



S11D – Truckless System

# Vale's production and sales in 3Q18

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## Production and sales highlights

Rio de Janeiro, October 15th, 2018 – Vale S.A (Vale) broke the emblematic production barrier of 100 Mt of iron ore fines in a quarter, reaching a production record of 104.9 Mt in 3Q18 vs 96.8 Mt in 2Q18 and achieving a production rate of 400 Mtpy. This reflected in a new sales record for iron ore and pellets of 98.2 Mt in 3Q18, 4.7 Mt higher than the previous record in 4Q17. Premium products<sup>1</sup> made up 79% of total sales in 3Q18 (vs. 77% in 2Q18) and together with the consolidation of the differentiation strategy of Vale's product portfolio resulted in contributions of quality and average premium to a realized price of iron ore fines of US\$ 8.6/t in 3Q18 vs US\$ 7.1/t in 2Q18 and US\$ 5.6/t in 3Q17.

Vale's superior product portfolio with high Fe content and low contaminants continues to improve. On average, Fe content reached 64.0% in 3Q18 vs 63.8% in 2Q18, alumina 1.2% in 3Q18 vs 1.3% in 2Q18 and silica 3.9% in 3Q18 vs 4.2% in 2Q18.

S11D had an important role in improving the share of premium products on sales to 79% in 3Q18 from 77% in 2Q18, reaching another quarterly production record of 16.1 Mt in 3Q18 vs 14.3 Mt in 2Q18, and achieving a production rate of approximately 70% of its nominal capacity in 3Q18. The breakthrough technology of the truckless system is proving effective and adherent to physical planning. Annual production in 2018 will be towards the upper limit of the 50-55 Mt guidance.

Vale reaffirms its iron ore production guidance of about 390 Mt and about 400 Mt for 2018 and 2019 onwards, respectively, as previously announced on Vale Day.

Vale achieved a quarterly pellet production record of 13.9 Mt, 1.1 Mt higher than in 2Q18 mainly due to the successful ramp-up of the Tubarão I and II pellet plants. The year to date performance together with the restart of the São Luis pellet plant in 3Q18 will lead Vale to achieve its production guidance of 55 Mt in 2018 and 60 Mt in 2019.

As previously announced, nickel operations in 3Q18 reflected planned one-off effects derived from Sudbury's scheduled maintenance shutdown. It was Sudbury's first annual maintenance since the shift to a single furnace and it occurred concomitantly with Thompson's transition to a mine-mill operation. Given that Thompson's feed is now sent for smelting at Sudbury,

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<sup>1</sup> Pellets, Carajás, BRBF (Brazilian Blend Fines), pellet feed and sinter feed low alumina



temporary effects on both operations led to overall nickel production of 55,700 t in 3Q18. These two one-offs affected only 3Q18 and now, with an enhanced flowsheet between Thompson and Sudbury, production is expected to go back to previous guidance levels from 4Q18 onwards. Sequential improvements are also expected in 2019 as the nickel business is under restructuring, with the new management team aiming to adjust mine plans, optimize nickel's cost structure and achieve higher efficiency.

Copper production reached 94,500 t in 3Q18, 3,400 t lower than in 2Q18, reflecting the annual scheduled maintenance shutdown in Sudbury and the strategic decision to decrease mine production at Voisey's Bay to extend the mine lifespan to match the Voisey's Bay Mine Extension - VBME underground development schedule.

As previously reported, the Coal business is reviewing mine plans and operations to ensure a sustainable ramp-up from 2019 onwards. The structural changes started to bear fruit in 3Q18, with production totaling 3.2 Mt, 11.3% higher than 2Q18.

## Production summary

000' metric tons	3Q18	2Q18	3Q17	9M18	9M17	% change		
						3Q18/2Q18	3Q18/3Q17	9M18/9M17
Iron ore <sup>1</sup>	104,945	96,755	95,102	283,652	275,150	8.5%	10.3%	3.1%
Pellets	13,878	12,838	12,766	39,497	37,404	8.1%	8.7%	5.6%
Manganese Ore	482	421	569	1,336	1,620	14.5%	-15.3%	-17.5%
Coal	3,194	2,871	3,213	8,497	8,684	11.3%	-0.6%	-2.2%
Nickel	55.7	66.2	72.7	180.6	210.1	-15.9%	-23.4%	-14.0%
Copper <sup>2</sup>	94.5	97.9	116.9	285.7	325.1	-3.5%	-19.2%	-12.1%
Cobalt	1,028	1,302	1,489	3,657	4,160	-21.0%	-31.0%	-12.1%
Gold (000' oz troy)	117	114	131	344	346	2.6%	-10.7%	-0.6%

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

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

## Sales summary

000' metric tons	3Q18	2Q18	3Q17	9M18	9M17	% change		
						3Q18/2Q18	3Q18/3Q17	9M18/9M17
Iron ore <sup>1</sup>	83,976	73,290	76,794	228,486	211,370	14.6%	9.4%	8.1%
Pellets	14,250	13,231	13,135	40,606	38,196	7.7%	8.5%	6.3%
Manganese Ore	553	239	498	1,130	1,086	131.4%	11.0%	4.1%
Coal	3,195	2,509	3,148	8,200	8,837	27.3%	1.5%	-7.2%
Nickel	57.3	61.6	71.3	176.8	214.8	-7.0%	-19.6%	-17.7%
Copper	92.4	94.6	110.2	274.8	313.3	-2.3%	-16.2%	-12.3%

<sup>1</sup> Including third party purchases and run-of-mine.



## Iron ore

000' metric tons	3Q18	2Q18	3Q17	9M18	9M17	% change		
						3Q18/2Q18	3Q18/3Q17	9M18/9M17
<b>Northern System</b>	<b>53,919</b>	<b>46,210</b>	<b>45,001</b>	<b>140,730</b>	<b>122,468</b>	<b>16.7%</b>	<b>19.8%</b>	<b>14.9%</b>
Northern and Eastern ranges	37,784	31,888	38,776	98,592	108,013	18.5%	-2.6%	-8.7%
S11D	16,135	14,322	6,226	42,138	14,455	12.7%	159.2%	191.5%
<b>Southeastern System</b>	<b>28,016</b>	<b>27,630</b>	<b>26,898</b>	<b>77,858</b>	<b>82,514</b>	<b>1.4%</b>	<b>4.2%</b>	<b>-5.6%</b>
Itabira	10,929	10,497	9,607	30,465	27,505	4.1%	13.8%	10.8%
Minas Centrais	9,705	9,373	9,197	26,832	29,176	3.5%	5.5%	-8.0%
Mariana	7,382	7,761	8,094	20,561	25,834	-4.9%	-8.8%	-20.4%
<b>Southern System</b>	<b>22,378</b>	<b>22,244</b>	<b>22,571</b>	<b>63,152</b>	<b>66,394</b>	<b>0.6%</b>	<b>-0.9%</b>	<b>-4.9%</b>
Paraopeba	7,270	7,206	7,247	20,608	19,925	0.9%	0.3%	3.4%
Vargem Grande	5,775	5,795	5,447	16,254	18,238	-0.3%	6.0%	-10.9%
Minas Itabirito	9,333	9,243	9,877	26,291	28,230	1.0%	-5.5%	-6.9%
<b>Midwestern System</b>	<b>632</b>	<b>670</b>	<b>632</b>	<b>1,911</b>	<b>1,774</b>	<b>-5.7%</b>	<b>0.0%</b>	<b>7.7%</b>
Corumbá	632	670	632	1,911	1,774	-5.7%	0.0%	7.7%
<b>IRON ORE PRODUCTION<sup>1</sup></b>	<b>104,945</b>	<b>96,755</b>	<b>95,102</b>	<b>283,652</b>	<b>273,150</b>	<b>8.5%</b>	<b>10.3%</b>	<b>3.8%</b>
<b>IRON ORE SALES<sup>2</sup></b>	<b>83,976</b>	<b>73,290</b>	<b>76,794</b>	<b>228,486</b>	<b>211,370</b>	<b>14.6%</b>	<b>9.4%</b>	<b>8.1%</b>
<b>IRON ORE AND PELLETS SALES</b>	<b>98,226</b>	<b>86,521</b>	<b>89,929</b>	<b>269,092</b>	<b>249,566</b>	<b>13.5%</b>	<b>9.2%</b>	<b>7.8%</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 and sales overview

The iron ore production record of 104.9 Mt in 3Q18 was 10.3% higher than in 3Q17, as a result of the S11D ramp-up, and 8.5% higher than in 2Q18 mainly due the usual weather-related seasonality and the performance of S11D.

The sales mix has been consistently improving mainly as a result of S11D and Tubarão I and II pellet plants ramp-ups. The share of premium products (pellets, Carajás, BRBF, pellet feed and sinter feed low alumina) increased to 79% in 3Q18, contributing to the US\$ 1.5/t increase of Vale's average premium to the realized iron ore fines CFR/FOB wmt price in 3Q18 vs. 2Q18<sup>2</sup>.

Vale continued the build-up of offshore inventories to increase the flexibility of the supply chain and product portfolio. Nevertheless, Vale achieved record sales for a quarter of 98.2 Mt, 8.7 Mt

<sup>2</sup> US\$ 8.6/t in 3Q18 vs US\$ 7.1/t in 2Q18

higher than in 3Q17, due to the solid production performance in 3Q18. In the coming quarters, the offshore inventories will increase in a lower rate than seen in previous quarters.

### **Northern System**

The Northern System, which comprises Carajás and S11D, achieved a quarterly record of 53.9 Mt in 3Q18, 7.7 Mt and 8.9 Mt higher than in 2Q18 and 3Q17, respectively, mainly due to the successful S11D ramp-up and the usual weather-related seasonality when compared to the 2Q18.

### **Southeastern System**

The Southeastern System, which encompasses the Itabira, Minas Centrais and Mariana mining hubs, produced 28.0 Mt in 3Q18, 1.1 Mt and 0.4 Mt higher than in 2Q18 and 3Q17, respectively, due to the restart of the Timbopeba plant and the better operational performance of the Itabira complex and the Brucutu plant.

### **Southern System**

The Southern System, which encompasses the Paraopeba, Vargem Grande and Minas Itabirito mining hubs, produced 22.4 Mt in 3Q18, in line with 2Q18 and 3Q17.

### **Midwestern System**

The Midwestern System produced 0.6 Mt in 3Q18, in line with 2Q18 and 3Q17.



## Pellets

000' metric tons	3Q18	2Q18	3Q17	9M18	9M17	% change		
						3Q18/2Q18	3Q18/3Q17	9M18/9M17
<b>Southeastern System</b>	<b>8,701</b>	<b>7,913</b>	<b>7,678</b>	<b>24,485</b>	<b>22,940</b>	<b>10.0%</b>	<b>13.3%</b>	<b>6.7%</b>
Tubarão 1 and 2	1,112	889	-	2,537	-	25.1%	n.m.	n.m.
Itabasco (Tubarão 3)	1,093	1,006	1,095	3,201	3,395	8.6%	-0.2%	-5.7%
Hispanobras (Tubarão 4)	1,122	728	1,192	2,959	3,446	54.1%	-5.9%	-14.1%
Nibrasco (Tubarão 5 and 6)	2,264	2,305	2,464	6,865	7,244	-1.8%	-8.1%	-5.2%
Kobrasco (Tubarão 7)	1,232	1,148	1,134	3,462	3,506	7.3%	8.6%	-1.3%
Tubarão 8	1,878	1,836	1,793	5,462	5,349	2.3%	4.7%	2.1%
<b>Southern System</b>	<b>2,543</b>	<b>2,805</b>	<b>2,600</b>	<b>8,052</b>	<b>7,664</b>	<b>-9.3%</b>	<b>-2.2%</b>	<b>5.1%</b>
Fábrica	1,057	1,034	998	3,071	2,837	2.2%	5.9%	8.2%
Vargem Grande	1,485	1,771	1,602	4,981	4,827	-16.1%	-7.3%	3.2%
<b>Oman</b>	<b>2,603</b>	<b>2,120</b>	<b>2,488</b>	<b>6,927</b>	<b>6,800</b>	<b>22.8%</b>	<b>4.6%</b>	<b>1.9%</b>
<b>PELLETS PRODUCTION</b>	<b>13,878</b>	<b>12,838</b>	<b>12,766</b>	<b>39,497</b>	<b>37,404</b>	<b>8.1%</b>	<b>8.7%</b>	<b>5.6%</b>
<b>PELLETS SALES</b>	<b>14,250</b>	<b>13,231</b>	<b>13,135</b>	<b>40,606</b>	<b>38,196</b>	<b>7.7%</b>	<b>8.5%</b>	<b>6.3%</b>

### Production and sales overview

Vale's pellet production achieved quarterly record of 13.9 Mt, 8.1% and 8.7% higher than in 2Q18 and 3Q17, respectively, mainly due to the resumption of the Tubarão I and II pellet plants and the effects of the maintenance stoppage in 2Q18 at the Tubarão IV plant.

The São Luis pellet plant restarted in September supporting Vale's production guidance of 55 Mt in 2018.

### Southeastern system

Production at the Tubarão pellet plants – Tubarão 1, 2, 3, 4, 5, 6, 7 and 8 – achieved a quarterly record of 8.7 Mt in 3Q18, 0.8 Mt and 1.0 Mt higher than in 2Q18 and 3Q17, respectively, mainly due to the restart of the Tubarão I and II pellet plants and the effects of the maintenance stoppage in 2Q18.

### Southern system

The Fábrica pellet plant achieved a production level of 1.1 Mt in 3Q18, in line with 2Q18 and 0.6 Mt higher than in 3Q17 due to the higher productivity of the plant.

The Vargem Grande pellet plant reached 1.5 Mt of production in 3Q18, 0.3 Mt and 0.1 Mt lower than in 2Q18 and 3Q17, respectively, due to a scheduled maintenance stoppage in July.

### **Oman operations**

The Oman pellet plant achieved a quarterly record of 2.6 Mt in 3Q18, 0.5 Mt and 0.1 Mt higher than in 2Q18 and 3Q17, respectively, due to the higher productivity of the plant and higher availability of feed, and because of the maintenance stoppage in April and May, which impacted negatively the production in 2Q18.





## Manganese ore and ferroalloys

000' metric tons	3Q18	2Q18	3Q17	9M18	9M17	% change		
						3Q18/2Q18	3Q18/3Q17	9M18/9M17
<b>MANGANESE ORE PRODUCTION</b>	<b>482</b>	<b>421</b>	<b>569</b>	<b>1,336</b>	<b>1,620</b>	<b>14.5%</b>	<b>-15.3%</b>	<b>-17.5%</b>
Azul	272	234	382	739	1,067	16.2%	-28.8%	-30.7%
Urucum	175	157	160	504	495	11.5%	9.4%	1.8%
Morro da Mina	34	30	27	93	58	13.3%	25.9%	60.3%
<b>MANGANESE ORE SALES</b>	<b>553</b>	<b>239</b>	<b>498</b>	<b>1,130</b>	<b>1,086</b>	<b>131.4%</b>	<b>11.0%</b>	<b>4.1%</b>
<b>FERROALLOYS PRODUCTION</b>	<b>43</b>	<b>38</b>	<b>36</b>	<b>126</b>	<b>111</b>	<b>13.2%</b>	<b>19.4%</b>	<b>13.5%</b>
<b>FERROALLOYS SALES</b>	<b>37</b>	<b>34</b>	<b>32</b>	<b>105</b>	<b>99</b>	<b>8.8%</b>	<b>15.6%</b>	<b>6.1%</b>

### Production and sales overview

Manganese ore production totaled 482,000 t in 3Q18, 14.5% higher than in 2Q18 and 15.3% lower than in 3Q17.

Manganese ore sales volumes reached 553,000 t in 3Q18, 131.4% and 11.0% higher than in 2Q18 and in 3Q17, respectively, due to the consumption of inventory built up in 2Q18.

Ferroalloy production in 3Q18 totaled 43,000 t, 13.2% and 19.4% higher than in 2Q18 and 3Q17, respectively, due to better operational performance.

Ferroalloys sales volumes totaled 37,000 t in 3Q18, 8.8% higher than in 2Q18 as a result of higher production volumes.

### Manganese ore

Production at the Azul manganese mine totaled 272,000 t in 3Q18, 16.2% higher than in 2Q18 due to the usual weather-related seasonality, and 28.8% lower than in 3Q17 due to lower grades in the run-of-mine, resulting in lower product recovery.

Production at the Urucum mine totaled 175,000 t in 3Q18, 11.5% and 9.4% higher than in 2Q18 and in 3Q17, respectively, positively reflecting the preventive maintenance stoppages of prior periods.

Production at the Morro da Mina mine totaled 34,000 t in 3Q18, 13.3% and 25.9% higher than in 2Q18 and 3Q17, respectively, mainly due to the two-shift operation as of April 2018.

## **Ferroalloy production**

Production in 3Q18 was composed of 21,000 t of ferrosilicon manganese alloys (FeSiMn), 15,000 t of high-carbon manganese alloys (FeMnHC) and 7,000 t of medium-carbon manganese alloys (FeMnMC).



Lucas Pupo / Agência Vale

## Nickel

### Finished production by source

000' metric tons	3Q18	2Q18	3Q17	9M18	9M17	% change		
						3Q18/2Q18	3Q18/3Q17	9M18/9M17
Canada	19.5	28.7	35.6	77.0	98.8	-32.1%	-45.2%	-22.1%
Sudbury	9.2	13.3	18.5	36.5	44.2	-30.8%	-50.3%	-17.4%
Thompson	1.9	5.8	6.7	12.9	16.0	-67.2%	-71.6%	-19.4%
Voisey's Bay	8.4	9.5	10.4	27.5	38.6	-11.6%	-19.2%	-28.8%
Indonesia	20.6	17.8	18.2	52.2	54.1	15.7%	13.2%	-3.5%
New Caledonia <sup>1</sup>	7.5	9.4	10.1	24.2	29.3	-20.2%	-25.7%	-17.4%
Brazil	6.1	5.6	7.1	17.4	18.7	8.9%	-14.1%	-7.0%
Feed from third parties <sup>2</sup>	2.1	4.8	1.7	9.9	8.9	-56.3%	23.5%	11.2%
<b>NICKEL PRODUCTION</b>	<b>55.7</b>	<b>66.2</b>	<b>72.7</b>	<b>180.6</b>	<b>210.1</b>	<b>-15.9%</b>	<b>-23.4%</b>	<b>-14.0%</b>
<b>NICKEL SALES</b>	<b>57.3</b>	<b>61.6</b>	<b>71.3</b>	<b>176.8</b>	<b>214.8</b>	<b>-7.0%</b>	<b>-19.6%</b>	<b>-17.7%</b>

<sup>1</sup> Production at VNC reached 6,900 t in 3Q18, while production of finished nickel from VNC totaled 7,500 t in 3Q18; the differences are due to the required time for processing into finished nickel.

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

### Production and sales overview

As anticipated in the last production and sales report, Sudbury conducted its annual scheduled maintenance shutdown and Thompson transitioned to a mine-mill operation, with its concentrate being sent to the Sudbury smelter for further processing. As a consequence, production of finished nickel reached 55,700 t in 3Q18, 15.9% lower than in 2Q18.

In 4Q18, nickel production is expected to reach close to 60,000 t as Sudbury returned from its annual scheduled maintenance shutdown in mid-September.

Sales volumes of nickel were 57,300 t in 3Q18, a decrease compared to 2Q18. Sales volumes did not decrease to the same extent as the production in 3Q18 mainly due to a drawdown of finished inventory in the quarter versus a buildup in 2Q18.

### Canadian operations

Production from the Sudbury mines reached 9,200 t in 3Q18, 4,100 t lower than in 2Q18. The decrease compared to 2Q18 was mainly due to the 3Q18 scheduled maintenance shutdown

that impacted mines and surface plants. The scheduled shutdown included the completion of the Atmospheric Emission Reduction (AER) project.

Production from the Thompson mines reached 1,900 t in 3Q18, 3,900 t lower than in 2Q18. In 3Q18, Thompson transitioned fully to a mine and mill operation and its concentrate will be processed in Sudbury for the foreseeable future. In 3Q18 Thompson's finished nickel production was impacted as Thompson's feed was not processed during Sudbury's scheduled maintenance.

Production from the Voisey's Bay mine reached 8,400 t in 3Q18, 1,100 t lower than in 2Q18. The decrease was mainly due to the strategic decision to decrease production output to extend the mine's lifespan to match the Voisey's Bay Mine Extension - VBME underground development schedule.

Production at the Long Harbour processing plant reached 8,300 t in 3Q18, 600 t lower than in 2Q18 as a result of the scheduled maintenance shutdown in August 2018.

### **Indonesian operation (PTVI)**

PTVI nickel in matte production reached 18,800 t in 3Q18, in line with 2Q18.

Production of finished nickel from PTVI reached 20,600 t in 3Q18, 15.7% higher than in 2Q18. The increase was mainly due to having established healthy feed stock inventory levels in previous periods, therefore Clydach consumed PTVI source material at high rates without compromising future production. PTVI source feed represents a primary source of feed at Class I Clydach rather than at our Class II Utility Nickel refineries. This represents a longer route to market but aims to maximize production of higher value carbonyl Class I products, in line with Vale's margin optimization strategy for the nickel business.

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

All the viable options for a stable and profitable operation that may lead to a sustainable business in the long haul are being assessed. Vale is supportive of its New Caledonian business and is currently studying options that, among other alternatives, include a revamped mining plan to enhance value generation from the asset and explore its cobalt potential in support of the EV batteries market. Vale is aiming to reach a decision on which alternative will be followed, possibly until the end of this year.

Production of NiO and NHC (nickel oxide and nickel hydroxide cake) at the VNC site (prior to shipping to Dalian in China for refining) was 6,900 t in 3Q18, 8% lower than in 2Q18. The decrease was mainly related to lower ore deliveries from the mine and refinery limitations. Additional trucks were added to the mining fleet in September to increase mine production in 4Q18. NiO accounted for 86% and NHC for 14% of VNC's 3Q18 site production.

Production of finished products from VNC source material reached 7,500 t in 3Q18, 20.2% lower than in 2Q18. Production was lower as higher levels of NiO were sent to Dalian to be refined into Utility Nickel during 3Q18, whereas in 2Q18 part of NiO was sold directly to the market in response to product demand, including in the EV battery supply chain. The difference in the time required to have nickel oxide sold immediately to the market as a saleable product and the lead time required to transport and refine it into Utility Nickel at the Dalian refinery were factors that reduced VNC source production in 3Q18.

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

Production from the Onça Puma operation reached 6,100 t in 3Q18, 8.9% higher than 2Q18. Production was higher than in 2Q18 due to greater furnace availability.





## Copper

### Finished production by source

000' metric tons	3Q18	2Q18	3Q17	9M18	9M17	% change		
						3Q18/2Q18	3Q18/3Q17	9M18/9M17
<b>BRAZIL</b>	<b>72.8</b>	<b>68.7</b>	<b>77.4</b>	<b>207.6</b>	<b>217.1</b>	<b>6.0%</b>	<b>-5.9%</b>	<b>-4.4%</b>
Sossego	22.8	21.9	25.6	67.2	76.7	4.1%	-10.9%	-12.4%
Salobo	50.0	46.7	51.8	140.4	140.4	7.1%	-3.5%	0.0%
<b>CANADA</b>	<b>21.7</b>	<b>29.2</b>	<b>39.5</b>	<b>78.1</b>	<b>108.0</b>	<b>-25.7%</b>	<b>-45.1%</b>	<b>-27.7%</b>
Sudbury	17.1	18.4	30.1	50.6	73.6	-7.1%	-43.2%	-31.3%
Thompson	0.4	0.4	0.3	1.0	1.0	0.0%	33.3%	0.0%
Voisey's Bay	2.5	6.9	6.6	17.8	24.4	-63.8%	-62.1%	-27.0%
Feed from third parties	1.7	3.5	2.5	8.7	9.1	-51.4%	-32.0%	-4.4%
<b>COPPER PRODUCTION</b>	<b>94.5</b>	<b>97.9</b>	<b>116.9</b>	<b>285.7</b>	<b>325.1</b>	<b>-3.5%</b>	<b>-19.2%</b>	<b>-12.1%</b>
<b>COPPER SALES</b>	<b>92.4</b>	<b>94.6</b>	<b>110.2</b>	<b>274.8</b>	<b>313.3</b>	<b>-2.3%</b>	<b>-16.2%</b>	<b>-12.3%</b>

### Production and sales overview

Copper production reached 94,500 t in 3Q18, 3.5% lower than in 2Q18, reflecting the annual scheduled maintenance shutdown in Sudbury and the strategic decision to decrease mine production at Voisey's Bay to extend the mine's lifespan matching the investment schedule.

Sales volumes of copper reached 92,400 t in 3Q18, in line with the lower copper production in 3Q18<sup>3</sup>.

### Brazilian operations

Production of copper in concentrate at Sossego totaled 22,800 t in 3Q18, 4.1% higher than in 2Q18 due to strong plant performance.

<sup>3</sup> Vale mainly sells copper concentrates with sales volumes approximately 3.5% lower compared to production volumes due to losses in the smelting process.

Production of copper in concentrate at Salobo reached 50,000 t in 3Q18, 7.1% higher than in 2Q18 due to higher ore grades, higher mill throughput and increased copper recovery.

### **Canadian operations**

Production of copper from the Sudbury mines reached 17,100 t in 3Q18, 7.1% lower than in 2Q18 reflecting Sudbury's scheduled maintenance shutdown which included mines and surface plants.

Production of copper from Voisey's Bay source reached 2,500 t in 3Q18, mainly due to the strategic decision to optimize margins through the extension of mine life to match the Voisey's Bay Mine Extension – VBME underground development schedule.



## Cobalt

### Finished production by source

	3Q18	2Q18	3Q17	9M18	9M17	% change		
						3Q18/2Q18	3Q18/3Q17	9M18/9M17
<b>COBALT (metric tons)</b>	<b>1,028</b>	<b>1,302</b>	<b>1,489</b>	<b>3,657</b>	<b>4,160</b>	<b>-21.0%</b>	<b>-31.0%</b>	<b>-12.1%</b>
Sudbury	83	156	279	362	618	-46.8%	-70.3%	-41.4%
Thompson	37	56	106	174	355	-33.9%	-65.1%	-51.0%
Voisey's Bay	371	479	382	1,345	1,030	-22.5%	-2.9%	30.6%
VNC	460	494	710	1,543	2,064	-6.9%	-35.2%	-25.2%
Others	77	118	12	234	95	-34.7%	541.7%	146.3%

### Production overview

Cobalt production totaled 1,028 t in 3Q18, 21.0% lower than in 2Q18, mainly due to decreased production from Sudbury and Voisey's Bay.

Cobalt production from Sudbury was 83 t in 3Q18, 46.8% lower than in 2Q18. The decrease from previous periods reflected the 3Q18 scheduled maintenance shutdown in Sudbury.

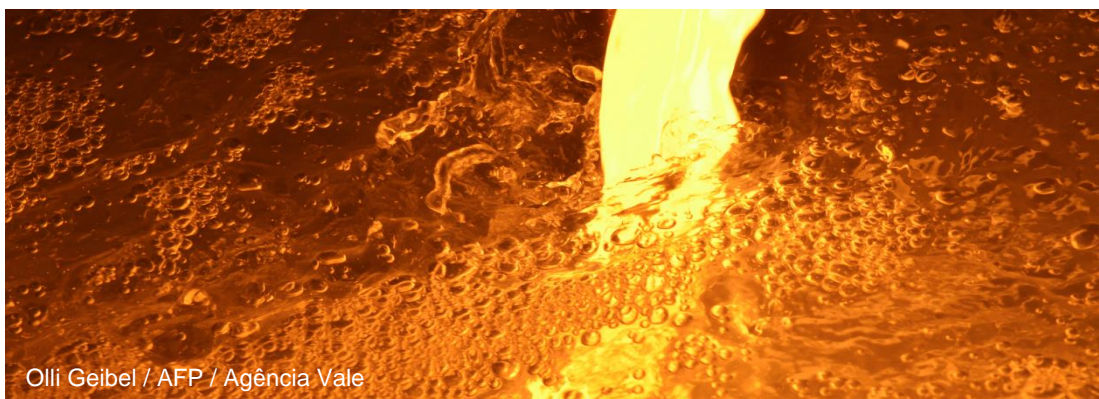
Production from Thompson source was 37 t in 3Q18, 33.9% lower than in 2Q18, reflecting Thompson's transition to a mine-mill complex in 3Q18 and the scheduled maintenance in Sudbury.

Production from Voisey's Bay was 371 t in 3Q18, 22.5% lower than in 2Q18. Production was adversely impacted in 3Q18 due to scheduled maintenance at Long Harbour and the consumption of all Voisey's Bay product at Sudbury. Cobalt from Voisey's Bay source is produced solely as cobalt rounds at the Long Harbour refinery.

Production from VNC reached 460 t in 3Q18, 6.9% lower than in 2Q18. Production in 3Q18 was adversely impacted by lower mine deliveries and lower cobalt grades in the VNC feed. In order to optimize cobalt value and in light of current market conditions – especially related to EVs – VNC's mining plan is being reviewed.

Production from other sources was 77 t in 3Q18, 34.7% lower than in 2Q18. Other source production varies according to the cobalt content of external feeds that are consumed in the

processes and it also includes PTVI source material being processed through the Port Colborne cobalt refinery after part of the feed is sent to the Clydach nickel refinery for processing.



Olli Geibel / AFP / Agência Vale

## Nickel and copper by-products

### Finished production by source

	3Q18	2Q18	3Q17	9M18	9M17	% change		
						3Q18/2Q18	3Q18/3Q17	9M18/9M17
PLATINUM (000' oz troy)	40	32	36	103	107	25.0%	11.1%	-3.7%
PALLADIUM (000' oz troy)	50	53	57	176	183	-5.7%	-12.3%	-3.8%
GOLD BY-PRODUCT (000' oz troy)	117	114	131	344	346	2.6%	-10.7%	-0.6%

### Platinum and palladium

Platinum production in 3Q18 was 40,000 oz and palladium production was 50,000 oz in 3Q18, 25.0% higher and 5.7% lower than in 2Q18, respectively.

### Gold as a by-product of nickel and copper concentrates

The contained volume of gold as a by-product in the nickel and copper concentrates reached 117,000 oz in 3Q18, 2.6% higher than in 2Q18.





## Coal

000' metric tons	3Q18	2Q18	3Q17	9M18	9M17	% change		
						3Q18/2Q18	3Q18/3Q17	9M18/9M17
<b>COAL PRODUCTION</b>	<b>3,194</b>	<b>2,871</b>	<b>3,213</b>	<b>8,497</b>	<b>8,684</b>	<b>11.3%</b>	<b>-0.6%</b>	<b>-2.2%</b>
Metallurgical coal	1,560	1,559	1,853	4,519	5,534	0.1%	-15.8%	-18.3%
Thermal Coal	1,634	1,313	1,360	3,978	3,150	24.4%	20.1%	26.3%
<b>COAL SALES</b>	<b>3,195</b>	<b>2,509</b>	<b>3,148</b>	<b>8,200</b>	<b>8,837</b>	<b>27.3%</b>	<b>1.5%</b>	<b>-7.2%</b>
Metallurgical coal	1,611	1,408	1,869	4,450	5,463	14.4%	-13.8%	-18.5%
Thermal coal	1,584	1,101	1,279	3,750	3,374	43.9%	23.8%	11.1%

### Production and sales overview

As previously stated in the last quarterly conference call, Coal division is reviewing its processes and mine plans to make 2018 the stabilization year of Moatize. Knowledge and operating standards from the iron ore business are being implemented and actions are ongoing to ensure a sustainable ramp-up from 2019 onwards, such as the increase in removal of overburden, opening of new mine sections, preparation of selected mining pits for future tailings disposals – initiatives that bring short term impact at 2018 production levels and product splits. As a result of the ongoing implementation of these structural changes, coal production guidance was reviewed to approximately 12 Mt in 2018.

In 3Q18, coal production totaled 3.2 Mt, 11.3% higher than 2Q18 and in line with 3Q17. The higher production vs. 2Q18 was mainly due to the improvement of the main operational indicators. Production of metallurgical coal was 1.6 Mt, in line with 2Q18 and 15.8% lower than 3Q17 and thermal coal production was 1.6 Mt, 24.4% higher than 2Q18 and 20.1% higher than 3Q17. Sales totaled 3.2 Mt, 27.3% higher than 2Q18 and in line with 3Q17, aligned with production. The higher sales volume vs. 2Q18 was mainly due to the drawdown of the inventory formed in 2Q18, as previously announced.