



# **The Global HBI/DRI Market: outlook for DR Grade pellet supply**

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FASTMARKETS AMM: 6<sup>TH</sup> DRI & MINI-MILLS CONFERENCE

CHICAGO, NOVEMBER 28<sup>TH</sup> 2018

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- **Iron ore and pellet market: key issues**
- **DRI production - historical and medium term**
- **Outlook for DR grade pellet supply**
- **Pellet feed supply**
- **Key messages**

## The over-arching issue is the flight to quality in China:

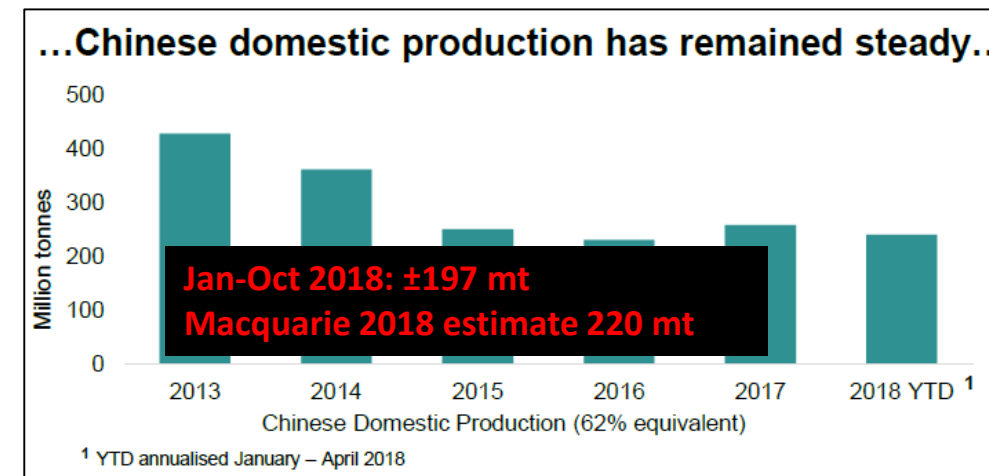
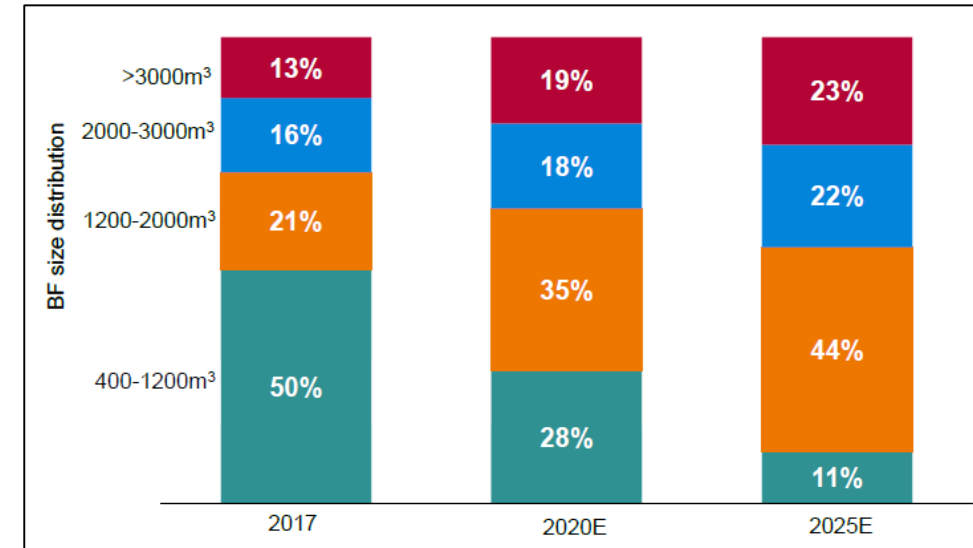
- improvement of the environment and lower CO<sub>2</sub> emissions
  - production curtailments - winter heating season
  - sinter and pelletising plants shut down
- improvement in blast furnace productivity

## Declining grades and increased acid gangue in iron ore

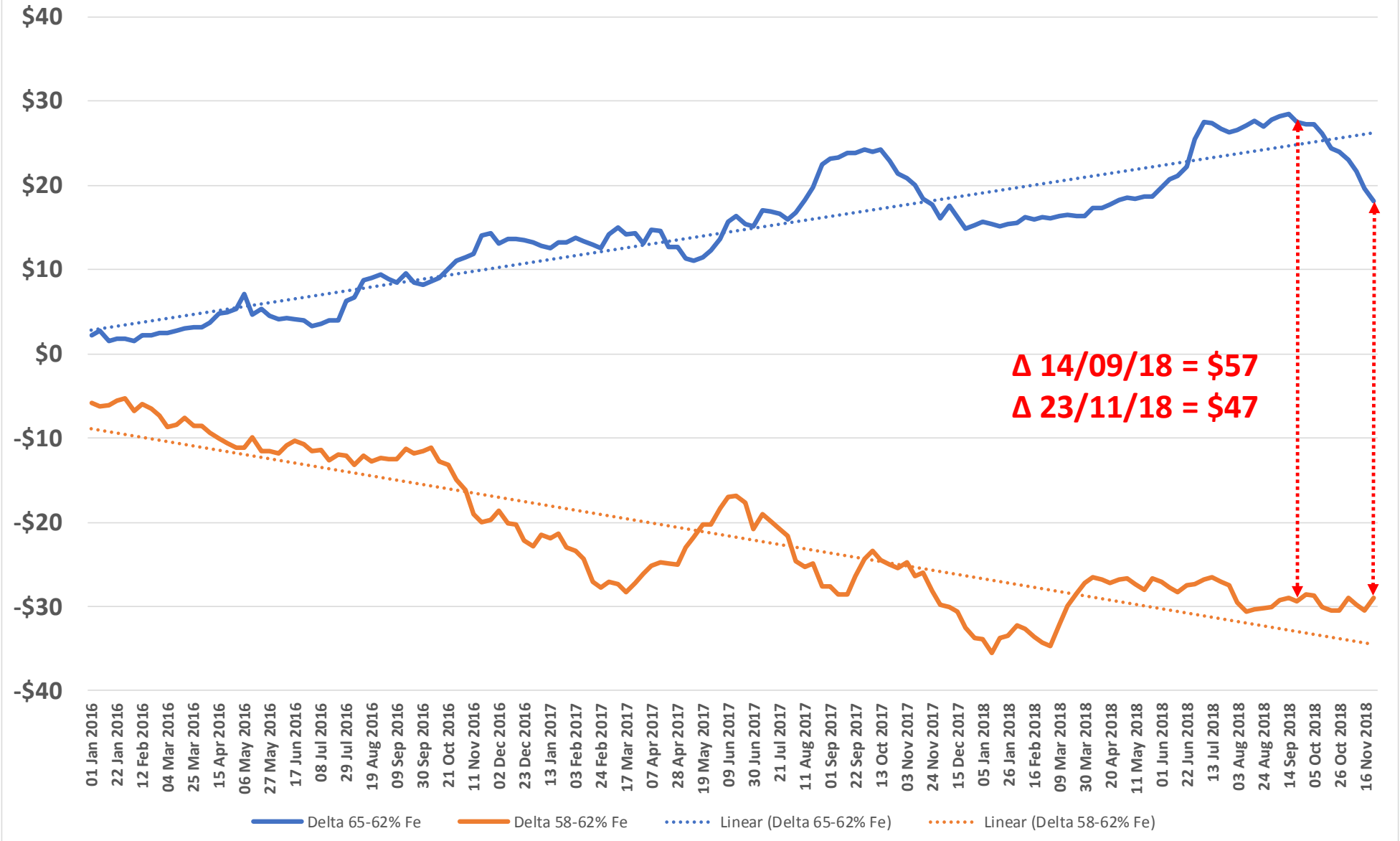
- Al<sub>2</sub>O<sub>3</sub> is of key importance, affecting slag viscosity and volume
- SiO<sub>2</sub> is also important, affecting slag volume

## Chinese domestic iron ore production is steady at <300 mt 62% Fe equivalent with apparently reduced price elasticity

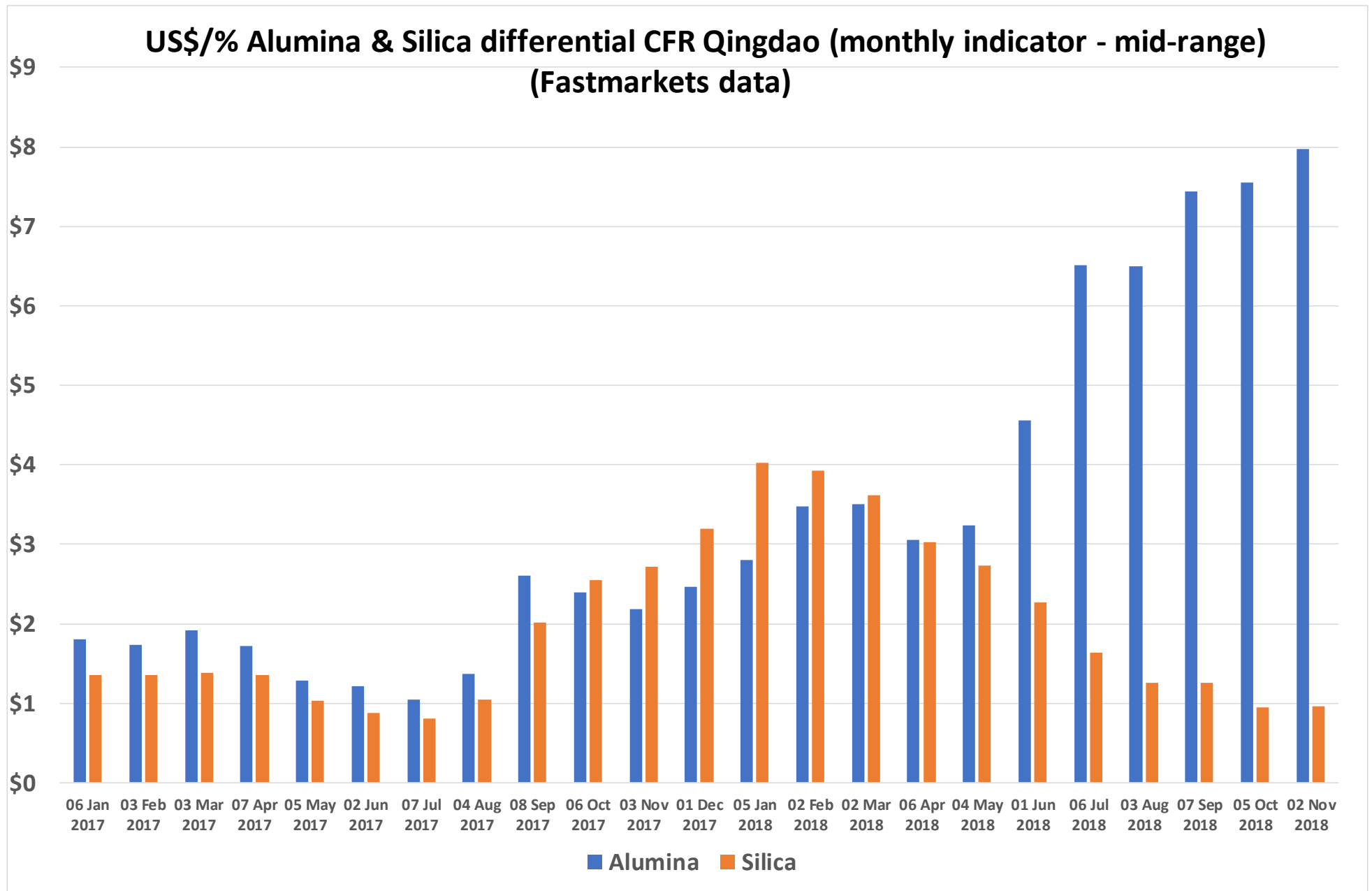
Chart source: Rio Tinto presentation June 2018



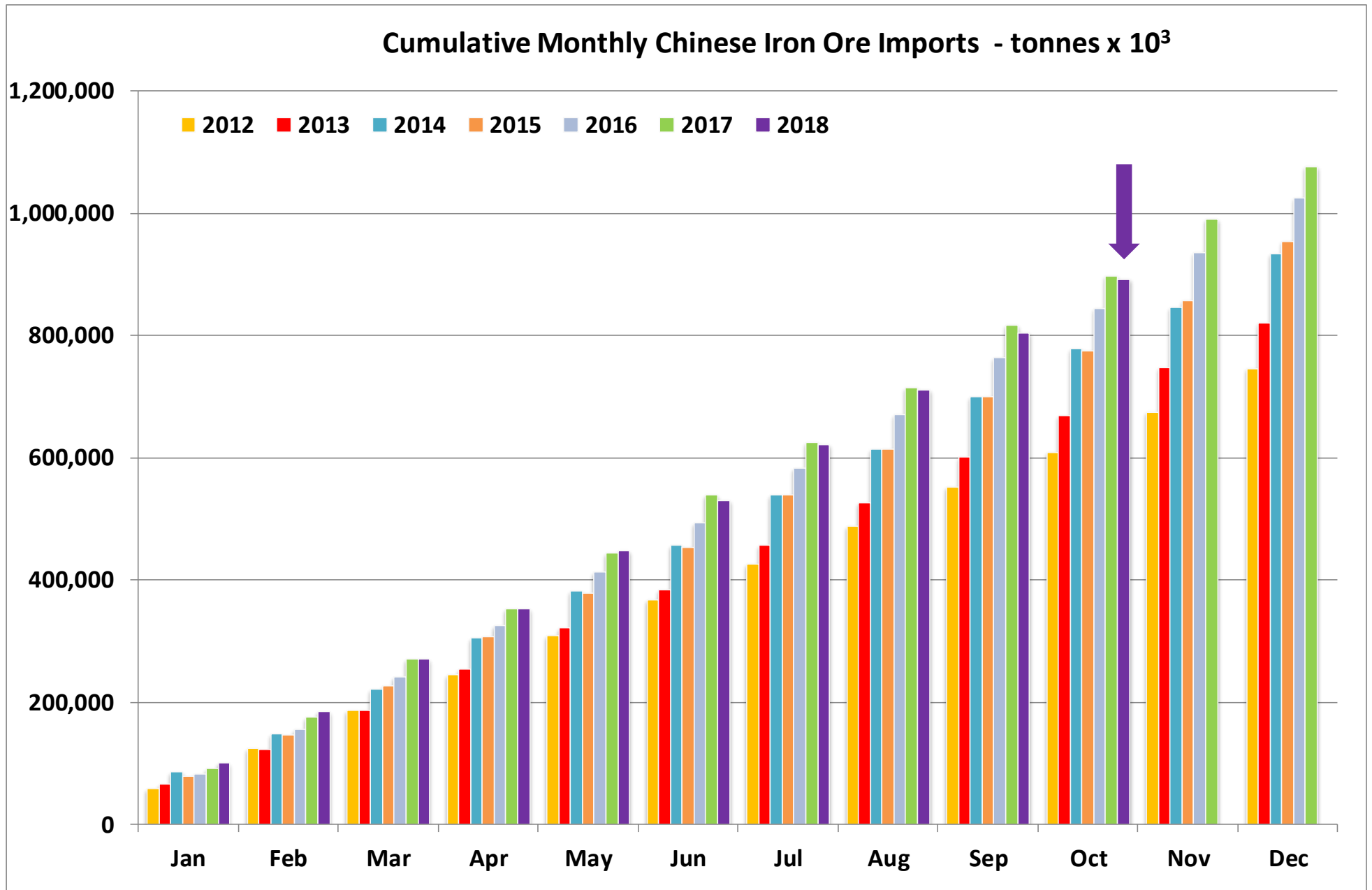
### Iron ore price premium/discount to 62% Fe price CFR North China (Fastmarkets data)



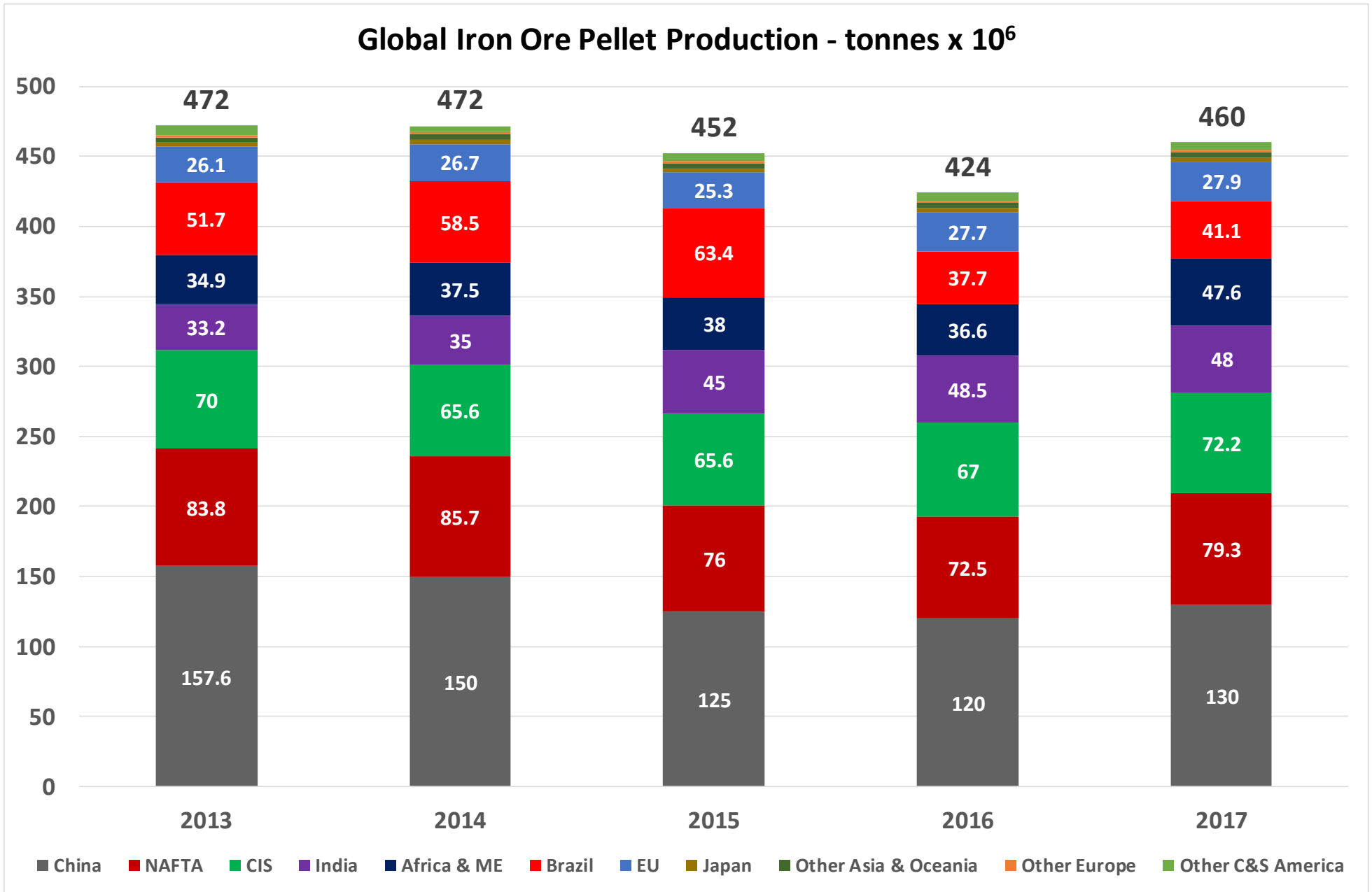
## US\$/% Alumina & Silica differential CFR Qingdao (monthly indicator - mid-range) (Fastmarkets data)



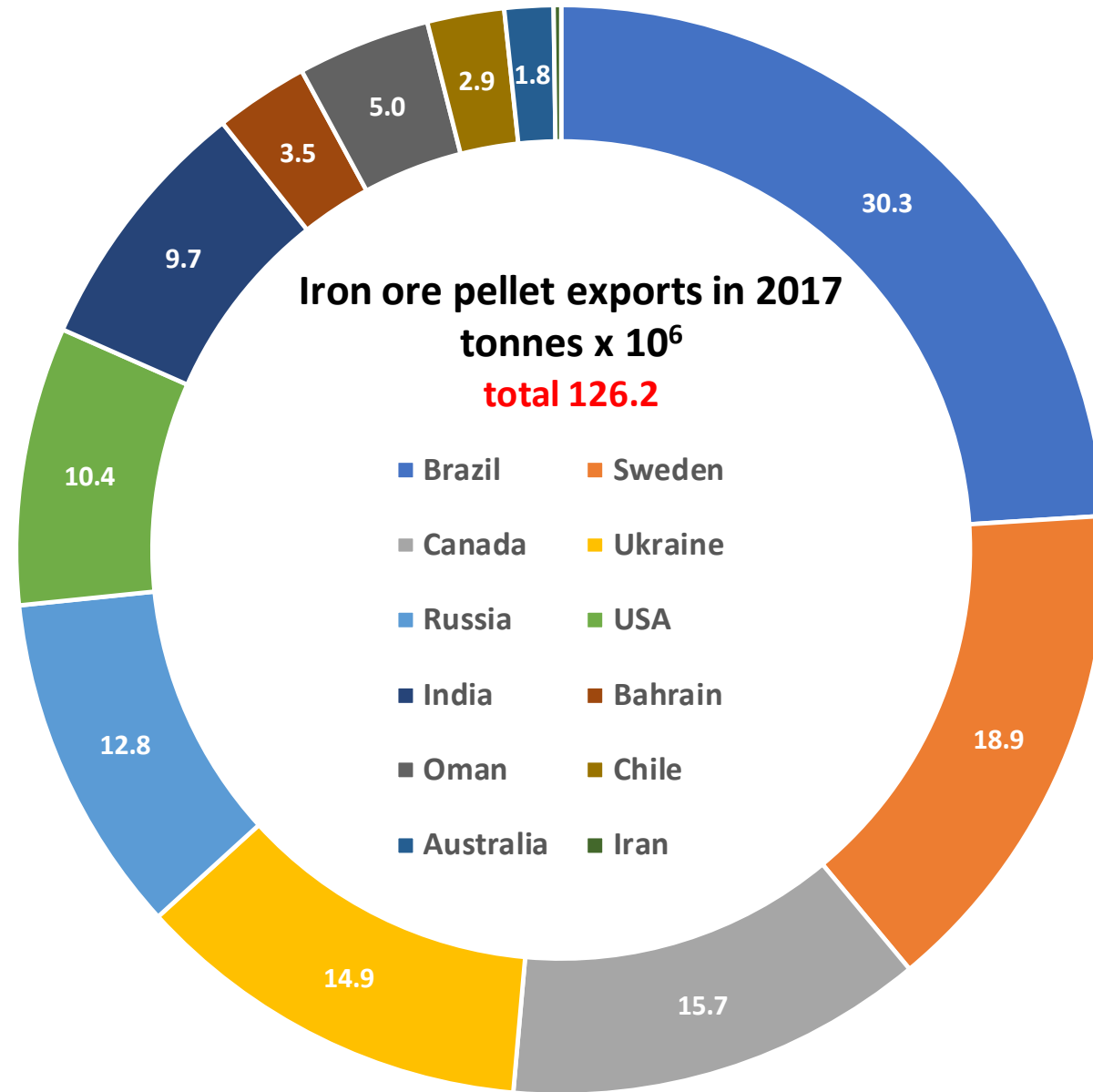
Cumulative Monthly Chinese Iron Ore Imports - tonnes x 10<sup>3</sup>



### Global Iron Ore Pellet Production - tonnes x 10<sup>6</sup>

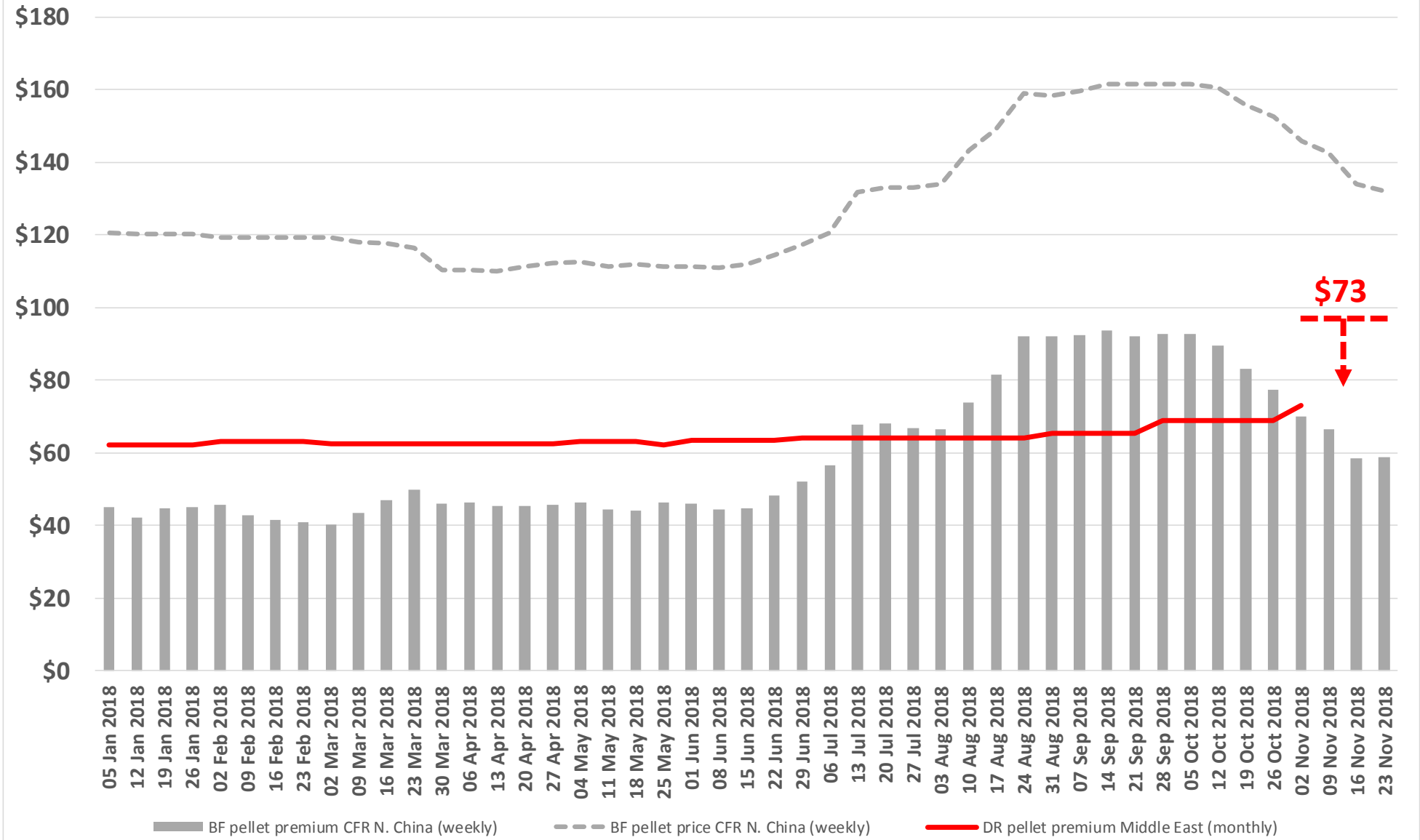






Data source: customs import & export data (CN code 260112) + private communications

### Pellet premium and price - \$/DMT (Fastmarkets data)



# Indian Pellet Exports



## Country wise pellet exports in H1 FY19



## Company wise pellet exports in H1 FY19



Chart source: Steel Mint

# DR grade iron ore pellet supply issues

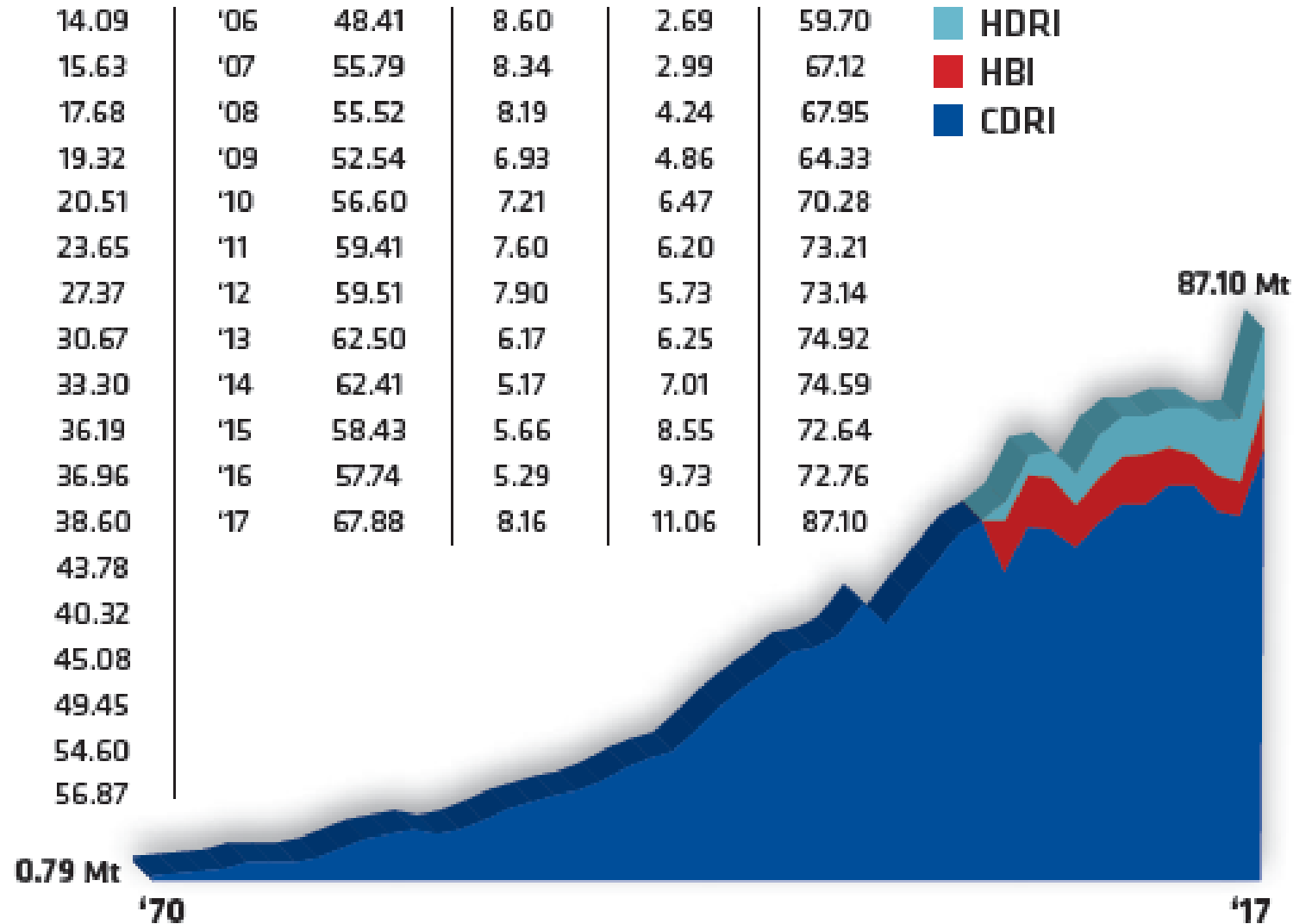


- **Samarco remains shut down (pellet capacity 30.5 mt)**
  - no definitive date for restart - 2020 at the earliest
- **IOC strike cost ≈1 mt pellet production in 2018**
  - 2018 guidance 9-10 mt pellets + concentrates
- **LKAB's Svappavaara plant out of operation through January 2019**
- **Anglo American's Minas Rio operation shut down in March 2018 for pipeline repairs, expected to be completed in Q4 2018**
  - 2018 guidance 3.0 mt concentrate (based on production prior to shutdown)
- **Bahrain Steel production constrained by pellet feed supply**
  - suspension of contract with Anglo American (Minas Rio)
  - Jan-Sep 2018 exports at 5.1 mt up 7.5% y-o-y

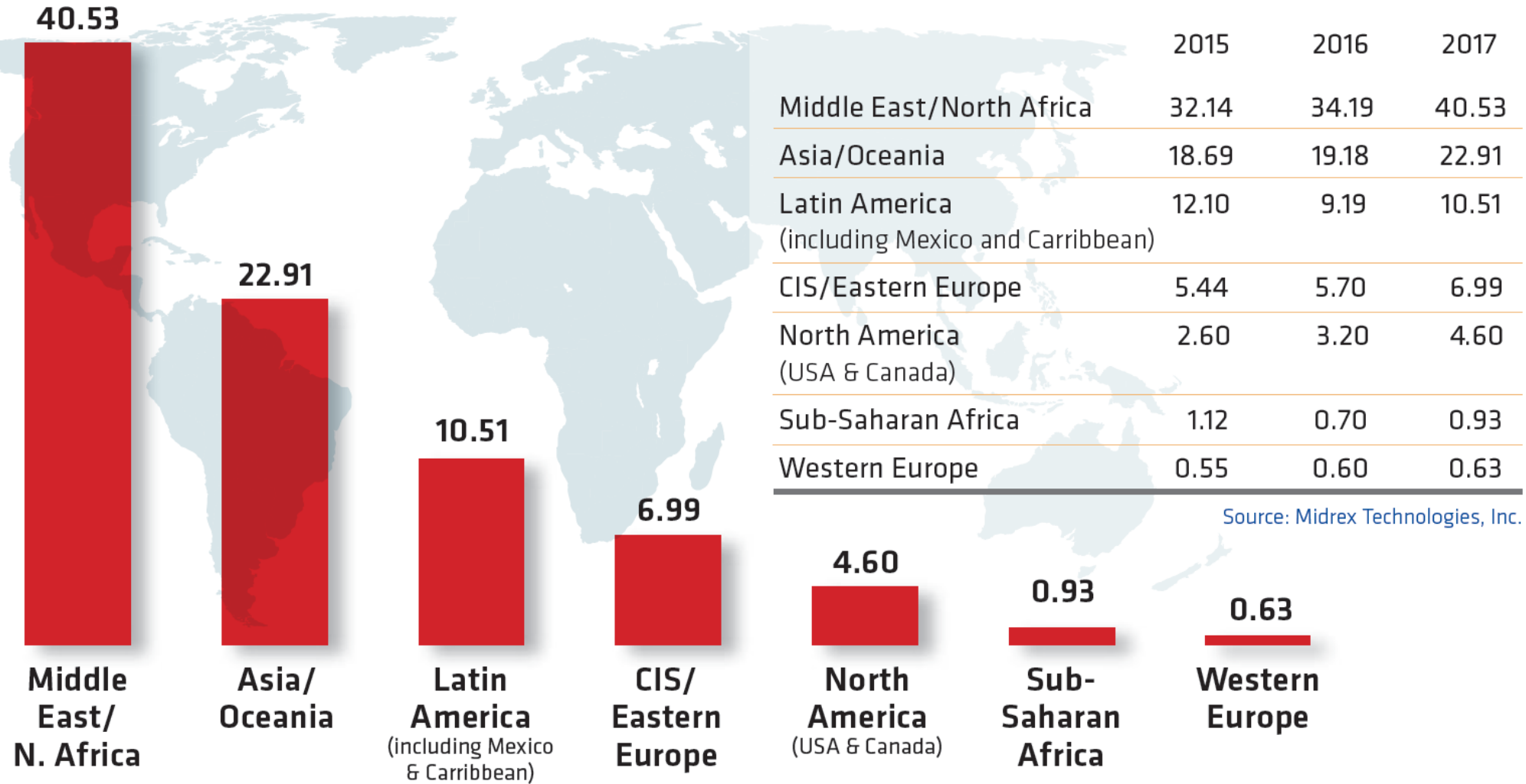
# World DRI Production by Year (Mt)

Source: Midrex Technologies, Inc.

Year	Total	Year	Total	Year	CDRI	HBI	HDRI	Total
'70	0.79	'88	14.09	'06	48.41	8.60	2.69	59.70
'71	0.95	'89	15.63	'07	55.79	8.34	2.99	67.12
'72	1.39	'90	17.68	'08	55.52	8.19	4.24	67.95
'73	1.90	'91	19.32	'09	52.54	6.93	4.86	64.33
'74	2.72	'92	20.51	'10	56.60	7.21	6.47	70.28
'75	2.81	'93	23.65	'11	59.41	7.60	6.20	73.21
'76	3.02	'94	27.37	'12	59.51	7.90	5.73	73.14
'77	3.52	'95	30.67	'13	62.50	6.17	6.25	74.92
'78	5.00	'96	33.30	'14	62.41	5.17	7.01	74.59
'79	6.64	'97	36.19	'15	58.43	5.66	8.55	72.64
'80	7.14	'98	36.96	'16	57.74	5.29	9.73	72.76
'81	7.92	'99	38.60	'17	67.88	8.16	11.06	87.10
'82	7.28	'00	43.78					
'83	7.90	'01	40.32					
'84	9.34	'02	45.08					
'85	11.17	'03	49.45					
'86	12.53	'04	54.60					
'87	13.52	'05	56.87					

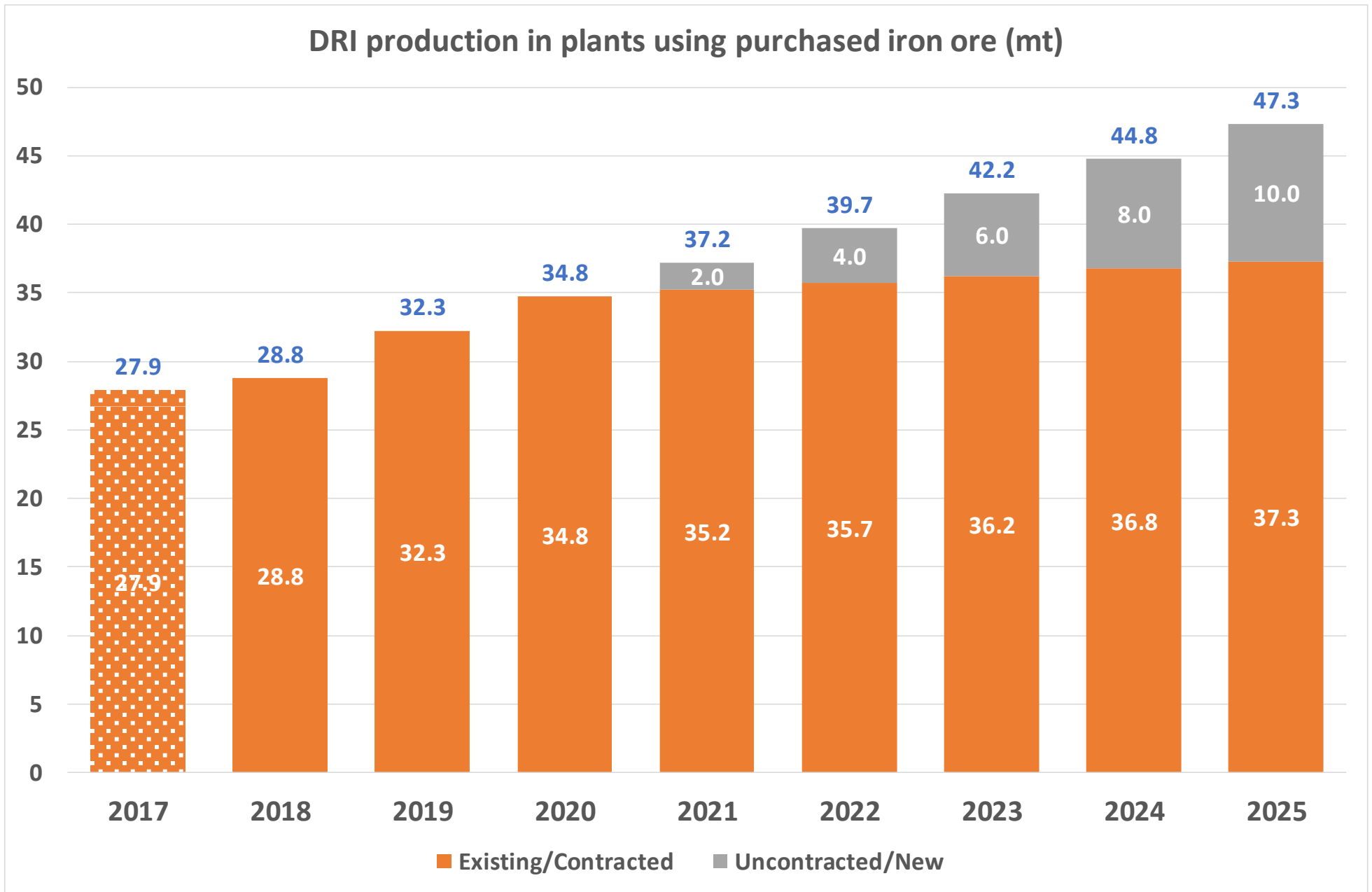


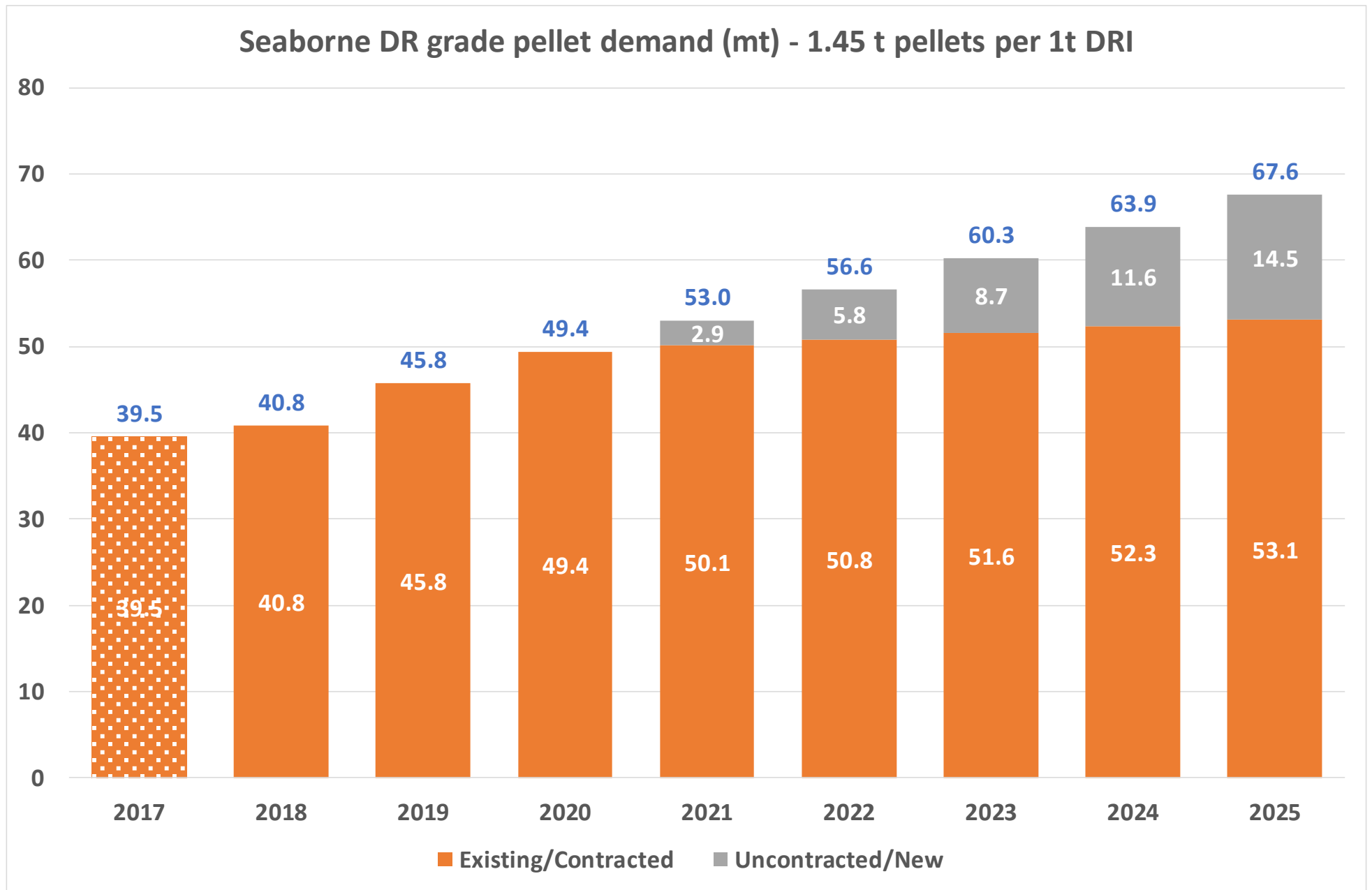
## 2017 World DRI Production by Region (Mt)



### DRI production in plants using purchased iron ore (mt)

Argentina
Trinidad
USA
Germany
South Africa
Algeria
Libya
Egypt
Saudi Arabia
Qatar
Bahrain
UAE
Oman
Malaysia

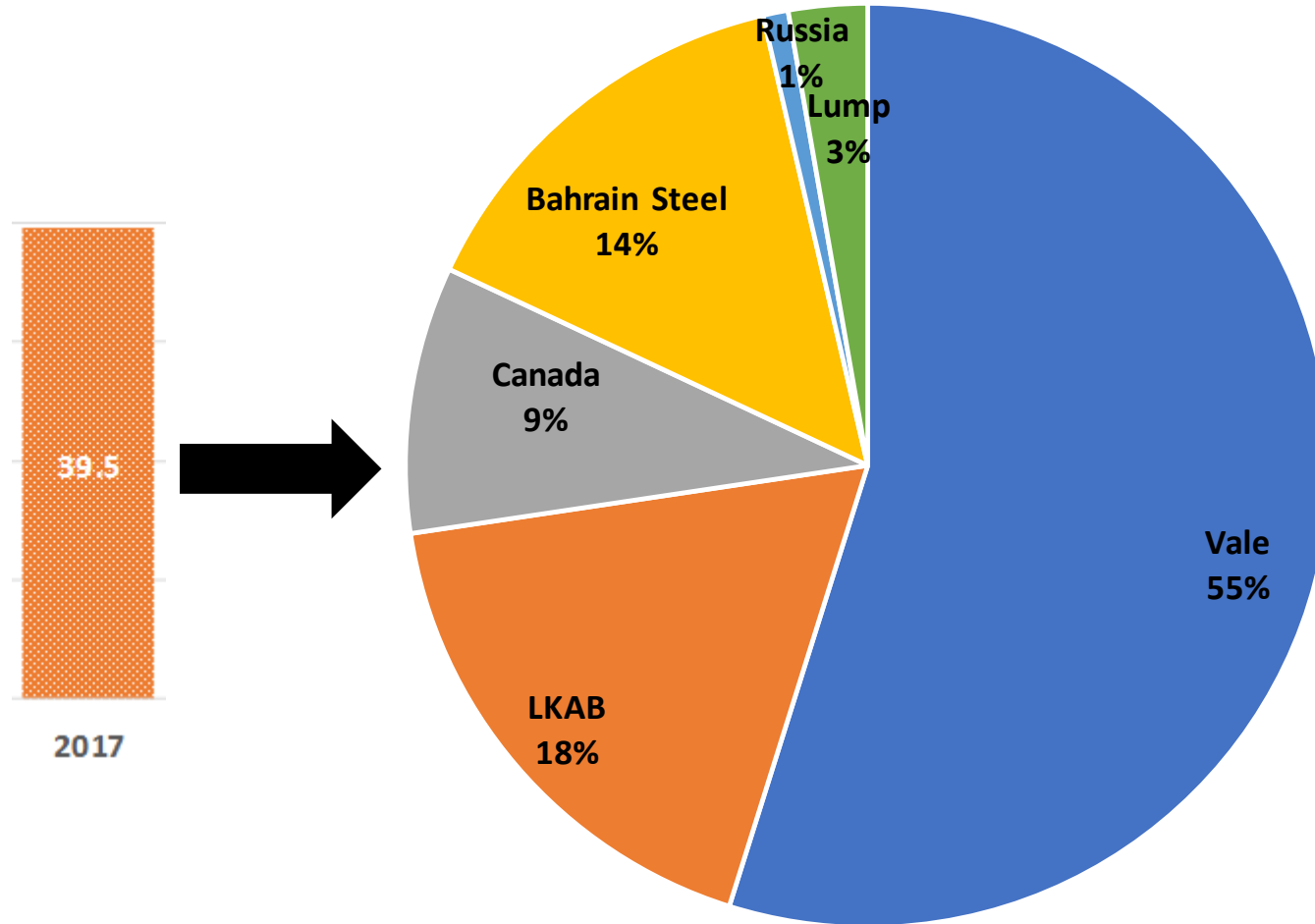






## Ore Supply 2017 (mt) - total 39.6 mt

source: trade statistics, private communications



- **Per the forecast, between 2017 and 2020, DRI production at plants using purchased iron ore increases by 6.9 mt, requiring an additional 9.9 mt iron ore, ideally DR grade pellets.**
  - **NB: 2017 supply included 1.1 mt lump ore and an unknown (probably modest) quantity of BF grade pellets from traditional and non-traditional sources.**
- **Between 2020 and 2025, DRI production increases by a further 12.5 mt, requiring an additional 18.2 mt iron ore, ideally pellets.**

## Bridging the gap to 2020 - **Vale**

- **Estimated pellet supply to the DR sector in 2017 = 21.7 mt (≈43% of pellet sales by volume).**
- **In 2018 Vale has restarted idled pellet plants with aggregate capacity of 13 mt, adding ≈5 mt production in 2018 (guidance 55 mt), bringing total capacity in Brazil and Oman to ≈60 mt.**
- **Of the restarted capacity, ≈6 mt is at plants which can produce DR grade pellets (Tubarão #1 and #2). Vale's supply of DR grade pellets in 2019 and 2020 is estimated at ≈27 mt (≈45% of pellet sales by volume).**

## Bridging the gap to 2020 - **LKAB**

- **LKAB has 10 mt capacity at pellet plants with coating capacity (Kiruna KK3 and KK4). Estimated 2017 DR grade pellet supply was 7.1 mt (31% of sales by volume).**
  - **KK3 produces only DR grade, KK4 can switch between BF and DR grades.**
- **With the current outage of production at Svappavaara, it seems unlikely that LKAB will have much scope for increased supply to the DR market in the short term.**
- **Estimated supply to DR markets in first 7 months of 2018 = 3.7 mt.**

## Bridging the gap to 2020 - **Canada**

- **Canada has two pellet producers, Iron Ore Company of Canada (IOC) and ArcelorMittal Canada (AM).**
  - **AM supplies DR grade pellets to captive DR plants in Canada and Germany.**
  - **IOC supplies the wider DR market, with estimated shipments of 3.3 mt in 2017. IOC lost  $\approx$ 1 mt pellet production to a strike in 2018, but should operate at close to full capacity of 12.5 mt in 2019 and 2020.**
- **IOC is thought to favour increasing the share of DR grade pellets in its portfolio and could supply perhaps 3.5-4.5 mt in 2019 and 2020 (28-36% of pellet sales by volume).**
- **AM is considered unlikely to supply DR grade pellets to external DRI producers.**

## Bridging the gap to 2020 - **Bahrain Steel**

- **Bahrain Steel is in effect partly captive to adjacent DR plant SULB which produced 1.3 mt DRI in 2017 (estimated pellet offtake from BS was 2.2 mt).**
- **Nameplate capacity of the two pellet lines is 11 mt.**
- **Supply to external markets in 2017 is understood to have been  $\approx$ 3.5 mt (but probably not all of DR quality).**
- **There is therefore apparent latent pellet capacity of  $\approx$ 5.3 mt.**
- **Production of DR grade pellets has been constrained by pellet feed supply with major supplier Anglo American's Minas Rio offline during most of 2018.**
  - **Current principal supply sources are thought to be CSN/Usiminas Brazil, CMP Chile and Champion Iron, Canada - imports Q1-3 2018 5.7 mt (5.5 mt in all 2017), implying pellet production of  $\approx$ 8 mt in 2018.**
- **With Minas Rio coming back online in Q1 2019, BS will have access to increased supply of higher grade pellet feed.**

## Bridging the gap to 2020 - **Tosyali Algeria**

- **Tosyali Algeria (2.5 mt DR plant now commissioning) has adjacent 4 mt pellet plant which has not yet started production. There is no captive supply of pellet feed.**
- **Supply of suitable pellet feed is a major constraint as grinding capacity is understood to be limited or non-existent.**
- **It seems unlikely that this pellet plant will deliver anything like its nameplate capacity in the short term, necessitating the purchase of pellets from external sources.**

## Bridging the gap to 2020 - **summary**

- **Incremental DR grade pellet demand is  $\approx$ 10 mt which could be met from among:**
  - **Vale: estimated 5 mt increase in supply**
  - **IOC: between 0.2 and 1.2 mt increase in supply**
  - **Bahrain Steel: apparent latent capacity of 5.3 mt**
  - **Tosyali Algeria: ???**
  - **Samarco: ???**
- **Conclusion: market tightness can be expected to continue.**
- **Note: the relative premiums for BF and DR grade pellets will be a factor - cost of producing DR grade pellet feed is higher and recovery lower than for BF grade material.**



## Bridging the gap 2020-25

- **Per the forecast, incremental DR grade pellet demand is  $\approx 18$  mt between 2020 and 2025.**
- **Current supply sources will be hard pushed meet the incremental demands of the existing DR plants ( +  $\approx 4$  mt over the period), necessitating incremental capacity expansions/de-bottlenecking and perhaps some switch from BF to DR grade pellets.**
- **Vale is considering capex projects to de-bottleneck its plants, thereby increasing production capacity to  $\approx 65$  mt by the mid-2020s. Of this additional 5 mt production,  $\approx 3$  mt could be DR grade.**
- **Although Cleveland Cliffs could theoretically produce 3.5 mt DR grade pellets at North Shore ( $\approx 1.2$  mt more than the needs of its Toledo HBI plant), high logistics costs effectively limit the scope for deliveries outside the Great Lakes area.**
- **New DR plants without captive pellet supply could struggle to obtain DR grade pellets from the seaborne market unless one or more existing DR plants are taken offline.**
- **However, there is of course one big elephant in the room....**

# The elephant in the room

**SAMARCO**



- **Government approvals and granting of licences by state authorities:**
  - environmental permits, water supply
  - licence applications subject to much scrutiny and politicians may be slow to take decisions
- **Germano pit is now licensed only for dry waste.**
  - Samarco's "in house" solution is to dump tailings into the Alegria South pit which is permitted, but Alegria Sul deposit has lowest P ore and is best suited for production of DR pellets, so with this solution scope for DR pellet production may be limited. Permit for preparatory operations granted, but Corrective Operational Licensing of the Germano Complex still awaited.
  - Use of Vale's adjacent, mined out Timbopeba pit, already licenced for wet tailings is an alternative that would allow access to the low P ore in Alegria Sul - non-binding term sheet agreed among Samarco, Vale and BHP.
- **Status of pellet plants**
- **Ongoing negotiations between Vale and BHP over future ownership structure, etc.**
- **Legal issues and claims to be settled**
- **Samarco's debt to be restructured**

Information sources: Samarco, author's understanding

# Vale Q3 2018 earnings call with analysts

## Fabio Schvartsman

Regarding Samarco, this year was a year of important achievements in Samarco. First, we had an agreement with all the parties involved, especially the prosecutors. That was a very complicated thing to get. And this was the most important step forward because it's taking out uncertainty of which we will be the impact of the liabilities that we had because of the accident that Samarco has because of accident. The second good news is that very recently, we decided to start the construction of the tail dam that will support the restart of the operation, called Alegria Sul where we not only decided to start but we got the licenses to build it. And we're under construction right now. **That means that by the end of 2019, we will have everything in place to ask for the license for restarting operation. Therefore, if we are able to get these licenses, we will have everything ready for restarting the operation by the beginning of 2020.**

- **To support new DR plants an injection of “new” DR grade pellet supply is needed, either a return to the market by Samarco, or new pellet plants.**
- **Samarco and its owners need to address the various issues before there is a clear way forward and it’s by no means clear at what rate, to what extent and with which products Samarco will return to the market.**
- **In the meantime, who would be brave enough to build a new pellet plant so long as Samarco’s 30.5 mt capacity is out there?**
- **Is there anyone else anyway, apart from existing players?**
- **Should new DR plants install captive pellet capacity?**

## Pellet feed - short term outlook - **supply**

- **Minas Rio** to resume Q4-2018 / Q1 2019 - aims to obtain permit in 2019 for ramp up to eventual full capacity of 26.5 mt
  - but with how much DR grade material ( $\geq 67.5\%$  Fe)?
- **Kaunis Iron** started production at the Pajala mine in northern Sweden in July 2018 aiming to produce 69% Fe concentrate at 2 mtpy rate by Q1 2019 (former operator Northland Resources went bankrupt in 2014).
- **Vale** accelerating ramp up of S11D to reach 90 mt sinter feed capacity in 2019 instead of 2020 (will replace lower grade fines from the south) - latest information is that expansion beyond 90 mt is under consideration.
- **Champion Iron's Bloom Lake mine** in Quebec producing 7.4 mtpy 66.2% Fe concentrate.

# Pellet feed - longer term potential - **supply**

- **Various development projects:**
  - **Eurasian Resources' Bamin project** in Brazil: 16-18 mt 67-68.5% Fe concentrate, start-up potentially 2021
  - **Metalloinvest** upgrading concentrate quality at **Mikhailovsky GOK** from 65% to 67% Fe by 2022
  - **Nordic Iron Ore** plans to produce 4.3 mtpy high grade magnetite concentrate at the Ludvika mines in central Sweden
  - **Carpentaria Resources' Hawsons Iron project** in NSW, Australia aims to produce 70% Fe magnetite concentrate at initial rate of 10 mt from early 2020s - now undertaking bankable feasibility study
  - **Sydvaranger AS** plans to restart high grade concentrate production at the Bjørnevåtn mine in mid 2019 (former operator Northern Iron ceased operations in 2015)

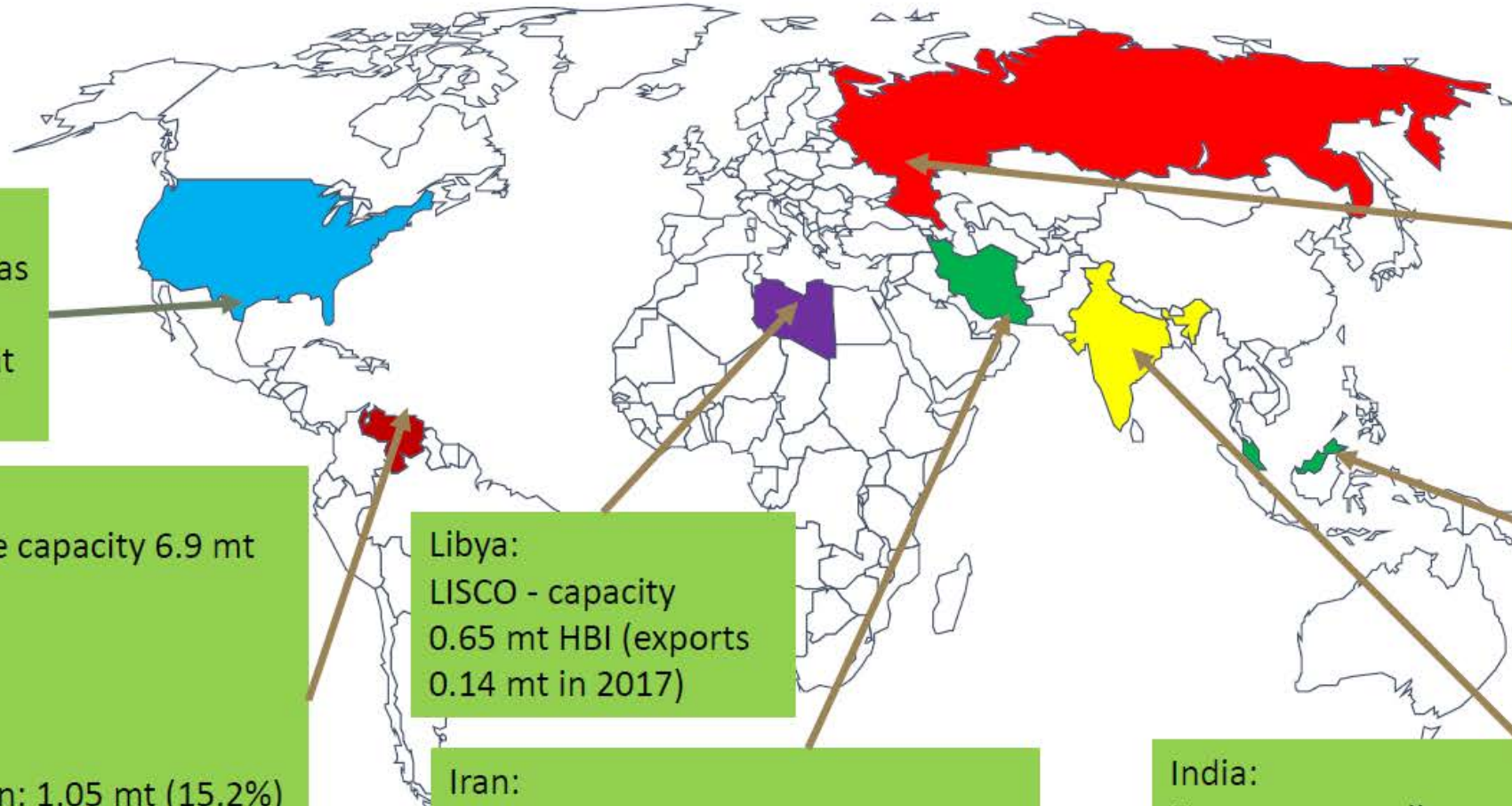


## Key messages

- **To the pellet buyer:** your job isn't going to get any easier over the coming years.
- **To the pellet seller:** when setting your pricing strategy, keep in mind that DRI and HBI need to be competitive with scrap (on a value-in-use basis).
- **To the iron ore industry in general and pellet producers in particular:** the market needs more DR grade pellets.
- **To Samarco, Vale and BHP:** please try to find a solution to enable sustainable and significant production of DR grade pellets.
- **To those considering building new DR plants:** make sure that you have a sustainable supply of pellets. If you build a captive pellet plant, make sure that you have a sustainable supply of pellet feed and the right kit to process it to pellet plant requirements.



# Global Merchant DRI/HBI supply



**USA:**  
voestalpine Texas  
2.0 mt HBI  
(exports ±1.0 mt  
in 2017)

**Russia:**  
Metalloinvest  
Lebedinsky GOK  
Capacity 4.5 mt HBI  
(2017 exports 2.8 mt)

**Venezuela:**  
Total HBI nameplate capacity 6.9 mt  
FMO 1.0 mt  
Comsigua 1.3 mt  
Briqven 1.5 mt  
Bricar 0.9 mt  
Bricor 2.2 mt  
2017 HBI production: 1.05 mt (15.2%)  
2017 DRI production 0.44 mt (9.2%)  
2017 DRI/HBI exports 1.25 mt

**Libya:**  
LISCO - capacity  
0.65 mt HBI (exports  
0.14 mt in 2017)

**Iran:**  
Various steel mills exporting surplus  
DRI /HBI to regional markets (0.6 mt  
In 2017)

**Malaysia:**  
Antara Steel Mills  
(Labuan plant)  
Capacity 0.7 mt HBI  
2017 exports ±0.55 mt

**India:**  
Numerous small sponge iron plants small  
volume exports to nearby markets (0.55 mt in  
2017)

**Mt = million tonnes**



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