come from Ponta da Madeira port, while supply from the southern ports (where most of Vale's pellet supply is exported from) has been up YoY.
- Beyond 2023, much of the growth in Vale's agglomerated product production is attributed to the expected ramp up of briquette output (*see explanation on p.2 of note*).
- The company has its first two briquetting plants at Tubarão scheduled to start this year, with a combined capacity of 6Mt, and eight plants under evaluation. We see limited volumes this year as the company's clients test the product but increasing volumes thereafter.
- At first Vale is focusing on BF-grade briquettes but is planning to test DR-grade briquettes. Of the 22Mt growth in Vale's agglomerated product supply that we forecast by 2027, 12Mt is DR grade (ramping up towards the end of our forecast period), and 10Mt is BF grade.
- We note that Vale stated that it is still exploring options for seaborne exports, including how to transport the briquette product. This is a downside risk to our traded pellet supply forecasts if shipping the briquette product proves more difficult than anticipated.
- We also highlight that Vale could focus its new briquetting operations in Middle Eastern 'Mega Hubs', limiting the proportion of production available to be exported. In November 2022 Vale announced it is studying the feasibility of developing industrial complexes that produce HBI (likely using the briquette product, with briquetting plants built in the hubs) and steel products in Saudi Arabia, the UAE and Oman.

Fig 17 Vale targeting significant growth in agglomerated product supply



*32.1Mt reported for 2022, 49% DR grade. Source: Company reports, Macquarie Strategy, Feb 2023

Fig 18 We see production hitting lower end of targets, but with downside risks



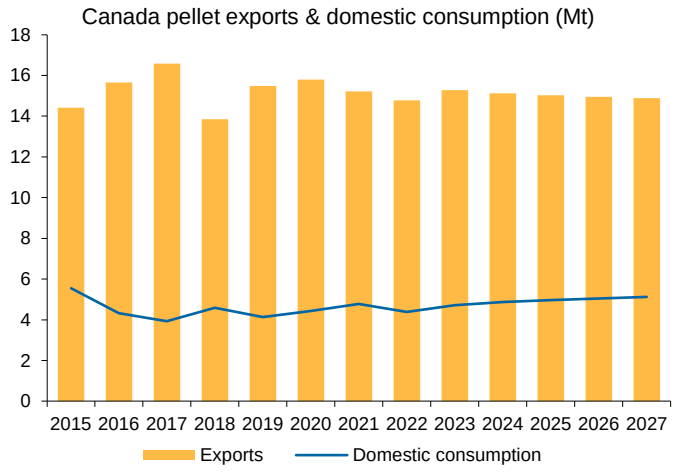
Source: Company reports, TDM, Macquarie Strategy, Feb 2023

- Apart from Vale, traded pellet supply growth is limited.
- For Samarco in Brazil, we expect exports to remain between 8-9Mt over the remainder of our forecast period. While Samarco previous exported much higher volumes (pre-dam failure), these volumes would be difficult to return to due to regulations.

Canada as an alternative supplier

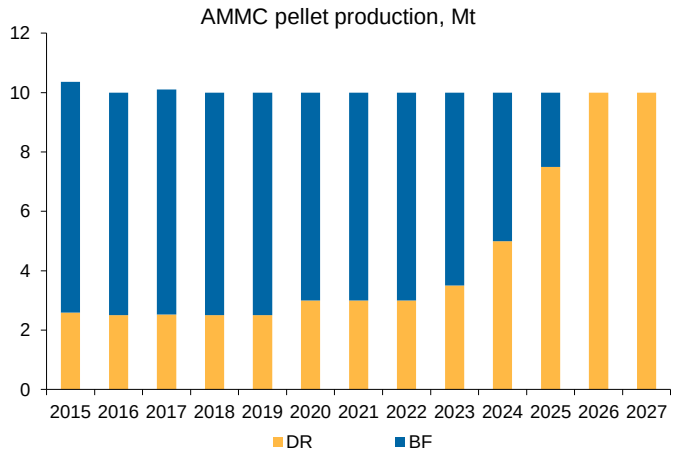
- In Canada, we do not forecast any additional export volumes coming online by 2027. In May 2022 Champion Iron acquired the Pointe Noire pelletising facility in Québec but is yet to produce a feasibility study on the recommissioning of the plant and so we have not included these volumes in our current forecast. The plant, which has been under care & maintenance since 2013, previously had a capacity of 6mtpa. Champion Iron is looking to produce DR grade pellets.

Fig 19 Canadian exports flat, but domestic consumption likely to increase after 2028



Source: Company reports, TDM, Worldsteel, Macquarie Strategy, Feb 2023

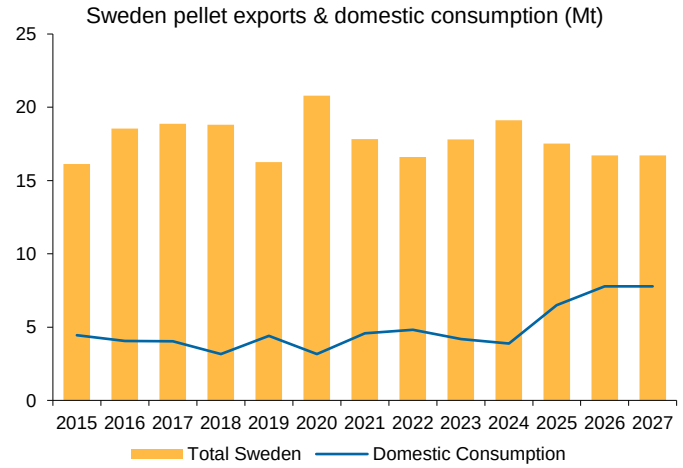
Fig 20 AMMC moving towards DR pellet only



Source: Company reports, Macquarie Strategy, Feb 2023

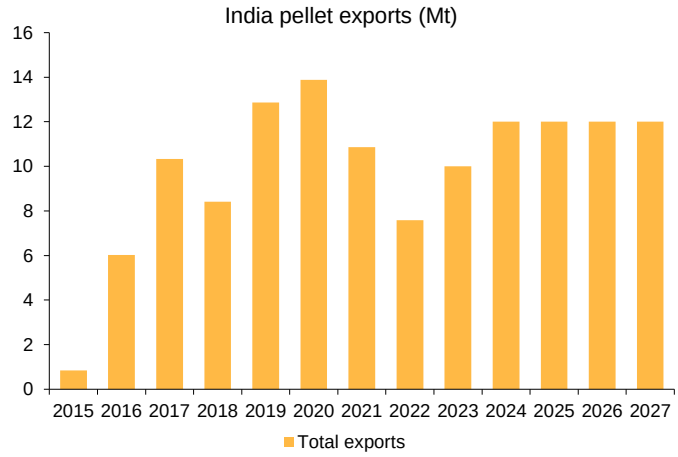
- While we don't forecast new pellet volumes coming from Canada, we do see growth in DR grade as ArcelorMittal Mining Canada (AMMC) converts its 10Mt Port-Cartier pellet plant to produce only DR pellet (currently ~30% DR grade). The project is scheduled to be completed in 2025.
- Our Canadian pellet export forecast assumes relatively flat domestic consumption out to 2027. We note however that long term domestic consumption is likely to rise as ArcelorMittal is building a DRI plant at its Dofasco plant, with the project scheduled to be complete in 2028, potentially limiting exports.

Fig 21 Rising domestic consumption caps Sweden's pellet exports



Source: Company reports, Thurlesonte, Macquarie Strategy, Feb 2023

Fig 22 India volumes recover after export tax



Source: Thurlestone, Macquarie Strategy, Feb 2023

- In Sweden, we do see rising domestic consumption resulting in lower pellet exports over the coming years as pellet demand from the HYBRIT project between SSAB, LKAB and Vattenfall, as well as a project by H2 Green Steel, all increase the use of pellet for domestic DRI production. We forecast an increase of 4Mt in domestic DR pellet consumption.
- We expect India to remain a pellet exporter, with volumes ~12mtpa. However, we note that increasing domestic steel production poses a downside risk to volumes.

Capex intensity as a barrier to entry

- As highlighted in our DRI capacity note, a key constraint to increasing pellet supply is the availability of high-Fe, low impurity pellet feed which require investment in capex intensive beneficiation/processing plants.
- Aside from FMG's Iron Bridge project which will produce high grade (67%Fe) iron ore suitable for pelletising, which is scheduled to come online this quarter, there are few relatively advanced pellet feed projects globally.
- Large known magnetite deposits outside of Brazil lie in regions (like South Australia and Canada) which often lack infrastructure access. High energy intensity of the pellet feed production process also makes these projects particularly capital intensive.
- Champion Iron in Canada produces high-grade ore (66%+), but beyond the almost complete expansion to 15mtpa, the company has not reported plans to further grow volumes. If the Pointe Noire pelletising facility is recommissioned, there will most likely be lower volumes of Champion Iron's high quality iron ore available to other pellet producers.
- CSN is aiming to increase the quality of its product to produce more DR and BF pellet feed, but we remain cautious of volume growth for now.
- This is compounded by the loss of some Ukrainian supply (Ferrexpo's product was 65%+ Fe).
- While agglomerated products that use sinter-grade fines are being tested – including Vale's briquette – this too will likely face challenges with large investments in increasing processing capacity needed.

High premiums required to incentivise lower consumption

- In conclusion – planned DRI expansion and revering BF output point to strong demand growth for agglomerated iron ore (BF, DR pellet) this decade. The capex intensity of pellet production limits supply growth while risks of delays to planned direct charge ore supply expansions are significant given these are concentrated in Brazil and come, to a large extent, in the form of new “briquette” products.
- While shorter term, the 8Mt global deficit in 2023 could be closed by drawing on stocks (e.g. Chinese port stocks, see fig. 8), the large LT deficits (40Mt by 2027) are more likely to be met via demand destruction/substitution, with high premium needed for this to occur in practice.

Fig 23 Global iron ore pellet market

Mt	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Total traded supply	133	124	135	140	132	125	130	109	117	123	129	135	139
Brazil	51	29	30	35	25	15	20	19	23	25	29	33	36
Other LATAM	3	4	3	3	2	3	3	3	3	3	3	3	3
US	8	9	10	13	11	10	13	10	10	10	10	10	10
Canada	14	16	17	14	15	16	15	15	15	15	15	15	15
Sweden	16	19	19	19	16	21	18	17	18	19	18	17	17
Ukraine	18	15	15	16	15	15	16	9	9	9	11	12	14
Russia	7	8	13	14	15	15	13	6	6	7	9	10	10
Oman	8	9	9	10	9	8	8	10	10	10	10	10	10
Bahrain	4	8	7	8	9	5	10	10	10	10	10	10	10
India	1	6	10	8	13	14	11	8	10	12	12	12	12
Australia	2	3	2	2	2	3	3	3	3	3	3	3	3
Total traded demand	133	124	135	140	132	125	130	109	125	139	156	169	182
Europe	52	48	52	52	42	37	47	37	41	46	55	64	72
MENA	22	26	28	31	30	27	33	36	35	36	37	37	37
JKT	13	13	16	15	13	6	10	8	10	11	13	13	13
China	25	15	18	19	33	45	22	16	20	24	28	31	35
Other	21	22	21	23	15	11	18	12	19	21	23	24	24
Supply-demand gap									-8	-16	-27	-34	-43
Pellet premium ($/t), rhs	32	31	45	59	57	29	63	69	59	75	70	85	80

Note: Traded market only. Source: Company reports, TDM, Macquarie Strategy, Feb 2023

Summary of Daily Prices

Commodity Prices

	28-Feb-23		27-Feb-23		% ch. day	2023 YTD	avg 2022
	US$/tonne	US¢/lb	US$/tonne	US¢/lb	on day	US$/tonne	US$/tonne
LME 3 Month*							
Aluminium	2,346	106	2,360	107	-0.6%	2,487	2,715
Aluminium Alloy	2,150	98	2,150	98	+0.0%	2,154	2,068
NAASAC	2,389	108	2,389	108	+0.0%	2,308	2,613
Copper	8,852	402	8,769	398	+0.9%	8,987	8,803
Lead	2,083	94	2,102	95	-0.9%	2,151	2,150
Nickel	25,100	1,139	24,900	1,129	+0.8%	27,813	26,065
Tin	25,350	1,150	25,350	1,150	+0.0%	27,627	31,077
Zinc	2,997	136	3,006	136	-0.3%	3,188	3,453
Cobalt	34,180	1,550	34,180	1,550	+0.0%	43,893	64,141
LME 2nd ring price. Year-to-date averages calculated from official fixes.							
Precious Metals							
Gold - *London 3pm price (US$/oz)*	1,823		1,818		+0.3%	1,875	1,801
Silver - *London 3pm price (US$/oz)*	20.79		20.78		+0.0%	22.88	21.79
Platinum - *London 3pm price (US$/oz)*	953		945		+0.9%	1,016	968
Palladium - *London 3pm price (US$/oz)*	1,416		1,448		-2.2%	1,656	2,124
Ferrous							
SGX Iron Ore - second contract *(US$/t)*	124		123		+1.1%	123	120
SGX Met Coal - first contract *(US$/t)*	346		345		+0.1%	336	360
SHFE Rebar - active contract *(RMB/t)*	4,170		4,201		-0.7%	4,110	4,344
US HRC - first contract *(US$/t)*	1,060		1,044		+1.5%	845	912
Energy							
Oil WTI - *NYMEX latest (US$/bbl)*	77.46		75.68		+2.4%	77.6	94.5
EU ETS - *Active future (EUR/t)*	99.80		100.23		-0.4%	88.73	121.36
Newcastle thermal - *Active month (US$/t*	197		197		+0.0%	257	290
Other Asset Classes							
FTSE All World	416		416		-0.0%	421	423
US 10y yield - *latest*	3.93		3.91		0.018	3.64	2.95
EUR : USD exchange rate - *latest*	1.0602		1.0609		-0.1%	1.0743	1.0533
AUD : USD exchange rate - *latest*	0.6746		0.6739		+0.1%	0.6925	0.6947

Base Metal Exchange Stocks

			change since last report		cancelled warrants	end-22 stocks	chg. since end-22
	28-Feb-23	27-Feb-23	tonnes	%ch.			
LME Aluminium	554,900	559,375	-4,475	-0.8%	111,225	450,300	104,600
SHFE Aluminium	295,920	295,920	0	+0.0%	-	95,881	200,039
Total Aluminium	**850,820**	**855,295**	**-4,475**	-0.5%	**111,225**	**546,181**	**304,639**
LME Copper	64,100	64,275	-175	-0.3%	24,275	88,925	-24,825
Comex Copper	17,962	17,962	0	+0.0%	-	31,834	-13,872
SHFE Copper	252,455	252,455	0	+0.0%	-	69,268	183,187
Total Copper	**334,517**	**334,692**	**-175**	-0.1%	**24,275**	**190,027**	**144,490**
LME Zinc	33,350	33,350	0	+0.0%	5,250	32,025	1,325
SHFE Zinc	120,977	120,977	0	+0.0%	-	20,453	100,524
Total Zinc	**154,327**	**154,327**	**0**	+0.0%	**5,250**	**52,478**	**101,849**
LME Lead	25,100	25,100	0	+0.0%	5,150	25,150	-50
SHFE Lead	48,006	48,006	0	+0.0%	-	35,217	12,789
Total Lead	**73,106**	**73,106**	**0**	+0.0%	**5,150**	**60,367**	**12,739**
LME Nickel	44,148	44,442	-294	-0.7%	3,192	55,476	-11,328
SHFE Nickel	2,514	2,514	0	+0.0%	-	2,496	18
Total Nickel	**46,662**	**46,956**	**-294**	-0.6%	**3,192**	**57,972**	**-11,310**
LME Tin	2,950	3,165	-215	-6.8%	585	2,990	-40
SHFE Tin	8,664	8,664	0	+0.0%	-	5482	3,182
Total Tin	**11,614**	**11,829**	**-215**	-1.8%	**585**	**8,472**	**3,142**

Source: CME, LME, LBMA, SHFE, ICE, LPPM, Bloomberg, Macquarie Strategy

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