Moatize II coal stockyard, Mozambique

# Vale production in 3Q16

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# Production highlights

Rio de Janeiro, October 20, 2016 – Vale S.A. (Vale) reached 92.1 Mt of iron ore production[1] in the third quarter of 2016 (3Q16), 5.3 Mt higher than in 2Q16 and 1.4 Mt higher than in 3Q15, mainly due to: (i) the better operational performance at the mines and plants in the Northern System; (ii) the start-up of a new crushing facility at the Fazendão mine; and (iii) better productivity in the Southern and Southeastern systems.

Carajás achieved a record production of 38.7 Mt in 3Q16, a 2.2 Mt increase (5.9%) vs. 2Q16, mainly due to the abovementioned improvement in operational performance at the mines and plants in the Northern System.

Pellet production reached 12.1 Mt in 3Q16, 20.1% higher than in 2Q16 and in line with 3Q15, mainly as a result of the resumption of the Fábrica beneficiation plant in the Southern System and the higher feed availability for the Vargem Grande and Tubarão plants. The Tubarão 8, Tubarão 3 and Vargem Grande pellet plants achieved quarterly production records of 1.2 Mt, 1.8 Mt and 1.8 Mt, respectively, in 3Q16.

Nickel production reached 76.0 kt in 3Q16, 3.3% lower than in 2Q16, but 6.1% higher than in 3Q15, mainly due to planned maintenance shutdowns at Thompson and New Caledonia in 3Q16, and a planned maintenance shutdown at the Sudbury refinery in 3Q15. Production from the Onça Puma operation reached a record of 6.6 kt in 3Q16. VNC production reached 4.0 kt in August, establishing a new monthly record for the operation, being closely followed by September production of 3.8 kt, the second highest month on record.

Copper production was a record third quarter 111,400 t in 3Q16, increasing 4,000 t vs. 2Q16, mainly due to the ramp-up of Salobo and the higher production from Sudbury. Production of copper in concentrate at Salobo totaled a record 44,300 t in 3Q16 with Salobo achieving a monthly production record of 17,000 t Cu in September.

The contained volume of gold as a by-product contained in our nickel and copper concentrates was a record 118,000 oz in 3Q16, mainly due to the operational performance of Sudbury and increased contained volume of by-products from our copper concentrate product in Salobo.

[1] Excluding Samarco's attributable production and including iron ore acquired from third parties

Coal production totaled 2.3 Mt in 3Q16, 54.4% and 13.2% higher than in 2Q16 and 3Q15, respectively, mainly as a result of the ramp-up of the Moatize II plant after its start-up in August 2016 and the resumption of the Carborough Downs operations after the operational challenges faced in 2Q16.

Production at Moatize reached a quarterly record of 1.8 Mt in 3Q16, being 40.3% and 32.8% higher than in 2Q16 and 3Q15, respectively, with an increase in both metallurgical and thermal coal production. The ramp-up of the Moatize II mine will enable an increase in production and a reduction in costs in the next quarters.

Phosphate rock production totaled 2.1 Mt in 3Q16, MAP (monoammonium phosphate) production totaled 244 kt in 3Q16 and SSP (single superphosphate) production totaled 495 kt in 3Q16, 14.5%, 3.9% and 9.0% higher than in 2Q16, respectively, mainly as a result of the stabilization of the plants after operational adjustments and maintenance stoppages in 2Q16.

## Production summary

| | | | | | | % change | | |
|---|---|---|---|---|---|---|---|---|
| **000' metric tons** | **3Q16** | **2Q16** | **3Q15** | **9M16** | **9M15** | **3Q16/2Q16** | **3Q16/3Q15** | **9M16/9M15** |
| Iron ore[1] | 92,093 | 86,823 | 90,739 | 256,461 | 257,468 | 6.1% | 1.5% | -0.4% |
| Pellets[1] | 12,071 | 10,049 | 12,196 | 33,598 | 35,821 | 20.1% | -1.0% | -6.2% |
| Manganese Ore | 642 | 553 | 644 | 1,791 | 1,790 | 16.3% | -0.3% | 0.1% |
| Coal | 2,324 | 1,505 | 2,052 | 5,492 | 5,759 | 54.4% | 13.2% | -4.6% |
| Nickel | 76.0 | 78.5 | 71.6 | 228 | 208 | -3.3% | 6.1% | 9.7% |
| Copper[2] | 111.4 | 107.4 | 99.3 | 330.6 | 311.3 | 3.8% | 12.2% | 6.2% |
| Cobalt | 1.488 | 1.312 | 1.171 | 4.199 | 3.262 | 13.5% | 27.1% | 28.7% |
| Gold (000' oz troy) | 118 | 109 | 100 | 346 | 303 | 8.3% | 18.5% | 14.3% |
| Potash | 142 | 101 | 125 | 353 | 344 | 41.1% | 14.0% | 2.7% |
| Phosphate rock | 2,068 | 1,805 | 1,935 | 5,488 | 6,041 | 14.5% | 6.9% | -9.2% |

[1] Excluding Samarco's attributable production and including third party purchases.

[2] Including Lubambe's attributable production.

# Iron Ore

| | | | | | | % change | | |
|---|---|---|---|---|---|---|---|---|
| 000' metric tons | 3Q16 | 2Q16 | 3Q15 | 9M16 | 9M15 | 3Q16/2Q16 | 3Q16/3Q15 | 9M16/9M15 |
| **Northern System** | **38,651** | **36,493** | **33,889** | **107,529** | **93,020** | **5.9%** | **14.1%** | **15.6%** |
| Carajás | 38,651 | 36,493 | 33,889 | 107,529 | 93,020 | 5.9% | 14.1% | 15.6% |
| **Southeastern System** | **27,240** | **25,166** | **31,379** | **74,950** | **86,419** | **8.2%** | **-13.2%** | **-13.3%** |
| Itabira | 8,781 | 8,491 | 9,809 | 24,784 | 26,561 | 3.4% | -10.5% | -6.7% |
| Minas Centrais | 10,431 | 10,008 | 11,216 | 30,425 | 30,141 | 4.2% | -7.0% | 0.9% |
| Mariana | 8,028 | 6,667 | 10,353 | 19,615 | 21,817 | 20.4% | -22.5% | -33.6% |
| **Southern System** | **25,648** | **24,575** | **24,430** | **72,255** | **74,372** | **4.4%** | **5.0%** | **-2.8%** |
| Paraopeba | 6,978 | 7,007 | 6,861 | 19,615 | 21,817 | -0.4% | 1.7% | -10.1% |
| Vargem Grande | 7,750 | 7,362 | 7,554 | 22,435 | 20,772 | 5.3% | 2.6% | 8.0% |
| Minas Itabirito | 10,919 | 10,206 | 10,015 | 30,205 | 31,783 | 7.0% | 9.0% | -5.0% |
| **Midwestern System** | **554** | **589** | **1,041** | **1,726** | **3,657** | **-5.9%** | **-46.7%** | **-52.8%** |
| Corumbá | 554 | 552 | 627 | 1,359 | 2,411 | 0.5% | -11.6% | -43.6% |
| Urucum | - | 38 | 414 | 367 | 1,246 | -100.0% | -100.0% | -70.6% |
| **IRON ORE** | **92,093** | **86,823** | **90,739** | **256,461** | **257,468** | **6.1%** | **1.5%** | **-0.4%** |

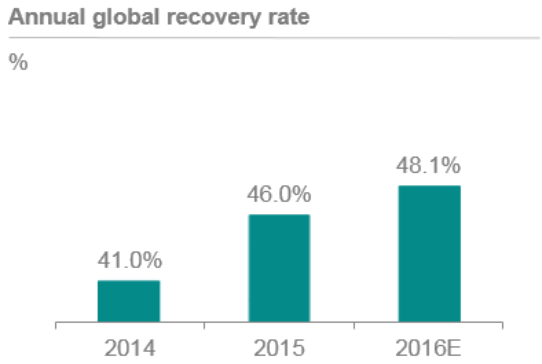
## Production summary

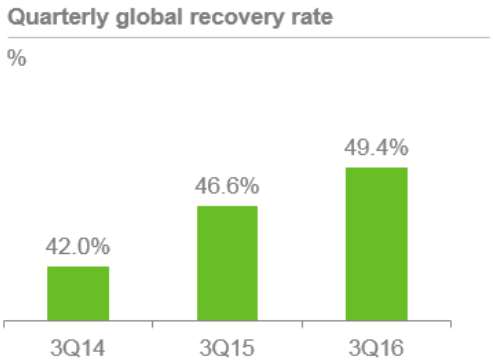
Vale's iron ore production[2] was 92.1 Mt in 3Q16, 5.3 Mt higher than in 2Q16 and 1.4 Mt higher than in 3Q15, mainly due to: (i) better operational performance at the mines and plants of the Northern System; (ii) the start-up of a new crushing facility at the Fazendão mine; and (iii) better productivity at the Southern and Southeastern systems.

Vale´s Global Recovery (GR)[3] increased from 41.0% in 2014 to 46.0% in 2015 and is expected to reach 48.1% in 2016. On a quarter-on-quarter basis, GR increased from 46.6% in 3Q15 to 49.4% in 3Q16.

[2] Including third party purchases and excluding Samarco's attributable production.

[3] Measured by output of final production divided by the total tons extracted (ROM and waste).




Carajás achieved a record production of 38.7 Mt in 3Q16, a 2.2 Mt increase (5.9%) vs. 2Q16, mainly due to the abovementioned improvement in operational performance at the mines and plants in the Northern System.

Production at lower margin operations (the Gongo Soco mine in the Southeastern system, the Urucum and Corumbá mines in the Midwestern system, and the Jangada and Feijão processing plants in the Southern System) was stopped or reduced in 3Q16 as per our previously announced strategy. Our production estimate for the full year of 2016 is of an annual supply in the lower end of the 340-350Mt guidance range for 2016, roughly compensating the stoppage of ROM sales to Samarco. Supply chain optimization will continue in 2017, with important inventory reductions in the Southern System and production volumes within the range of 360-380Mt[4] in 2017.

Iron ore and pellets shipments from Brazil and Argentina reached 85.2 Mt in 3Q16, 8.0 Mt and 7.3 Mt higher than in 2Q16 and 3Q15 respectively. The increase in shipments is a result of the ongoing elimination of logistics bottlenecks, which allowed inventories to move from the mines to the Distribution Centers (DCs) for offshore blending and provided for additional commercial flexibility. The share of offshore over total inventories increased from 9% in 2014 to 15% in 2015 and is expected to reach 26% at the end of 2016 and around 35% at the end of 2017, consolidating the progressive downstream shift of inventories along the supply chain.

The average Fe content increased slightly from 63.6% in 2Q16 to 63.8% in 3Q16, despite the ongoing change of some beneficiation plants from wet to dry processing in the Southeastern system, due to the relative increase of Carajás production.

Production is flat in 9M16 vs. 9M15 despite the impact at the Mariana mining hub of the Samarco's Fundão tailing dam failure.

[4] Values to be confirmed at the 2016 Vale Day, after the conclusion of the current planning cycle and the approval of the Board of Directors.

## Northern system

Carajás achieved a new quarterly production record of 38.7 Mt in 3Q16, 5.9% and 14.1% higher than in 2Q16 and 3Q15, respectively. The increases were mainly due to: (i) better operational performance at the mines and plants, as a result of the positive outcome of several initiatives to increase fleet productivity; (ii) the improvement of equipment availability and reliability; and (iii) the higher use of dry processing (74.3% of the total Northern System production was carried out using dry processing in 3Q16 vs. 69.6% and 67.6% in 2Q16 and 3Q15, respectively), resulting in a higher operational yield and higher mass recovery at the processing plants.

S11D successfully initiated its hot commissioning in 3Q16 and its start-up is expected for 4Q16 with the first commercial ore planned for 1Q17. S11D will have a 4-year phased ramp-up instead of the 2-year ramp-up originally planned in order to maximize margins. The S11D full production of 90 Mtpy will be reached by 2020, totaling a net additional output of 75 Mtpy from the Northern System (Northern and Southern ranges) which is expected to supply around 155 Mt in 2016 and 230 Mt in 2020.

## Southeastern system

The Southeastern System, which encompasses the Itabira, Minas Centrais and Mariana mining hubs, produced 27.2 Mt in 3Q16, 2.1 Mt higher than in 2Q16 but 4.1 Mt lower than in 3Q15. The production increase vs. 2Q16 was mainly due to: (i) higher production at the Conceição Itabiritos I plant; (ii) better operational performance at the Brucutu mine and plant; and (iii) the start-up of new crushing facilities at Fazendão. The production decrease vs. 3Q15 was mainly a result of: (i) stoppages associated with the ramp-up of the Cauê Itabiritos plant; (ii) the closure of the Gongo Soco mine in April 2016; and (iii) the stoppage of run-of-mine supply to Samarco.

## Southern system

The Southern System, composed of the Paraopeba, Vargem Grande and Minas Itabirito mining hubs, produced 25.8 Mt in 3Q16, 4.4% and 5.0% higher than in 2Q16 and in 3Q15, respectively, mainly due to a greater efficiency of the processing plants at Vargem Grande and Pico.

## Midwestern system

The Midwestern System, composed of the Urucum and the Corumbá mines, produced 0.6 Mt in 3Q16, in line with 2Q16 and 0.5 Mt lower than in 3Q15, as a result of Vale's strategy to optimize margins.

# Pellets

| | | | | | | % change | | |
|---|---|---|---|---|---|---|---|---|
| 000' metric tons | 3Q16 | 2Q16 | 3Q15 | 9M16 | 9M15 | 3Q16/2Q16 | 3Q16/3Q15 | 9M16/9M15 |
| **Southeastern System** | **7,000** | **6,657** | **7,200** | **20,878** | **21,520** | **5.1%** | **-2.8%** | **-3.0%** |
| Itabrasco (Tubarão 3) | 1,150 | 1,119 | 1,052 | 3,369 | 3,313 | 2.8% | 9.3% | 1.7% |
| Hispanobras (Tubarão 4) | 1,084 | 1,088 | 1,122 | 3,299 | 3,309 | -0.3% | -3.3% | -0.3% |
| Nibrasco (Tubarão 5 and 6) | 2,283 | 1,715 | 2,180 | 6,156 | 6,649 | 33.1% | 4.7% | -7.4% |
| Kobrasco (Tubarão 7) | 694 | 969 | 1,125 | 2,752 | 3,302 | -28.4% | -38.3% | -16.7% |
| Tubarão 8 | 1,789 | 1,767 | 1,720 | 5,302 | 4,948 | 1.3% | 4.0% | 7.2% |
| **Southern System** | **2,749** | **1,544** | **2,649** | **6,622** | **7,639** | **78.0%** | **3.8%** | **-13.3%** |
| Fábrica | 956 | - | 946 | 1,817 | 2,753 | - | 1.0% | -34.0% |
| Vargem Grande | 1,792 | 1,544 | 1,702 | 4,804 | 4,886 | 16.1% | 5.3% | -1.7% |
| **Oman** | **2,323** | **1,848** | **2,347** | **6,099** | **6,661** | **25.7%** | **-1.0%** | **-8.5%** |
| **TOTAL PELLETS** | **12,072** | **10,049** | **12,196** | **33,598** | **35,821** | **20.1%** | **-1.0%** | **-6.2%** |

## Production overview

Vale's pellet production, totaled 12.072 Mt in 3Q16, 20.1% higher than in 2Q16 and in line with 3Q15, mainly as a result of the resumption of the Fábrica plant and higher feed availability for the Vargem Grande and Tubarão plants.

Vale is currently studying alternatives to overcome the challenges of increasing its pellet feed availability and to develop options to increase its pellet production, in order to offset a supply shortage resulting from the stoppage of Samarco.

## Southeastern system

The Tubarão pellet plants – Tubarão 3, 4, 5, 6, 7 and 8 – reached production of 7.000 Mt in 3Q16, 5.1% higher than in 2Q16 mainly due to higher availability of feed in the quarter and to the scheduled maintenance which took place in 2Q16. Production was 2.8% lower than in 3Q15, mainly due to the scheduled maintenance stoppage in Tubarão 7 in July and August.

The Tubarão 8 and Tubarão 3 pellet plants achieved a record quarterly production of 1.150 Mt and 1.789 Mt, respectively in 3Q16.

## Southern system

The Fábrica pellet plant achieved production of 956 kt in 3Q16, in line with 3Q15. Production was suspended in 2Q16 due to delays in obtaining environmental permits for the expansion of adjacent mines. On July 2nd the environmental permits were granted and the operations resumed.

The Vargem Grande pellet plant achieved a quarterly production record of 1.8 Mt, 16.1% and 5.3% higher than in 2Q16 and 3Q15, respectively, due to the scheduled maintenance in 2Q16, better performance of the plant and higher feed availability.

## Oman operations

The Oman pellet plant reached production of 2.3 Mt in 3Q16, 25.7% higher than in 2Q16 and in line with 3Q15, mainly due to maintenance stoppages in 2Q16. The Oman pellet plant achieved a monthly production record in July.

# Manganese ore and ferroalloys

| | | | | | | % change | | |
|---|---|---|---|---|---|---|---|---|
| 000' metric tons | 3Q16 | 2Q16 | 3Q15 | 9M16 | 9M15 | 3Q16/2Q16 | 3Q16/3Q15 | 9M16/9M15 |
| **MANGANESE ORE** | **642** | **553** | **644** | **1,791** | **1,790** | **16.3%** | **-0.3%** | **0.1%** |
| Azul | 475 | 397 | 468 | 1,306 | 1,221 | 19.8% | 1.6% | 7.0% |
| Urucum | 167 | 156 | 177 | 485 | 569 | 7.2% | -5.5% | -14.8% |
| **FERROALLOYS (Brazil)** | **36** | **29** | **21** | **89** | **80** | **25.2%** | **68.5%** | **12.1%** |

## Production overview

Manganese ore production increased by 16.3% in 3Q16 vs. 2Q16 and was in line with 3Q15.

Ferroalloy production reached 36,000 t in 3Q16. The Barbacena plant resumed production in February with the lower spot energy prices, while the Ouro Preto ferroalloy plant in Minas Gerais remains closed as market demand still does not justify the resumption of the operation.

## Manganese ore production

Production at the Azul manganese mine reached 475,000 t in 3Q16, 19.8% and 1.6% higher than in 2Q16 and 3Q15, respectively, as a result of higher physical availability in the plant improving its operational efficiency.

Production at the Urucum mine reached 167,000 t in 3Q16, 7.2% higher than in 2Q16, due to higher availability of mine faces, but 5.5% lower than in 3Q15 due to lower efficiency of mine equipment.

## Ferroalloy production

Ferroalloy production in 3Q16 was 36,000 t, 25.1% and 68.5% higher than in 2Q16 and 3Q15, respectively, mainly due to the higher productivity at the Simões Filho and Barbacena units and the resumption of the operations at the Barbacena unit, which were halted in 3Q15.

Production was comprised of 16,000 t of ferrosilicon manganese alloys (FeSiMn), 15,000 t of high-carbon manganese alloys (FeMnHC) and 5,000 t of medium-carbon manganese alloys (FeMnMC).


# Nickel

## Finished production by source

| | | | | | | % change | | |
|---|---|---|---|---|---|---|---|---|
| 000' metric tons | 3Q16 | 2Q16 | 3Q15 | 9M16 | 9M15 | 3Q16/2Q16 | 3Q16/3Q15 | 9M16/9M15 |
| Canada[1] | 37.6 | 38.3 | 32.8 | 112.5 | 97.3 | -1.7% | 14.5% | 15.6% |
| Sudbury | 22.1 | 18.9 | 18.3 | 60.5 | 41.4 | 17.1% | 20.8% | 46.1% |
| Thompson | 4.9 | 8.1 | 4.9 | 19.3 | 17.7 | -39.2% | 0.5% | 9.0% |
| Voisey's Bay | 10.6 | 11.3 | 9.6 | 32.7 | 38.2 | -6.4% | 9.8% | -14.4% |
| Indonesia | 20.8 | 20.7 | 19.8 | 59.3 | 51.3 | 0.4% | 4.9% | 15.7% |
| New Caledonia[2] | 7.4 | 8.4 | 7.3 | 25.4 | 18.6 | -12.1% | 0.8% | 36.4% |
| Brazil | 6.6 | 6.4 | 5.9 | 18.5 | 18.0 | 3.4% | 10.8% | 3.0% |
| Feed from third parties[3] | 3.6 | 4.8 | 5.7 | 12.3 | 22.8 | -24.8% | -36.5% | -46.1% |
| **TOTAL NICKEL** | **76.0** | **78.5** | **71.6** | **228.0** | **207.9** | **-3.3%** | **6.1%** | **9.7%** |

[1] Canadian subtotal figures used to include feed from third parties in the previous reports, but since external feed has been processed at our Asian operations in 3Q16, the Canadian subtotal does not include the "feed from third parties" category in its calculation any longer.

[2] Production at VNC reached 9,000 t in 3Q16, while production of finished nickel from VNC totaled 7,400 t in 3Q16; the differences stem from the required processing time into finished nickel.

[3] External feed purchased from third parties and processed into finished nickel in our Canadian and Asian operations.

## Production overview

Production of nickel reached 76,000 t in 3Q16, being 3.3% lower than in 2Q16 mainly due to scheduled maintenance shutdowns at Thompson and New Caledonia in 3Q16, and 6.1% higher than in 3Q15, due to scheduled maintenance shutdowns at Sudbury surface plants in August 2015.

## Canadian operations

Production from the Sudbury mines reached 22,100 t in 3Q16, 17.1% and 20.8% higher than in 2Q16 and in 3Q15, respectively. The Sudbury refinery was impacted by a scheduled maintenance shutdown at its surface plant in August 2015, which happens every 18 months at Sudbury. A maintenance shutdown is planned for the shift to a single furnace operation at Sudbury in 2017.

Production from the Thompson mines reached 4,900 t in 3Q16, 39.2% lower than in 2Q16 and in line with 3Q15. In August 2016, Thompson carried out a scheduled maintenance shutdown at the surface plants.

Production from the Voisey's Bay mine reached 10,600 t in 3Q16, 6.4% lower than in 2Q16, as production from Voisey's Bay source ore was negatively affected by the surface plant maintenance at Thompson, and 9.8% higher than in 3Q15 due to the Long Harbour refinery ramp-up. Voisey's Bay concentrate is currently being processed at Thompson, Sudbury and Long Harbour, and it will be the sole feed for the Long Harbour refinery during its ramp-up.

Production at the Long Harbour processing plant reached 3,800 t in 3Q16, in line with 2Q16 and 5.6% higher than in 3Q15. There was steady progress in the ramp-up of the Long Harbour refinery, but the operation was impacted by equipment maintenance in the second half of September. The refinery has since resumed full operation.

## Indonesian operation (PTVI)

PTVI nickel in matte production reached 21,700 t in 3Q16, 12.3% higher than in 2Q16 with high utilization rates in 3Q16, and in line with 3Q15.

Production of finished nickel from PTVI reached 20,800 t in 3Q16, in line with 2Q16 and 5.1% higher than in 3Q15.

## New Caledonia operation (VNC)

Production of finished products from VNC reached 7,400 t in 3Q16, 12.1% lower and 0.8% higher than in 2Q16 and 3Q15, respectively. Production was impacted by the annual scheduled maintenance carried out in July 2016.

Production of NiO and NHC at VNC reached 9,000 t in 3Q16, the second best quarter on record despite the three-week maintenance shutdown in July, being 7.1% higher than in 2Q16 and 11.1% higher than in 3Q15. NiO represented 78% and NHC 22% of VNC's 3Q16 site production. August production reached 4,034 t, establishing a new monthly record for the operation, being closely followed by September production of 3,839 t, the second highest month on record.

## Brazilian operation (Onça Puma)

Production from the Onça Puma operation reached a record 6,600 t in 3Q16, 3.4% and 10.8% higher than in 2Q16 and in 3Q15, respectively. Production was positively impacted by process improvements and the strong performance of the rotatory kilns and electric furnace.

# Copper

## Finished production by source

| 000' metric tons | 3Q16 | 2Q16 | 3Q15 | 9M16 | 9M15 | % change 3Q16/2Q16 | % change 3Q16/3Q15 | % change 9M16/9M15 |
|---|---|---|---|---|---|---|---|---|
| **BRAZIL** | **68.4** | **64.4** | **65.4** | **196** | **195** | **6.2%** | **4.5%** | **1%** |
| Sossego | 24.1 | 23.6 | 25.3 | 70 | 81 | 1.9% | -5.0% | -14% |
| Salobo | 44.3 | 40.7 | 40.1 | 126 | 113 | 8.7% | 10.5% | 11% |
| **CANADA** | **40.9** | **41.2** | **31.4** | **129** | **109** | -0.7% | 30.2% | **18%** |
| Sudbury | 29.7 | 28.9 | 19.0 | 89 | 67 | 2.7% | 56.4% | 34% |
| Thompson | 0.8 | 0.8 | 0.1 | 2 | 1 | -0.1% | 845.8% | 146% |
| Voisey's Bay | 5.6 | 7.3 | 7.8 | 21 | 21 | -22.9% | -28.1% | -2% |
| Feed from third parties | 4.9 | 4.3 | 4.6 | 16 | 20 | 14.1% | 6.8% | -18% |
| **TOTAL EX-LUBAMBE** | **109.3** | **105.6** | **96.9** | **325** | **303** | **3.5%** | **12.8%** | **7%** |
| Lubambe[1] | 2.1 | 1.7 | 2.4 | 6 | 8 | 23.5% | -12.5% | -25% |
| **TOTAL COPPER** | **111.4** | **107.4** | **99.3** | **331** | **311** | **3.7%** | **12.2%** | **6%** |

[1] Attributable production.

## Production overview

Production of copper[5] was a record for a third quarter with 109,300 t in 3Q16, 3.5% higher than in 2Q16 and 12.8% higher than in 3Q15, mainly due to Salobo's ramp-up and to higher production from Sudbury.

## Brazilian operations

Production of copper in concentrate at Sossego totaled 24,100 t in 3Q16, 1.9% higher than in 2Q16 due to higher ore grades, increased mill utilization and improved recoveries. Production in 3Q16 was 5.0% lower than in 3Q15 due to lower ore grades in 3Q16 than in 3Q15.

Production of copper in concentrate at Salobo reached a record of 44,300 t in 3Q16, 8.7% higher than in 2Q16 and 10.5% higher than in 3Q15. Salobo achieved a monthly production record of 17,000 t in September, running at nominal capacity on a monthly basis.

[5] Excluding Lubambe attributable production

## Canadian operations

Production of copper from Sudbury reached 29,700 t in 3Q16, 2.7% higher than in 2Q16 and 56.4% higher than in 3Q15. In August 2015, Sudbury carried out a scheduled maintenance shutdown of its surface plants.

Production of copper from Voisey's Bay reached 5,600 t in 3Q16, 22.9% lower than in 2Q16 and 28.1% lower than in 3Q15. Voisey's Bay carried out its annual scheduled maintenance in July 2016, whereas last year the maintenance was conducted in 2Q15. Copper production is more directly impacted by maintenance stoppages when compared to nickel as it is immediately sold to the market as copper concentrate, whereas nickel is further refined and, thus, the inventory levels in the downstream supply chain softens the impact of production interruptions.

## African operation (Lubambe)

Lubambe delivered 5,200 t of copper in concentrate on a 100% basis (attributable production of 2,100 t).

# Nickel and copper by-products

### Finished production by source

| | | | | | | % change | | |
|---|---|---|---|---|---|---|---|---|
| | 3Q16 | 2Q16 | 3Q15 | 9M16 | 9M15 | 3Q16/2Q16 | 3Q16/3Q15 | 9M16/9M15 |
| **COBALT (metric tons)** | **1,488** | **1,312** | **1,171** | **4,199** | **3,262** | **13.4%** | **27.1%** | **28.7%** |
| Sudbury | 198 | 225 | 171 | 596 | 479 | -12.0% | 15.8% | 24.4% |
| Thompson | 191 | 171 | 91 | 544 | 279 | 11.7% | 109.9% | 95.0% |
| Voisey's Bay | 227 | 194 | 263 | 566 | 759 | 17.0% | -13.7% | -25.4% |
| VNC | 843 | 682 | 611 | 2,374 | 1,611 | 23.6% | 38.0% | 47.4% |
| Others | 30 | 40 | 34 | 119 | 134 | -25.0% | -11.8% | -11.2% |
| **PLATINUM (000' oz troy)** | **44** | **49** | **29** | **140** | **116** | **-10.2%** | **51.7%** | **20.7%** |
| Sudbury | 44 | 49 | 29 | 140 | 116 | -10.2% | 51.7% | 20.7% |
| **PALLADIUM (000' oz troy)** | **79** | **95** | **56** | **274** | **262** | **-16.8%** | **41.1%** | **4.6%** |
| Sudbury | 79 | 95 | 56 | 274 | 262 | -16.8% | 41.1% | 4.6% |
| **SILVER BY-PRODUCT (000' oz troy)** | **474** | **554** | **415** | **1,544** | **1,151** | **-14.4%** | **14.2%** | **34.1%** |
| Sudbury | 474 | 554 | 415 | 1,544 | 1,151 | -14.4% | 14.2% | 34.1% |
| **GOLD BY-PRODUCT (000' oz troy)** | **118** | **109** | **100** | **345** | **303** | **8.3%** | **18.0%** | **14.2%** |

## Cobalt

Cobalt production totaled 1,488 t in 3Q16, 13.4% and 27.1% higher than in 2Q16 and 3Q15, respectively, mainly driven by the higher production from Thompson and New Caledonia. Thompson production was not impacted by the maintenance shutdown in the surface plants, as previously accumulated inventories were drawn down at Port Colborne.

Cobalt production from Sudbury decreased to 198 t in 3Q16 from the 225 t in 2Q16 and up from 171 t in 3Q15. Cobalt production from Voisey's Bay increased to 227 t in 3Q16 from 194 t in 2Q16 and decreased from the 263 t in 3Q15. Cobalt production from VNC reached 843 t in 3Q16, increasing from the 682 t in 2Q16 and 611 t in 3Q15.

## Platinum and palladium

Platinum production was 44,000 oz and palladium production was 79,000 oz, 10.2% and 16.8% lower than in 2Q16, respectively.

## Gold

The contained volume of gold as a by-product contained in our nickel and copper concentrates reached a record of 118,000 oz in 3Q16.

# Coal

| 000' metric tons | 3Q16 | 2Q16 | 3Q15 | 9M16 | 9M15 | % change 3Q16/2Q16 | % change 3Q16/3Q15 | % change 9M16/9M15 |
|---|---|---|---|---|---|---|---|---|
| **METALLURGICAL COAL** | **1,631** | **1,062** | **1,644** | **4,059** | **4,540** | **53.6%** | **-0.8%** | **-10.6%** |
| Moatize | 1,063 | 808 | 914 | 2,474 | 2,527 | 31.5% | 16.3% | -2.1% |
| Carborough Downs | 568 | 254 | 730 | 1,585 | 2,013 | 123.6% | -22.2% | -21.2% |
| **THERMAL COAL** | **693** | **443** | **408** | **1,433** | **1,219** | **56.4%** | **69.9%** | **17.6%** |
| Moatize | 693 | 443 | 408 | 1,433 | 1,219 | 56.4% | 69.9% | 17.6% |
| **TOTAL COAL** | **2,324** | **1,505** | **2,052** | **5,492** | **5,759** | **54.4%** | **13.2%** | **-4.6%** |

## Production overview

Coal production totaled 2.3 Mt in 3Q16, 54.4% and 13.2% higher than in 2Q16 and 3Q15, respectively, mainly as a result of the ramp-up of the Moatize II plant after its start-up in August 2016 and the resumption of the Carborough Downs operations after facing operational challenges in 2Q16.

## Australian operations

Production at Carborough Downs reached 568,000 t in 3Q16, 123.6% higher than in 2Q16, due to the resumption of operations after the geological instability faced in 2Q16, but 22.2% lower than in 3Q15 as production in July 2016 was still impacted by the operational issues which occurred in 2Q16.

## Moatize operations

Production at Moatize reached a quarterly record of 1,756,000 t in 3Q16, being 40.3% and 32.8% higher than in 2Q16 and 3Q15, respectively, with an increase in both metallurgical and thermal coal production.

Production of metallurgical coal was 31.5% and 16.2% higher than in 2Q16 and in 3Q15, respectively. Production of thermal coal was 56.4% and 70.0% higher than in 2Q16 and in 3Q15, respectively. During the early stage of the Moatize II plant start-up, a lower proportion of

metallurgical coal is expected to be produced compared to thermal coal, as the fines circuit, in which only metallurgical coal is produced, is still being adjusted.

The Moatize I plant maintained a stable level of good performance in August and September 2016, reaching a new monthly production record of 588,000 t in September.

The commissioning of the Moatize II coal handling and processing plant was concluded with start-up in August 2016. The ramp-up of production is progressing well and reached 129,000 t in August and 169,000 t in September.

The ramp-up of the Nacala Logistics Corridor continued as planned, with 2.002 Mt being transported on the railway in 3Q16 against 1.655 Mt in 2Q16. Twenty one shipments (2.025 Mt) were completed in 3Q16 compared to nineteen shipments (1.567 Mt) in 2Q16.

# Fertilizer Nutrients

## Potash

| 000' metric tons | 3Q16 | 2Q16 | 3Q15 | 9M16 | 9M15 | % change 3Q16/2Q16 | % change 3Q16/3Q15 | % change 9M16/9M15 |
|---|---|---|---|---|---|---|---|---|
| **POTASH** | **142** | **101** | **125** | **353** | **344** | **41.1%** | **14.0%** | **2.7%** |
| Taquari-Vassouras | 142 | 101 | 125 | 353 | 344 | 41.1% | 14.0% | 2.7% |

## Phosphates

| 000' metric tons | 3Q16 | 2Q16 | 3Q15 | 9M16 | 9M15 | % change 3Q16/2Q16 | % change 3Q16/3Q15 | % change 9M16/9M15 |
|---|---|---|---|---|---|---|---|---|
| **PHOSPHATE ROCK** | **2,068** | **1,805** | **1,935** | **5,488** | **6,041** | **14.5%** | **6.9%** | **-9.2%** |
| Brazil | 1,062 | 969 | 977 | 2,733 | 3,179 | 9.6% | 8.8% | -14.0% |
| Bayóvar | 1,005 | 836 | 958 | 2,755 | 2,862 | 20.2% | 4.9% | -3.7% |
| **MAP[1]** | **244** | **235** | **242** | **736** | **820** | **3.9%** | **0.6%** | **-10.2%** |
| **TSP[2]** | **192** | **246** | **189** | **651** | **660** | **-22.0%** | **1.3%** | **-1.4%** |
| **SSP[3]** | **495** | **454** | **495** | **1,275** | **1,430** | **9.0%** | **0.0%** | **-10.8%** |
| **DCP[4]** | **128** | **114** | **130** | **365** | **351** | **12.8%** | **-0.9%** | **3.8%** |

[1] Monoammonium phosphate

[2] Triple superphosphate

[3] Single superphosphate

[4] Dicalcium phosphate

## Potash

Potash production totaled 142 kt in 3Q16, 41.1% and 14.0% higher than in 2Q16 and 3Q15, respectively. The increase was due to higher availability and lower ROM moisture in 3Q16 and better performance at the Taquari-Vassouras beneficiation plant after an unscheduled maintenance stoppage in 2Q16.

## Phosphate Rock

Production of phosphate rock was 2.1 Mt in 3Q16, 14.5% and 6.9% higher than in 2Q16 and in 3Q15 respectively, due to higher production in Brazil and in Peru (Bayóvar).

Production in Brazil was 1.1 Mt in 3Q16, 9.6% and 8.8% higher than in 2Q16 and 3Q15, respectively, due to the stabilization of the Catalão and Cajati plants after maintenance

stoppages in 2Q16 and also due to the higher availability of the Araxá plant after a maintenance stoppage in 3Q15.

Production at Bayóvar was 1.0 Mt in 3Q16, 20.2% and 4.9% higher than in 2Q16 and 3Q15, respectively, due to an unscheduled maintenance stoppage at the concentration plant in 2Q16 and the lower performance of the plant in 3Q15 associated with the processing of lower grade ore.

## MAP

Production of MAP (monoammonium phosphate) totaled 244 kt in 3Q16, 3.9% higher than in 2Q16 due to the prioritization of phosphoric acid use for MAP production (rather than for TSP production) at the Uberaba plant and the stabilization of the phosphoric acid plant at Cubatão after a scheduled maintenance stoppage in June 2016. Production in 3Q16 was in line with 3Q15.

## TSP

Production of TSP (triple superphosphate) totaled 192 kt in 3Q16, 22.0% lower than in 2Q16 due to the prioritization of MAP production at the Uberaba plant due to market conditions. Production in 3Q16 was in line with 3Q15.

## SSP

Production of SSP (single superphosphate) totaled 495 kt in 3Q16, 9.0% higher than in 2Q16 due to the stabilization of the Cubatão plant after operational adjustments and unscheduled maintenance stoppages at Araxá plant in 2Q16. Production in 3Q16 was in line with 3Q15.

## DCP

DCP (dicalcium phosphate) production totaled 128 kt in 3Q16, 12.8% higher than in 2Q16 after operational adjustments at the Uberaba plant in 2Q16. Production in 3Q16 was in line with 3Q15.

# Nitrogen

| 000' metric tons | 3Q16 | 2Q16 | 3Q15 | 9M16 | 9M15 | % change | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | 3Q16/2Q16 | 3Q16/3Q15 | 9M16/9M15 |
| AMMONIA | 39 | 40 | 42 | 105 | 132 | -2.0% | -7.3% | -20.2% |
| NITRIC ACID | 119 | 115 | 127 | 353 | 359 | 3.0% | -6.6% | -1.4% |
| AMMONIUM NITRATE | 132 | 128 | 144 | 395 | 386 | 2.9% | -8.7% | 2.4% |

## Ammonia production

Ammonia production totaled 39 kt in 3Q16, remaining practically in line with 2Q16, and 105 kt in 9M16, 20.2% lower than in 9M15, mainly as a result of corrective maintenance carried out in 1Q16.

## Nitric acid and ammonium nitrate production

Nitric acid production totaled 119 kt in 3Q16, 3.0% higher than in 2Q16 due to the stabilization of the Cubatão plant after unscheduled maintenance stoppages in 2Q16. Production was 6.6% lower than in 3Q15 due to better performance of the plant in 2015.

Ammonium nitrate production totaled 132 kt in 3Q16, 2.9% higher than in 2Q16 but 8.7% lower than in 3Q15 based on the availability of diluted nitric acid.