



José Rodrigo Zermiani / Agência Vale

# Vale's production and sales in 4Q17





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## Production and sales highlights

Rio de Janeiro, February 16<sup>th</sup>, 2018 – Vale S.A. (Vale) delivered another strong operational performance in 4Q17 and in 2017, with several production records in iron ore, pellets, Salobo, gold and coal.

### Ferrous Minerals

#### IRON ORE & PELLETS

- Annual iron ore production record of 366.5 Mt<sup>1</sup> in 2017.
- Annual iron ore production record in the Northern System of 169.2 Mt in 2017, 21.0 Mt higher than in 2016.
- Annual pellet production of 50.3 Mt in 2017, 4.1 Mt higher than in 2016.
- Annual iron ore and pellets shipments record of 335.5 Mt from Brazil, 17.1 Mt higher than in 2016.
- Annual blended volumes in Asia of 66 Mt in 2017, compared to 3 Mt in 2014, 18 Mt in 2015 and 41 Mt in 2016.
- Annual iron ore and pellets sales volumes totaled 343.1 Mt in 2017, remaining practically in line with 2016, as a result of company's strong supply discipline and its value over volume strategy to maximize margins by reducing the supply of lower grade and high silica material.
- Quarterly iron ore production totaled 93.4 Mt in 4Q17, 1.8% lower than in 3Q17, as a result of the value over volume strategy and the historical weather related seasonality.
- Quarterly iron ore production record in the Northern System of 46.7 Mt, 1.7 Mt higher than in 3Q17 and 6.1 Mt higher than in 4Q16.

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<sup>1</sup> Including third party purchases.

## Base Metals

### NICKEL

- Annual production of 288,200 t in 2017, 7.3% lower than in 2016, mainly as a result of Vale's commitment to maximize cash generation.
- Annual production from VNC of 40,300 t in 2017, 6,000 t higher than in 2016.

### COPPER

- Annual production<sup>2</sup> of 438,500 t in 2017, remaining practically in line with 2016.
- Annual production record at Salobo of 193,400 t in 2017, 17,500 t higher than in 2016.
- Quarterly production record at Salobo of 53,000 t in 4Q17, 1,200 t higher than in 3Q17 and 3,200 t higher than in 4Q16.

### COBALT

- Annual production of 5,811 t in 2017.
- Quarterly production of 1,650 t in 4Q17, 161 t higher than in 3Q17, driven by production from VNC, Voisey's Bay and in Sudbury.

### GOLD

- Annual production record of 485,000 oz in 2017.

## Coal

- Annual production record at Moatize of 11.3 Mt in 2017, 5.8 Mt higher than in 2016.
- Quarterly production of 2.6 Mt, 0.6 Mt lower than in 3Q17 mainly due to an already addressed failure in one of the hydraulic excavators.

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<sup>2</sup> Excluding Lubambe attributable production.

## Production summary

000' metric tons	4Q17	3Q17	4Q16	2017	2016	% change		
						4Q17/3Q17	4Q17/4Q16	2017/2016
Iron ore <sup>1</sup>	93,361	95,102	92,386	366,511	348,847	-1.8%	1.1%	5.1%
Pellets <sup>1</sup>	12,898	12,766	12,620	50,300	46,220	1.0%	2.2%	8.8%
Manganese Ore	553	568	580	2,173	2,371	-2.6%	-4.6%	-8.3%
Coal	2,576	3,213	1,724	11,260	7,216	-19.8%	49.4%	56.0%
Nickel	78.0	72.7	83.0	288.2	311.0	7.3%	-6.0%	-7.3%
Copper <sup>2</sup>	113.5	116.9	120.7	438.5	445.5	-2.9%	-6.0%	-1.6%
Cobalt	1,650	1,489	1,600	5,811	5,799	10.8%	3.1%	0.2%
Gold (000' oz troy)	139	131	137	485	483	6.1%	1.5%	0.4%

<sup>1</sup> Excluding Samarco's attributable production.

<sup>2</sup> Excluding Lubambe's attributable production.

## Sales summary

000' metric tons	4Q17	3Q17	4Q16	2017	2016	% change		
						4Q17/3Q17	4Q17/4Q16	2017/2016
Iron ore	79,958	76,794	82,507	291,329	293,436	4.1%	-3.1%	-0.7%
Pellets	13,579	13,135	13,190	51,775	47,709	3.4%	2.9%	8.5%
Manganese Ore	740	498	534	1,826	1,851	48.6%	38.6%	-1.4%
Coal	2,943	3,148	2,503	11,780	10,364	-6.5%	17.6%	13.7%
Nickel	79.8	71.3	82.8	294.6	311.2	11.9%	-3.6%	-5.3%
Copper	110.5	110.2	114.8	423.8	429.6	0.3%	-3.7%	-1.4%



## Iron ore

000' metric tons	4Q17	3Q17	4Q16	2017	2016	% change		
						4Q17/3Q17	4Q17/4Q16	2017/2016
<b>Northern System</b>	<b>46,683</b>	<b>45,001</b>	<b>40,594</b>	<b>169,152</b>	<b>148,123</b>	<b>3.7%</b>	<b>15.0%</b>	<b>14.2%</b>
Carajás	38,955	38,776	40,214	146,968	147,743	0.5%	3.1%	-
S11D	7,728	6,226	380	22,184	380	24.1%	n.m.	n.m.
<b>Southeastern System</b>	<b>26,038</b>	<b>26,898</b>	<b>27,785</b>	<b>108,552</b>	<b>102,735</b>	<b>-3.2%</b>	<b>-6.3%</b>	<b>5.7%</b>
Itabira	10,333	9,607	8,573	37,837	33,357	7.5%	20.5%	13.4%
Minas Centrais	8,456	9,197	10,516	37,632	40,941	-8.0%	-19.6%	-8.0%
Mariana	7,249	8,094	8,696	33,083	28,437	-10.4%	-16.6%	16.3%
<b>Southern System</b>	<b>19,998</b>	<b>22,536</b>	<b>23,430</b>	<b>86,391</b>	<b>95,686</b>	<b>-11.2%</b>	<b>-14.5%</b>	<b>-9.7%</b>
Paraopeba	6,362	7,247	6,789	26,287	26,404	-12.6%	-6.5%	-0.4%
Vargem Grande	5,033	5,447	6,716	23,271	29,151	-7.6%	-25.0%	-20.2%
Minas Itabirito	8,604	9,877	9,925	36,834	40,131	-12.0%	-12.9%	-8.1%
<b>Midwestern System</b>	<b>643</b>	<b>632</b>	<b>577</b>	<b>2,417</b>	<b>2,304</b>	<b>1.7%</b>	<b>11.4%</b>	<b>4.9%</b>
Urucum	-	-	-	-	367	-	-	-
Corumbá	643	632	577	2,417	1,937	1.7%	11.4%	24.8%
<b>IRON ORE<sup>1</sup> PRODUCTION</b>	<b>93,361</b>	<b>95,102</b>	<b>92,386</b>	<b>366,511</b>	<b>348,847</b>	<b>-1.8%</b>	<b>1.0%</b>	<b>5.1%</b>
<b>IRON ORE<sup>2</sup> SALES</b>	<b>79,958</b>	<b>76,794</b>	<b>82,507</b>	<b>291,329</b>	<b>293,436</b>	<b>4.1%</b>	<b>-3.1%</b>	<b>-0.7%</b>
<b>IRON ORE AND PELLETS SALES</b>	<b>93,537</b>	<b>89,929</b>	<b>95,697</b>	<b>343,104</b>	<b>341,145</b>	<b>4.0%</b>	<b>-2.3%</b>	<b>0.6%</b>

<sup>1</sup> Including third party purchases, run-of-mine and feed for pelletizing plants.

<sup>2</sup> Including third party purchases and run-of-mine.

### Production summary

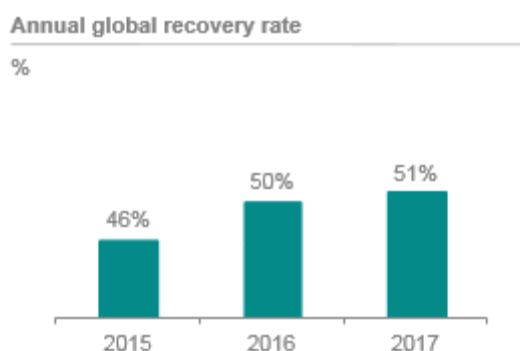
Vale's iron ore production achieved a record of 366.5 Mt in 2017, 5.1% higher than in 2016 mainly due to the S11D ramp-up, which is advancing according to plan, and higher production in the Conceição I plant in the Southeastern System due to the conclusion of its ramp-up in 2016.

The annual production of iron ore was within the original guidance of 360-380 Mt, being closer to the lower end of the range, mainly due to the reduction of production of iron ore with high silica content from the Southern and Southeastern Systems, in line with the ongoing strategy to maximize margins.

Vale reaffirms its production guidance for 2018 of around 390 Mt, as previously announced on Vale Day.

The Northern System achieved a production record of 169.2 Mt in 2017, 14.2% higher than in 2016, due to the S11D mine and plant ramp-up.

Vale's Global Recovery rate (GR)<sup>3</sup> increased from 46% in 2015 to 50% in 2016 and now to 51% in 2017, as a result of the continuous improvement in productivity.



Iron ore and pellets shipments from Brazil totaled 335.5 Mt in 2017, 34.2 Mt and 17.1 Mt higher than in 2015 and 2016, respectively, mainly due to higher production in the Northern System.

Blended volumes in Asia totaled 66.2 Mt in 2017, 48.1 Mt and 24.9 Mt higher than in 2015 and 2016, respectively.

Sales volumes of iron ore and pellets reached 343.1 Mt in 2017, remaining practically in line with 2016, but with improvements in the portfolio mix. In 4Q17, some sales were deliberately postponed to 1Q18 for margin optimization purposes.

On a quarterly basis, Vale's 4Q17 iron ore production reached 93.4 Mt, 1.8% lower than in 3Q17 due to the seasonal weather conditions in the Southeastern and Southern Systems and 1.1% higher than in 4Q16 due to the S11D ramp-up in the Northern System which more than offset the reduction in lower grade ore production from the Southern and Southeastern Systems.

Average Fe content was 64.3% in 4Q17, slightly higher than the 64.1% in 3Q17 mainly due to the S11D ramp-up and the reduction in lower grade ore production aligned with the ongoing strategy to maximize margin.

## Northern System

The Northern System, which comprises Carajás, Serra Leste and S11D, achieved a production record of 46.7 Mt in 4Q17, 15.0% and 3.7% higher than in 3Q17 and 4Q16, respectively, mainly due to the ramp-up of S11D, which is advancing according to plan.

<sup>3</sup> Measured by output of final production divided by the total tonnages extracted (ROM and waste).

## **Southeastern System**

The Southeastern System, which encompasses the Itabira, Minas Centrais and Mariana mining hubs, produced 26.0 Mt in 4Q17, 3.2% Mt lower than in 3Q17 mainly due to Vale's actions to reduce supply of lower grade and high silica material, as well as weather-related seasonality and 6.3% lower Mt than in 4Q16 due to the curtailment of lower grade ores production.

## **Southern System**

The Southern System, which encompasses the Paraopeba, Vargem Grande and Minas Itabirito mining hubs, produced 20.0 Mt in 4Q17, 11.2% lower than in 3Q17 mainly due to Vale's actions to reduce supply of lower grade and high silica material, as well as weather-related seasonality and 14.6% lower than in 4Q16 due to the curtailment of lower grade ore production.

## **Midwestern System**

The Midwestern System, which encompasses the Urucum and the Corumbá mines, produced 0.6 Mt in 4Q17, in line with 3Q17 and 4Q16.





## Pellets

000' metric tons	4Q17	3Q17	4Q16	2017	2016	% change		
						4Q17/3Q17	4Q17/4Q16	2017/2016
<b>Southeastern System</b>	<b>7,890</b>	<b>7,678</b>	<b>7,616</b>	<b>30,830</b>	<b>28,495</b>	<b>2.8%</b>	<b>3.6%</b>	<b>8.2%</b>
Itabasco (Tubarão 3)	1,157	1,095	1,133	4,552	4,502	5.7%	2.1%	1.1%
Hispanobras (Tubarão 4)	1,160	1,192	1,104	4,606	4,403	-2.7%	5.1%	4.6%
Nibrasco (Tubarão 5 and 6)	2,372	2,464	2,378	9,615	8,535	-3.7%	-0.2%	12.6%
Kobrasco (Tubarão 7)	1,311	1,134	1,150	4,817	3,902	15.6%	14.0%	23.4%
Tubarão 8	1,890	1,793	1,851	7,239	7,153	5.4%	2.1%	1.2%
<b>Southern System</b>	<b>2,605</b>	<b>2,600</b>	<b>2,551</b>	<b>10,268</b>	<b>9,173</b>	<b>0.2%</b>	<b>2.1%</b>	<b>11.9%</b>
Fábrica	989	998	981	3,825	2,798	-0.9%	0.8%	36.7%
Vargem Grande	1,616	1,602	1,570	6,443	6,374	0.9%	2.9%	1.1%
<b>Oman</b>	<b>2,403</b>	<b>2,488</b>	<b>2,453</b>	<b>9,203</b>	<b>8,552</b>	<b>-3.4%</b>	<b>-2.0%</b>	<b>7.6%</b>
<b>PELLETS PRODUCTION</b>	<b>12,898</b>	<b>12,766</b>	<b>12,620</b>	<b>50,300</b>	<b>46,220</b>	<b>1.0%</b>	<b>2.2%</b>	<b>8.8%</b>
<b>PELLETS SALES</b>	<b>13,579</b>	<b>13,135</b>	<b>13,190</b>	<b>51,775</b>	<b>47,709</b>	<b>3.4%</b>	<b>2.9%</b>	<b>8.5%</b>

### Production overview

Vale's pellet production achieved a record of 50.3 Mt in 2017, 8.9% higher than in 2016, mainly due to higher productivity and a reduction in the number of scheduled maintenance stoppages.

In 4Q17, Vale's pellet production achieved a new quarterly record of 12.9 Mt, 1.0% and 2.2% higher than in 3Q17 and 4Q16, respectively, mainly due to higher productivity in the plants.

Projects for restarting pellet plants are on schedule, with the start-ups of Tubarão I and São Luís pellet plants envisioned for end of 1Q18 and 3Q18, respectively. Tubarão II pellet plant has already started up in January 2018.

Vale reaffirms its production guidance for 2018 of around 55 Mt, as previously announced on Vale Day.

### Southeastern system

Production at the Tubarão pellet plants – Tubarão 3, 4, 5, 6, 7 and 8 – achieved a quarterly record of 7.9 Mt in 4Q17, 2.8% and 3.6% higher than in 3Q17 and 4Q16, mainly due to higher productivity in the plants.

## **Southern system**

The Fábrica pellet plant achieved a production level of 1.0 Mt in 4Q17, in line with 3Q17 and 4Q16.

The Vargem Grande pellet plant reached 1.6 Mt of production in 4Q17, in line with 3Q17 and 3.0% higher than in 4Q16, mainly due to higher availability of feed.

## **Oman operations**

The Oman pellet plant reached 2.4 Mt of production in 4Q17, 3.4% and 2.1% lower than in 3Q17 and 4Q17, respectively, due to unusually heavy rainfall impacting the productivity of the plant.



## Manganese ore and ferroalloys

000' metric tons	4Q17	3Q17	4Q16	2017	2016	% change		
						4Q17/3Q17	4Q17/4Q16	2017/2016
<b>MANGANESE ORE PRODUCTION</b>	<b>553</b>	<b>568</b>	<b>580</b>	<b>2,173</b>	<b>2,371</b>	<b>-2.6%</b>	<b>-4.6%</b>	<b>-8.3%</b>
Azul	352	382	391	1,419	1,697	-7.8%	-9.9%	-16.4%
Urucum	178	160	167	673	652	11.4%	6.7%	3.2%
Morro da Mina	23	27	22	81	22	-14.4%	5.0%	269.5%
<b>MANGANESE ORE SALES</b>	<b>740</b>	<b>498</b>	<b>534</b>	<b>1,826</b>	<b>1,851</b>	<b>48.6%</b>	<b>38.6%</b>	<b>-1.4%</b>
<b>FERROALLOYS PRODUCTION</b>	<b>35</b>	<b>35</b>	<b>35</b>	<b>146</b>	<b>124</b>	<b>-0.3%</b>	<b>-0.3%</b>	<b>17.7%</b>
<b>FERROALLOYS SALES</b>	<b>34</b>	<b>32</b>	<b>35</b>	<b>133</b>	<b>127</b>	<b>6.3%</b>	<b>-2.8%</b>	<b>4.7%</b>

### Production overview

Manganese ore production totaled 2.2 Mt in 2017, decreasing 8.3% vs. 2016. Sales volumes reached 1.8 Mt in 2017, in line with 2016.

Ferroalloy production reached 146,000 t in 2017, increasing 17.7% vs. 124,000 t in 2016. Sales volumes totaled 133,000 t, 4.7% higher than in 2016.

### Manganese ore

Production at the Azul manganese mine totaled 1.4 Mt in 2017, 16.4% lower than in 2016, mainly due to the decrease in the grade of the run-of-mine, resulting in lower product recovery. For the same reason, production in 4Q17 was 7.7% and 9.9% lower than in 3Q17 and 4Q16, respectively, reaching 385,000 t.

Production at the Urucum mine totaled 673,000 t in 2017, 3.2% higher than 2016 due to higher equipment availability. In 4Q17, production at the Urucum mine reached 178,000 t, 11.4% higher than in 3Q17 due to a scheduled maintenance stoppage at the plant in 3Q17, and 6.9% higher than in 4Q16 due to higher availability of the beneficiation plants.

Production at the Morro da Mina mine totaled 81,000 t in 2017. In 4Q17, production at the Morro da Mina mine reached 23,000 t, 14.5% lower than in 3Q17 due to a scheduled maintenance stoppage in 4Q17, and 3.0% higher than in 4Q16 due to the resumption of activities in October 2016.

Sales volumes for manganese ore totaled 740,000 t in 4Q17, 48.6% higher than in 2016 due to the reduction of inventories.

## Ferroalloy production

Ferroalloy production in 2017 totaled 146,000 t, 17.7% more than 124,000 t in 2016, mainly due to higher availability and utilization of furnaces 10 and 11 of Simões Filho; acquisition of competitive electric power for Barbacena plant in December 2016; and resumption of one furnace in Ouro Preto in September 2017.

Production of 2017 was composed of 68,000 t of ferrosilicon manganese alloys (FeSiMn), 52,000 t of high-carbon manganese alloys (FeMnHC) and 26,000 t of medium-carbon manganese alloys (FeMnMC).

Ferroalloy production in 4Q17 was 35,000 t, in line with 3Q17 and 4Q16. Product mix in 4Q17 was comprised of 16,000 t of FeSiMn, 12,000 t of FeMnHC and 7,000 t of FeMnMC.

Sales volumes for ferroalloys totaled 34,000 t in 4Q17, 6.3% higher than in 3Q17.





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## Nickel

### Finished production by source

000' metric tons	4Q17	3Q17	4Q16	2017	2016	% change		
						4Q17/3Q17	4Q17/4Q16	2017/2016
Canada	37.9	35.6	43.4	136.9	155.9	6.5%	-12.7%	-12.2%
Sudbury	17.7	18.5	19.9	61.9	80.4	-4.3%	-11.1%	-23.0%
Thompson	7.0	6.7	7.2	23.0	26.5	4.5%	-2.8%	-13.2%
Voisey's Bay	13.2	10.4	16.3	51.8	49.0	26.9%	-19.0%	5.7%
Indonesia	19.0	18.2	21.8	73.1	81.1	4.4%	-12.8%	-9.9%
New Caledonia <sup>1</sup>	10.9	10.1	8.9	40.3	34.3	7.9%	22.5%	17.5%
Brazil	6.0	7.1	5.6	24.7	24.1	-15.5%	7.1%	2.5%
Feed from third parties <sup>2</sup>	4.2	1.7	3.3	13.1	15.6	147.1%	27.3%	-16.0%
<b>NICKEL PRODUCTION</b>	<b>78.0</b>	<b>72.7</b>	<b>83.0</b>	<b>288.2</b>	<b>311.0</b>	<b>7.3%</b>	<b>-6.0%</b>	<b>-7.3%</b>
<b>NICKEL SALES</b>	<b>79.8</b>	<b>71.3</b>	<b>82.8</b>	<b>294.6</b>	<b>311.2</b>	<b>11.9%</b>	<b>-3.6%</b>	<b>-5.3%</b>

<sup>1</sup> Production at VNC reached 10,600 t in 4Q17, while production of finished nickel from VNC totaled 10,900 t in 4Q17, the differences stemming from the required time for processing into finished nickel. Production at VNC reached 37,200 t in 2017, while production of finished nickel from VNC totaled 40,300 t in 2017, the differences also stemming from the required time for processing into finished nickel and inventory drawdown.

<sup>2</sup> External feed purchased from third parties and processed into finished nickel in our Canadian and Asian operations.

### Production overview

Production of nickel reached 288,200 t in 2017, being 7.3% lower than in 2016 as a result of the closure of one of the furnaces in Thompson, in line with Vale's commitment to a smaller nickel footprint, and the transition to a single furnace in Sudbury, which will optimize the North Atlantic flowsheet and improve overall competitiveness. Annual production in 2017 was in line with the 287,000 t previously forecasted during the Vale Day presentation.

Annual production from VNC sourced material reached 40,300 t in 2017, 6,000 t higher than 2016 and also in line with the guidance of 40,000 t that had been previously provided. Onça Puma reached an annual production of 24,700 t in 2017, 600 t higher than in 2016.

Sales volumes of nickel were 294,600 t in 2017, 5.3% lower than in 2016 mainly as a result of lower production. Sales volumes were higher compared to production volumes in 2017 mainly due to 4,000 t of purchased nickel sales and 2,000 t of finished inventory draw down.

## Canadian operations

Production from the Sudbury mines reached 17,700 t in 4Q17, 4.3% lower than in 3Q17 and 11.1% lower than in 4Q16. The decrease compared to 3Q17 was due to the full transition to a single furnace operation in 4Q17 whereas Sudbury operated with two furnaces during part of 3Q17. Production decreased in relation to 4Q16 due to the transition to a single furnace operation as well as the cessation of mining activities at Stobie mine since 2Q17, following Vale's strategy to optimize margins and reduce the nickel footprint. The ramp-up of the single furnace operation was completed ahead of schedule and the furnace has been running above expected levels.

Production from the Thompson mines reached 7,000 t in 4Q17, 4.5% higher than in 3Q17 and 2.8% lower than 4Q16. The increase when compared to 3Q17 was due to a scheduled maintenance shutdown at its surface plants in 3Q17. The decrease when compared to 4Q16 was due to lower production as the Birchtree mine was placed under care and maintenance at the end of September, as well as the closure of one of the furnaces since January 2017 whereas Thompson operated with two furnaces in 4Q16. Thompson will fully transition to a mine-mill operation in 3Q18, when the remaining furnace and refinery will be shut down.

Production from the Voisey's Bay source reached 13,200 t in 4Q17, 26.9% higher than in 3Q17 and 19.0% lower than in 4Q16. The increase compared to 3Q17 was mainly due to the drawdown of Voisey's Bay feed in Thompson as it returned to full production after the scheduled maintenance shutdown in 3Q17. Production decreased in relation to 4Q16 as both Thompson and Sudbury operated with two furnaces during 2016 and consumed higher volumes of Voisey's Bay feed.

Production at the Long Harbour processing plant reached 8,400 t in 4Q17, in line with 3Q17 and 61.5% higher than in 4Q16. Production continues to ramp up with November 2017 output reaching 85% of nameplate capacity. The nickel concentrate being produced at Voisey's Bay is now processed solely at Long Harbour.

## Indonesian operation (PTVI)

Production of finished nickel from PTVI reached 19,000 t in 4Q17, 4.4% higher than in 3Q17 and 12.8% lower than in 4Q16. The decrease compared to 4Q16 was mainly due to differences in the required time for processing matte into finished nickel as increasing volumes of PTVI source feed were shipped to our Clydach refinery.

PTVI nickel in matte production reached 19,300 t in 4Q17, 4.5% lower than in 3Q17 and in line with 4Q16.

### **New Caledonia operation (VNC)**

Production of finished products from VNC reached 10,900 t in 4Q17, 7.9% and 22.5% higher than in 3Q17 and 4Q16, respectively.

Production of NiO and NHC at VNC reached 10,600 t in 4Q17 and an annual production of 37,300 t in 2017. Site production was 12.8% higher than 3Q17 and 14.0% higher than 4Q16. NiO represented 80% and NHC 20% of VNC's 4Q17 site production. VNC continues to ramp up its production.

### **Brazilian operation (Onça Puma)**

Production reached 6,000 t in 4Q17, 15.5% lower than in 3Q17 and 7.1% higher than in 4Q16. The decrease when compared to 3Q17 was due to lower ore grades while the increase when compared to 4Q16 was a result of stronger plant performance in 4Q17.



# Copper

## Finished production by source

000' metric tons	4Q17	3Q17	4Q16	2017	2016	% change		
						4Q17/3Q17	4Q17/4Q16	2017/2016
<b>BRAZIL</b>	<b>75.6</b>	<b>77.4</b>	<b>72.3</b>	<b>293.1</b>	<b>268.5</b>	<b>-2.3%</b>	<b>4.6%</b>	<b>9.2%</b>
Sossego	22.6	25.6	22.5	99.7	92.6	-11.7%	0.4%	7.7%
Salobo	53.0	51.8	49.8	193.4	175.9	2.3%	6.4%	9.9%
<b>CANADA</b>	<b>37.9</b>	<b>39.5</b>	<b>48.4</b>	<b>145.4</b>	<b>177.0</b>	<b>-4.1%</b>	<b>-21.7%</b>	<b>-17.9%</b>
Sudbury	25.4	30.1	32.2	98.3	121.6	-15.6%	-21.1%	-19.2%
Thompson	0.7	0.3	0.4	1.7	2.5	133.3%	75.0%	-32.0%
Voisey's Bay	9.2	6.6	11.0	33.5	31.7	39.4%	-16.4%	5.7%
Feed from third parties	2.6	2.5	4.8	11.9	21.2	4.0%	-45.8%	-43.9%
<b>COPPER PRODUCTION</b>	<b>113.5</b>	<b>116.9</b>	<b>120.7</b>	<b>438.5</b>	<b>445.5</b>	<b>-2.9%</b>	<b>-6.0%</b>	<b>-1.6%</b>
<b>COPPER SALES</b>	<b>110.5</b>	<b>110.2</b>	<b>114.8</b>	<b>423.8</b>	<b>429.6</b>	<b>0.3%</b>	<b>-3.7%</b>	<b>-1.4%</b>
Lubambe production <sup>1</sup>	1.8	1.9	1.8	7.1	7.6	-5.3%	0.0%	-6.6%

<sup>1</sup> Attributable production. Vale's stake in Lubambe was sold in 4Q17.

## Production overview

Copper production<sup>4</sup> reached 438,500 t in 2017, remaining practically in line with 2016 and with the guidance of 438,000 t that had been previously announced. Production decrease in Canadian operations, mainly due to the flowsheet transition towards a smaller footprint as well as the impact of an unscheduled maintenance shutdown at the Coleman mine, was practically offset by a record annual production of 193,400 t at Salobo, 17,500 t higher than in 2016.

Sales volumes of copper reached 423,800 t in 2017, remaining in line with 2016. Sales volumes are lower compared to production volumes due to payable copper vs. contained copper content: part of the copper contained in the concentrates is lost in the smelting and refining process and, hence, payable quantities of copper are approximately 3.5% lower than production volumes.

<sup>4</sup> Excluding Lubambe attributable production.



## **Brazilian operations**

Production of copper in concentrate at Sossego totaled 22,600 t in 4Q17, 11.7% lower than in 3Q17 and in line with 4Q16. The decrease when compared to 3Q17 was due to lower ore grades being processed at the mill.

Production of copper in concentrate at Salobo reached a quarterly record of 53,000 t in 4Q17, 2.3% and 6.4% higher than in 3Q17 and 4Q16, respectively, mainly due to higher feed grades and strong plant performance. Salobo achieved a monthly production record of 18,500 t of copper in concentrate in November.

## **Canadian operations**

Production of copper from Sudbury reached 25,400 t in 4Q17, 15.6% and 21.1% lower than in 3Q17 and 4Q16, respectively, mainly due to the extended unscheduled maintenance at the Coleman mine as well as the cessation of mining activities at the Stobie mine since 2Q17.

Production of copper from Voisey's Bay reached 9,200 t in 4Q17, 39.4% higher than in 3Q17 due to the three week scheduled maintenance period in 3Q17. 4Q17 production was 16.4% lower than in 4Q16 due to lower copper mine grades and as a result of more Voisey's Bay nickel concentrate feed being sent to Long Harbour rather than Sudbury in order to support Long Harbour's successful ramp-up. In 2018, copper cathode production from Voisey's Bay source feed will increase at Long Harbour.



## Cobalt

### Finished production by source

	4Q17	3Q17	4Q16	2017	2016	% change		
						4Q17/3Q17	4Q17/4Q16	2017/2016
<b>COBALT (metric tons)</b>	<b>1,650</b>	<b>1,489</b>	<b>1,600</b>	<b>5,811</b>	<b>5,799</b>	<b>10.8%</b>	<b>3.1%</b>	<b>0.2%</b>
Sudbury	225	279	286	840	882	-19.4%	-21.3%	-4.8%
Thompson <sup>1</sup>	-219	106	156	138	700	-306.6%	-240.4%	-80.3%
Voisey's Bay <sup>1</sup>	799	382	320	1,829	887	109.2%	149.7%	106.2%
VNC	716	710	814	2,780	3,188	0.8%	-12.0%	-12.8%
Others	130	12	23	224	143	n.m.	465.2%	56.6%

<sup>1</sup> Cobalt by-product has been reclassified between Thompson and Voisey's Bay operations. The reconciliation of previous period volumes attributed a negative amount to Thompson and higher volumes to Voisey's Bay in 4Q17.

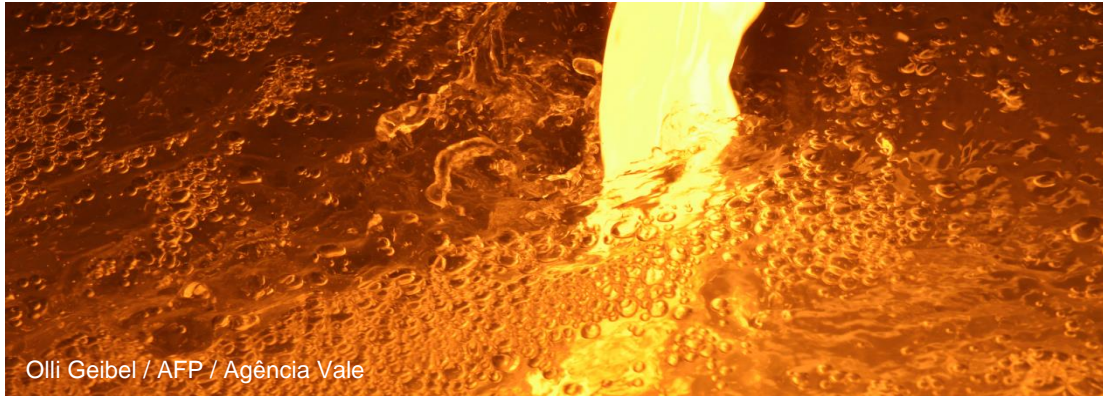
### Production overview

Cobalt reached an annual production of 5,811 t in 2017.

Cobalt production totaled 1,650 t in 4Q17, 10.8% and 3.1% higher than in 3Q17 and 4Q16, respectively, mainly driven by production from VNC, Voisey's Bay and in Sudbury.

Production of cobalt from Sudbury source takes about 3 months from the moment nickel ore is mined at Sudbury to the moment that the cobalt by-product is processed in Port Colborne. Sudbury source cobalt decreased 19.4% compared to 3Q17 mainly due to the impact of the closure of Stobie mine in 2Q17, whose inventory of cobalt intermediate was drawdown and processed in 3Q17. To compensate for this decrease, Sudbury cobalt production line consumed greater amounts of external cobalt feed, leading to the increase in cobalt from Other sources.

Voisey's Bay cobalt production increased compared to 3Q17, mainly due to the successful ramp-up of Long Harbour. As Long Harbour continues to ramp-up we will benefit from the high cobalt recoveries at Long Harbour and produce more Voisey's Bay source cobalt than in previous periods. Also, there was a spot reconciliation of previous period volumes that attributed a negative amount to Thompson and higher volumes to Voisey's Bay (254 t) in 4Q17. Cobalt production in Long Harbour increased from around 100 t in 1Q17 to 400 t in 4Q17, a significant increase that strengthens the refinery performance with robust by-product credits.



Olli Geibel / AFP / Agência Vale

## Nickel and copper by-products

### Finished production by source

	4Q17	3Q17	4Q16	2017	2016	% change		
						4Q17/3Q17	4Q17/4Q16	2017/2016
PLATINUM (000' oz troy)	37	36	27	144	166	2.8%	37.0%	-13.3%
PALLADIUM (000' oz troy)	31	57	48	214	322	-45.6%	-35.4%	-33.5%
GOLD BY-PRODUCT (000' oz troy)	139	131	137	485	483	6.1%	1.5%	0.4%

### Platinum and palladium

Platinum reached an annual production of 144,000 oz and palladium reached an annual production of 214,000 oz in 2017.

Platinum production in 4Q17 was 37,000 oz and palladium production in 4Q17 was 31,000 oz, 2.8% higher and 45.6% lower than in 3Q17, respectively.

### Gold

Production reached an annual record of 485,000 oz in 2017, 2,000 oz higher than in 2016.

The contained volume of gold as a by-product in our nickel and copper concentrates reached a record of 139,000 oz in 4Q17, 6.1% and 1.5% higher than in 3Q17 and 4Q16, respectively.



## Coal

000' metric tons	4Q17	3Q17	4Q16	2017	2016	% change		
						4Q17/3Q17	4Q17/4Q16	2017/2016
<b>MOZAMBIQUE</b>	<b>2,576</b>	<b>3,213</b>	<b>1,585</b>	<b>11,260</b>	<b>5,492</b>	-19.8%	62.5%	105.0%
Metallurgical coal	1,419	1,853	1,006	6,953	3,480	-23.4%	41.0%	99.8%
Thermal coal	1,157	1,360	579	4,307	2,012	-14.9%	100.0%	114.1%
<b>AUSTRALIA</b>	-	-	<b>139</b>	-	<b>1,724</b>	-	-	-
Metallurgical coal	-	-	139	-	1,724	-	-	-
<b>COAL PRODUCTION</b>	<b>2,576</b>	<b>3,213</b>	<b>1,724</b>	<b>11,260</b>	<b>7,216</b>	-19.8%	49.4%	56.0%
Metallurgical coal	1,419	1,853	1,145	6,953	5,204	-23.4%	23.9%	33.6%
Thermal coal	1,157	1,360	579	4,307	2,012	-14.9%	100.0%	114.1%
<b>COAL SALES</b>	<b>2,943</b>	<b>3,148</b>	<b>2,503</b>	<b>11,780</b>	<b>10,364</b>	-6.5%	17.6%	13.7%
Metallurgical coal	1,715	1,869	1,382	7,178	4,907	-8.2%	24.1%	46.3%
Thermal coal	1,228	1,279	1,121	4,602	5,457	-4.0%	9.5%	-15.7%

### Production overview

Coal production totaled 11.3 Mt in 2017, 56.0% higher than the 7.2 Mt in 2016, as a result of the ramp-up of Moatize II, partly offset by the divestment of Carborough Downs operations in November 2016. 2017 was the first year with production exclusively at Moatize, with the volume at that site increasing by 105.0% from 2016 levels.

Coal production in 4Q17 was 2.6 Mt, 19.8% lower than in 3Q17. The lower quarterly production was mainly impacted by an already addressed failure in one of the hydraulic excavators, which is also the main reason for the lower production compared to the 11.7Mt forecast announced on Vale Day 2017. The 49% increase in production compared to 4Q16 is a result of the ramp-up of Moatize II, partially offset by the divestment of Carborough Downs mentioned above, whereas standalone production at Moatize increased 62.5% when compared to 4Q16.

Production of metallurgical coal from Mozambique was 1.4 Mt in 4Q17, 23.4% lower than in 3Q17 and 41.0% higher than in 4Q16. Production of thermal coal was 1.2 Mt in 4Q17, 14.9% lower than 3Q17 but 100.0% higher than in 4Q16. The higher share of thermal coal in overall production in 4Q17 was due to a combination of the geological characteristics of the feed, with relatively higher ash content, and the processing of remaining tonnes of thermal coal stockpile in the Coal Handling and Processing Plant 1 (CHPP1). Our expectation is that the share of



metallurgical coal in overall production will return to 60% - 65% with the access to feed with lower ash content and the implementation of improvements in the coal preparation processes in 2018.

Coal sales volumes reached 11.780 Mt in 2017, 13.7% higher than in 2016, with metallurgical coal sales increasing 46.3% in 2017 whereas thermal coal sales decreased 15.7% in the same period. Thermal coal sales decrease was due to high level of sales in 2016, as the ramp-up of Nacala Logistics Corridor enabled to draw down accumulated inventories of thermal coal produced in 2015.