



Fernandinho dam decharacterization works concluded in July 2021

VALE'S PRODUCTION AND SALES IN 2Q21

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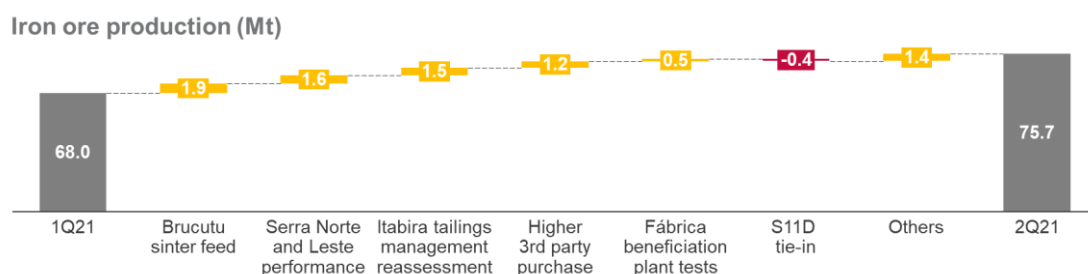
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Production and sales in 2Q21

16 Mt increase in iron ore production (1H21 vs 1H20)	Normalization of Ponta da Madeira Terminal operations	First ore production at VBME Project	Moatize ramping up to 15 Mtpy run rate
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Rio de Janeiro, July 19th, 2021 – Vale S.A. (“Vale”) completed another quarter of iron ore production growth (+11%q/q) and achieving a current capacity of 330 Mtpy, which if sustained could allow for an average of 1 Mt per day production in 2H21, due to the favorable seasonality from better weather conditions in the period. The unmanned train operation in Timbopeba is performing well and the maintenance of ship loader 6 (CN6) at the Ponta da Madeira Maritime Terminal was executed as scheduled, causing no impact in this year’s expected shipments. On Base Metals, the first ore production on its Reid Brook deposit at the Voisey’s Bay Mine Expansion Project was an important achievement to the continued delivery of quality, predictable and responsibly sourced material to market.

Vale’s iron ore fines production¹ totaled 75.7 Mt in 2Q21, 11.3% higher than in 1Q21, as a result of: (i) higher volumes from Brucutu with the increase of high-silica sinter feed production by dry processing taking advantage of a very favorable market environment; (ii) seasonal improvement of weather-related conditions in Serra Norte and a strong performance in Serra Leste; (iii) higher productivity in Itabira Complex, with the reassessment of temporary tailings management solutions; (iv) higher third-party purchase; and (v) wet processing production in Fábrica during the tests to resume beneficiation plant operations. Those positive results were partially offset by the interferences (tie-in effect) caused by the installation and commissioning of the first of four jaspilite crusher in S11D.



¹ Including third party purchases, run-of-mine and feed for pelletizing plants. Vale’s product portfolio Fe content reached 62.4%, alumina 1.4% and silica 5.8%.

Considering the iron ore mining plan and the implementation of new initiatives, **Vale achieved a production capacity of 330 Mtpy**, mainly as a result of Serra Leste achieving full capacity. The start-up date of some operations were revised due to the time required to receive their respective authorizations, namely (i) Vargem Grande conveyor belt resumption (now expected for 3Q21); (ii) to continue Fábrica's wet processing production (now expected for 3Q21); and (iii) Torto dam in Brucutu following the need of extra works to increase safety factor (now expected for 2H22).

Vale's pellet production totaled 8.0 Mt in 2Q21, 27.4% higher than in 1Q21, although still limited by pellet feed capacity. Quarterly increase is mainly explained by the seasonally higher pellet feed availability which was mainly directed to Oman plants and by the ramp-up of Vargem Grande pellet plant.

Sales volumes of iron ore fines and pellets totaled 74.9 Mt in 2Q21, up 14.2% higher than in 1Q21, as iron ore production increased. Iron ore price premium was US\$ 8.4/t², in line with 1Q21, following higher pellet, IOCJ and BRBF premiums, which were offset by a higher share of high-silica products with the increase of sinter feed production by dry processing, taking advantage of a strong market environment.

Production of finished nickel was 41.5 kt in 2Q21, 14.3% lower than 1Q21 mainly due to the labour disruption at Sudbury and unscheduled maintenance in Clydach Nickel Refinery, which impacted total production from material sourced from PTVI.

On June 1st, 2021, production and maintenance employees represented by the United Steelworkers (USW) Local 6500 in Sudbury voted to reject the Company's offer for a new five-year collective bargaining agreement, resulting in a labor disruption at Sudbury operations. Meanwhile, Vale implemented contingency plans to preserve the integrity and safety of the plants and mines.

Copper production reached 73.5 kt in 2Q21, 3.9% lower than 1Q21 resulted from the labour disruption in Sudbury and delays in mining at Voisey's Bay, partially offset by a more robust performance in Salobo due to the ramp-up of mine maintenance activities and better performance at Sossego operations.

In line with COVID-19 safety measures, which limited the mobilization of contractors, Vale decided to only perform the critical maintenance activities in Sossego's SAG mill in 2Q21. This has allowed the deferral of a major portion of the SAG mill maintenance to 2022. Vale expects production improvements as of 2H21.

Also, movement at Salobo mine is improving with increased availability of equipment as the ramp-up of the mine maintenance workshop continues. Total mine movement at Salobo has

² Iron ore premium of US\$ 3.0/t and weighted average contribution of pellets of US\$ 5.4/t.

increased 31.2% in Q2 compared to Q1, achieving 8.4 Mt in June. Improvement in mine movement is expected to continue in Q3.

Given uncertainties concerning the labor situation in Ontario and the ramp-up of the safety and maintenance process implementation in Sossego and Salobo, **our guidance for nickel and copper for the year is under review.**

Production summary

000 ¹ metric tons	2Q21	1Q21	2Q20	1H21	1H20	% change		
						2Q21/1Q21	2Q21/2Q20	1H21/1H20
Iron ore ¹	75,685	68,031	67,598	143,715	127,203	11.3%	12.0%	13.0%
Pellets	8,008	6,287	7,070	14,295	13,997	27.4%	13.3%	2.1%
Manganese Ore	113	91	149	204	512	24.2%	-24.2%	-60.2%
Coal	2,091	1,090	1,283	3,181	3,246	91.8%	63.0%	-2.0%
Nickel	41.5	48.4	49.0	89.9	102.2	-14.3%	-15.3%	-12.0%
Copper	73.5	76.6	84.5	150.1	179	-4.0%	-13.0%	-16.1%
Cobalt (metric tons)	754	711	562	1,465	1,228	6.0%	34.2%	19.3%
Gold (000 ¹ oz troy)	96	86	114	182	233	11.6%	-15.8%	-21.9%

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

Sales summary

000 ¹ metric tons	2Q21	1Q21	2Q20	1H21	1H20	% change		
						2Q21/1Q21	2Q21/2Q20	1H21/1H20
Iron ore ¹	67,218	59,298	54,615	126,516	106,271	13.4%	23.1%	19.1%
Pellets	7,647	6,271	6,950	13,918	14,261	21.9%	10.0%	-2.4%
Manganese Ore	169	258	270	427	489	-34.5%	-37.4%	-12.7%
Coal	1,544	1,015	1,385	2,559	2,951	52.1%	11.5%	-13.3%
Nickel ²	47.4	48.0	37.5	95.4	74.2	-1.3%	26.4%	28.6%
Copper	74.2	71.2	83.4	145.4	172.7	4.2%	-11.0%	-15.8%

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

² Historical figures exclude VNC sales.

Production guidance

	2021
Iron ore (Mt)	315-335
Nickel (kt)	Under review
Copper (kt)	Under review

Iron ore

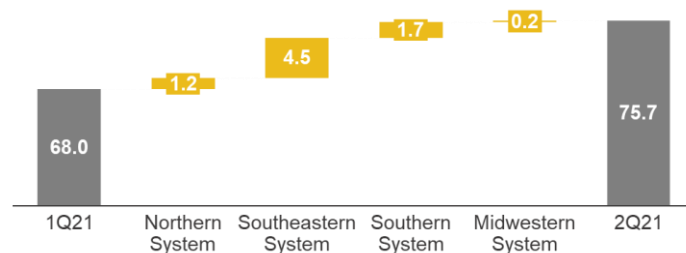
000' metric tons	2Q21	1Q21	2Q20	1H21	1H20	% change		
						2Q21/1Q21	2Q21/2Q20	1H21/1H20
Northern System	43,501	42,293	42,463	85,794	82,363	2.9%	2.4%	4.2%
Serra Norte and Serra Leste	26,916	25,300	24,319	52,216	45,799	6.4%	10.7%	14.0%
S11D	16,585	16,993	18,144	33,578	36,564	-2.4%	-8.6%	-8.2%
Southeastern System	18,059	13,529	12,721	31,588	24,510	33.5%	42.0%	28.9%
Itabira (Cauê, Conceição and others)	7,233	5,681	5,324	12,914	11,331	27.3%	35.9%	14.0%
Minas Centrais (Bucatu and others)	5,490	3,456	4,190	8,946	7,839	58.9%	31.0%	14.1%
Mariana (Alegria, Timbopeba and others)	5,337	4,392	3,207	9,729	5,340	21.5%	66.4%	82.2%
Southern System	13,441	11,708	11,768	25,149	19,124	14.8%	14.2%	31.5%
Paraopeba (Mutuca, Fábrica and others) ¹	5,899	5,317	5,873	11,216	9,521	10.9%	0.4%	17.8%
Vargem Grande (Vargem Grande, Pico and others)	7,542	6,391	5,895	13,933	9,603	18.0%	27.9%	45.1%
Midwestern System	684	500	645	1,184	1,204	36.8%	6.0%	-1.7%
Corumbá	684	500	645	1,184	1,204	36.8%	6.0%	-1.7%
IRON ORE PRODUCTION²	75,685	68,031	67,598	143,715	127,203	11.3%	12.0%	13.0%
IRON ORE SALES³	67,218	59,298	54,615	126,516	106,271	13.4%	23.1%	19.1%
IRON ORE AND PELLETS SALES²	74,865	65,569	61,565	140,434	120,532	14.2%	21.6%	16.5%

¹ 1 Q21 results were reviewed (-13 kt than previously announced).

² Including third party purchases, run-of-mine and feed for pelletizing plants.

³ Including third party purchases and run-of-mine.

Production variation (1Q21 x 2Q21) Mt



Northern System

The better performance of our Northern System was caused by the seasonal improvement from better weather conditions and the strong performance in Serra Leste, which achieved its full production capacity of 6 Mtpy; but partially offset by the negative impact of the tie-in effect of the installation of the first of four jaspilite crushers in S11D. The second jaspilite crusher is expected to be installed by the end of 3Q21.

As previously announced, Vale has resumed loading activities at ship loader 6 at the Ponta da Madeira Maritime Terminal, in São Luís, Maranhão, after 5 months of maintenance due to a fire in the equipment. The maintenance of ship loader 6, which involved the substitution of over

60% of its components, did not impact Ponta da Madeira Maritime Terminal's monthly iron ore shipment schedule for the year.

Southeastern System

The solid performance of Southeastern System's was a result of (i) the increase in high-silica sinter feed production in Brucutu from dry processing, thus taking advantage of the strong iron ore market with a solid price environment; (ii) higher productivity in Itabira Complex, with the reassessment of temporary tailings management solutions; and (iii) better performance at the Timbopeba site from the commissioning of the 3 additional wet-processing lines during March and despite the 9-day stoppage due to Xingu dam interdiction in EFVM railway operation.

In compliance with the interdiction term drawn up by the Regional Superintendence of Labor (SRT), the access of workers and the circulation of vehicles to the flood zone of the Xingu dam, located in Mariana, including the EFVM railway, was suspended, temporally impacting Timbopeba and Alegria site operations. In order to guarantee the operational stability of these sites, Vale implemented an unmanned train operation covering a 16 km stretch to expedite Timbopeba site production and increased the ROM availability from Alegria mine.

Southern System

The operational performance in 2Q21 can be in large attributed to (i) higher third-party purchases; (ii) production in Fábrica by wet processing during the tests to resume beneficiation plant operations; and (iii) stronger production from Abóboras and Capitão do Mato mines, located in Vargem Grande complex, as expected in mining plan.

Operational stabilization and resumption plan

	Actions in Progress	Accomplishments in 2Q21	Timeline for Resumption
Northern System	<ul style="list-style-type: none"> Licensing and opening new mining fronts. Progressing on the construction of Gelado, Northern System 240 Mtpy and Serra Sul 120 projects. 	<ul style="list-style-type: none"> Serra Leste reached its full capacity (6 Mtpy). Installation and ramp-up of first of four crushers to process jaspilite ore bodies in S11D. 	<ul style="list-style-type: none"> 2021/22: Installation of new crushers to process jaspilite ore bodies in S11D. 1H22: Start-up of Gelado project with 10 Mtpy capacity. 2H22: Start-up of Northern System 240 Mtpy project, increasing the System's capacity by 10 Mtpy. 1H23: Expansion of Serra Leste to 8 Mtpy capacity. 2021/23: Applying for new licenses and opening new mining fronts. 2H24: Start-up of Serra Sul 120 project³. 2025: Usina 1 shift to 100% dry processing temporarily impacting production.
Itabira	<ul style="list-style-type: none"> Completion of tailings' filtration plants construction to increase wet processing capacity. Requirements to restart Itabiruçu dam raising construction works. Tailings piles developing and licensing to support filtration plant. 	<ul style="list-style-type: none"> Tailings' filtration plant construction works achieved 73% and 71% of physical progress in Cauê and Conceição, respectively. Reassessment of temporary tailings management solutions. 	<ul style="list-style-type: none"> 2021/22: Capacity restrictions due to area constraint for tailings disposal. 2021/22: Start-up of Cauê and Conceição tailings filtering plants and dry stacking activities. 2H22: Completion of Itabiruçu raising works.
Brucutu	<ul style="list-style-type: none"> Usage maximization of the remaining volume of Sul dam to support current operation. Tailings piles developing and licensing to support filtration plant. Completion of Torto dam⁴ and tailings' filtration plant construction to increase wet processing capacity. Assessment of Norte/Laranjeiras dam geotechnical characteristics. 	<ul style="list-style-type: none"> Increase of sinter feed production by dry processing, due to the positive market environment, achieving 16 Mtpy capacity in Brucutu site. Need of extra works identified to increase safety factor of Torto dam. Tailings' filtration plant construction works achieved 73% of physical progress. 	<ul style="list-style-type: none"> 1Q22: Start-up of tailings' filtering plant and dry stacking activities. 2H22: Start-up of Torto dam⁵, increasing site's capacity to 28 Mtpy after conclusion of extra works.

³ Start-up date was reviewed by new licensing expectations. Previously, start-up was expected to 1H24.

⁴ A positive declaration of stability condition (DCE) and an operating license for Torto dam operations are necessary, relying on the external auditor and authorities' assessment.

⁵ Start-up date was reviewed due to the time required to receive authorizations following additional works to increase safety factor identified. Previously, start-up was expected to 4Q21.

	Actions in Progress	Accomplishments in 2Q21	Timeline for Resumption
Fábrica	<ul style="list-style-type: none"> • Conclusion of beneficiation plant vibration tests (to certify the absence of impacts on the site's structures), depending on external assessment/ approval. • Studies to resume mining blasting activities. 	<ul style="list-style-type: none"> • Vibration tests at beneficiation plant and pelletizing facilities were concluded, waiting final authorization. 	<ul style="list-style-type: none"> • 3Q21: Final authorization to maintain wet processing production⁶. • 2022: Resumption of Fábrica pellet plant, depending on market conditions.
Vargem Grande Complex	<ul style="list-style-type: none"> • Completion of Maravilhas III dam to increase wet processing capacity. • Licensing and development of new waste piles for Capitão do Mato mine. • Tailings piles developing and licensing to support filtration plant. • Studies to debottleneck logistics capacity, limited by the impossibility to operate the long-distance conveyor belt in the segment close to the Vargem Grande dam and the use of autonomous train in Forquilhas and Grupo dams self-rescue zones (ZAS). 	<ul style="list-style-type: none"> • Approval received to resume blasting activities at Galinheiro and Abóboras mines. • Maravilhas III dam first phase construction works completed, pending stability declaration emission. • Vibration tests at VGR's conveyor belt are ongoing and results are under analysis. 	<ul style="list-style-type: none"> • 3Q21: Start-up of Maravilhas III dam. • 3Q21: Unlock site's conveyor belt capacity⁷. • 2022/23: Start-up of new waste piles. • 2023: Start-up of 1.5 Mtpy capacity dry magnetic concentration plant. • 2021/27: Increase railway capacity, advancing in studies to elevate automated train productivity and decreasing emergency levels of Forquilhas and Grupo dams⁸.

⁶ Previously, final authorization was expected to 2Q21.

⁷ Start-up date was reviewed by the need of additional analysis requested by auditors and Vale's geotechnical team to certify the absence of impact on Vargem Grande dam. Previously, start-up was expected to 2Q21.

⁸ Decrease of emergency levels also depends on external evaluation by ANM and external auditors.

Pellets

000' metric tons	2Q21	1Q21	2Q20	1H21	1H20	% change		
						2Q21/1Q21	2Q21/2Q20	1H21/1H20
Northern System	748	961	919	1,709	1,802	-22.2%	-18.6%	-5.2%
São Luis	748	961	919	1,709	1,802	-22.2%	-18.6%	-5.2%
Southeastern System	3,963	3,609	3,537	7,572	8,669	9.8%	12.0%	-12.7%
Tubarão 1 and 2	-	-	-	-	-	-	-	-
Itabasco (Tubarão 3)	742	583	455	1,325	1,343	27.3%	63.1%	-1.3%
Hispanobras (Tubarão 4)	-	169	363	169	992	-100.0%	-100.0%	-83.0%
Nibrasco (Tubarão 5 and 6)	974	699	842	1,673	2,067	39.3%	15.7%	-19.1%
Kobrasco (Tubarão 7)	803	607	541	1,410	1,351	32.3%	48.4%	4.4%
Tubarão 8	1,445	1,551	1,336	2,996	2,916	-6.8%	8.2%	2.7%
Southern System	975	656	129	1,631	129	48.6%	655.8%	1,164.3%
Fábrica	-	-	-	-	-	-	-	-
Vargem Grande	975	656	129	1,631	129	48.6%	655.8%	1164.3%
Oman	2,322	1,061	2,485	3,383	3,397	118.9%	-6.6%	-0.4%
PELLETS PRODUCTION	8,008	6,287	7,070	14,295	13,997	27.4%	13.3%	2.1%
PELLETS SALES	7,647	6,271	6,950	13,918	14,261	21.9%	10.0%	-2.4%

Production overview

Pellet production increased from 1Q21, although still limited by the pellet feed availability from Itabira and Brucutu. Quarterly results variations are mainly explained by the seasonally higher pellet feed availability which was mainly directed for Oman plants and the ramp-up of Vargem Grande pellet plant, which were partially offset by a 20-day maintenance carried out in São Luis plant in May and June.

Manganese ore and ferroalloys

000' metric tons	2Q21	1Q21	2Q20	1H21	1H20	% change		
						2Q21/1Q21	2Q21/2Q20	1H21/1H20
MANGANESE ORE PRODUCTION	113	91	149	204	512	24.2%	-24.2%	-60.0%
Azul	-	-	-	-	230	-	-	-100%
Urucum	78	63	131	142	241	23.8%	-40.5%	-41.2%
Morro da Mina	35	28	18	63	41	25.0%	95.2%	53.9%
MANGANESE ORE SALES	169	258	270	427	489	-34.5%	-37.4%	-12.8%
FERROALLOYS PRODUCTION	19	16	15	35	43	18.8%	26.7%	18.7%
FERROALLOYS SALES	15	14	10	29	37	7.1%	50.0%	20.2%

Production and sales overview

Manganese ore production totaled 113 kt in 2Q21, 24.2% higher than in 1Q21, mainly due to the end of the rainy season and improved performance at the beneficiation plant in Morro da Mina. However, the 2Q21 production was 24.2% down on the same quarter in 2020, due to adjustments in the mining plan to ensure the safety and sustainability of underground operations at the Urucum mine.

Manganese ore sales reached 169 kt in 2Q21, 34.5% lower than in 1Q21, due to the lower inventory volume remaining from the Azul Mine, following its ongoing suspension of operations.

Ferroalloy production and sales volumes were higher than in 1Q21, mainly due to the operation resumption of a furnace at the Ouro Preto plant, following the recovery in market demand.

Nickel

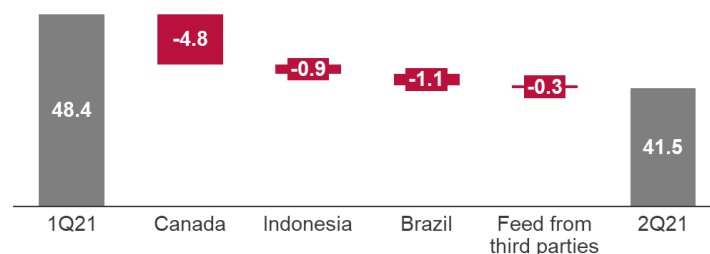
Finished production by source

000' metric tons	2Q21	1Q21	2Q20	1H21	1H20	% change		
						2Q21/1Q21	2Q21/2Q20	1H21/1H20
Canada	20.4	25.2	26.6	45.6	48.5	-19.0%	-23.3%	-6.0%
Sudbury	9.0	12.0	13.5	21.0	25.5	-25.0%	-33.3%	-17.6%
Thompson	1.4	2.8	3.6	4.2	6.3	-50.0%	-61.1%	-33.3%
Voisey's Bay	10.0	10.4	9.4	20.4	16.7	-3.8%	6.4%	22.2%
Indonesia	14.5	15.4	17.5	29.9	36.1	-5.8%	-17.1%	-17.2%
Brazil	5.2	6.3	3.2	11.5	6.2	-17.5%	62.5%	85.5%
Feed from third parties ¹	1.3	1.6	1.7	2.9	3.5	-18.8%	-23.5%	-17.1%
NICKEL PRODUCTION	41.5	48.4	49.0	89.9	102.2	-14.3%	-15.3%	-12.0%
NICKEL SALES²	47.4	48.0	37.5	95.4	74.2	-1.3%	26.4%	28.6%

¹ External feed purchased from third parties and processed into finished nickel in our Canadian operations.

² Historical figures exclude VNC sales.

Production Variation (1Q21 x 2Q21) kt



Canadian operations

Finished production from Sudbury and Thompson ore sources declined 25% q/q and 50% q/q, respectively. The lower volume was mainly due to the labor disruption in Sudbury operations started in June, as the concentrate originated from the ore mined at Sudbury and Thompson are both further processed in Sudbury's Copper Cliff smelter.

Finished production from Voisey's Bay ore source in 2Q21 was relatively in line with 1Q21, as Long Harbour continues to have solid production rates. In addition, Vale reached first ore production on the Reid Brook deposit at the Voisey's Bay Mine Expansion Project in June, which is now 66% complete.

Indonesian operation (PTVI)

Finished production from PTVI source reached 14.5 kt in 2Q21, 5.8% lower than 1Q21 and 17.1% lower than 2Q20, mainly due to a 48-day unscheduled maintenance of one of the kilns at Clydach Nickel Refinery.

Nickel-in-matte production at PTVI site reached 15.0 kt in 2Q21, relative in line with 1Q21 and 19.8% lower than 2Q20, mainly due to delayed ramp-up of furnace following maintenance activities.

Brazilian operation (Onça Puma)

Production at Onça Puma reached 5.2 kt in 2Q21, 17.5% lower than 1Q21, mainly due to furnace operational challenges impacting finished production, which should be partially addressed in the planned maintenance in 2H21 and completely in 2022.

Feed from third parties

Finished nickel produced from third-party feed reached 1.3 kt in 2Q21, 18.8% lower than 1Q21 mainly due to labour disruption in Sudbury, which impacted the ability to process the material. The purchase of third-party feed is a normal process to sustain a regular finished nickel production flow.

Sales

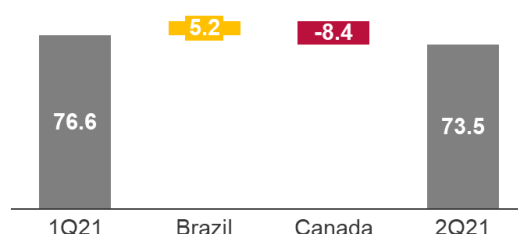
Nickel sales volumes were 47.4 kt in 2Q21, in line with 1Q21, as the sale of available inventories offset the lower production for the quarter.

Copper

Finished production by source

000' metric tons	2Q21	1Q21	2Q20	1H21	1H20	% change		
						2Q21/1Q21	2Q21/2Q20	1H21/1H20
BRAZIL	55.2	50.0	60.8	105.2	125.4	10.4%	-9.2%	-16.1%
Salobo	38.7	34.1	41.3	72.8	83.5	13.5%	-6.3%	-12.8%
Sossego	16.6	15.9	19.5	32.5	41.9	4.4%	-14.9%	-22.4%
CANADA	18.2	26.6	23.7	44.8	53.6	-31.6%	-23.2%	-16.4%
Sudbury	13.0	19.4	21.9	32.4	45.0	-33.0%	-40.6%	-28.0%
Thompson	0.1	0.2	0.3	0.3	0.5	-50.0%	-66.7%	-40.0%
Voisey's Bay	4.5	6.1	0.5	10.6	5.8	-26.2%	800.0%	82.8%
Feed from third parties	0.6	1.1	1.0	1.7	2.3	-45.5%	-40.0%	-26.1%
COPPER PRODUCTION	73.5	76.6	84.5	150.1	179.0	-4.0%	-13.0%	-16.1%
COPPER SALES	74.2	71.2	83.4	145.4	172.7	4.2%	-11.0%	-15.8%
Copper Sales Brazil	55.8	45.4	59.7	101.2	118.3	22.9%	-6.5%	-14.5%
Copper Sales Canada	18.4	25.8	23.7	44.2	54.4	-28.7%	-22.4%	-18.8%

Production Variation (1Q21 x 2Q21) kt



Production and sales overview

In 2Q21, copper production in Salobo totalled 38.7 kt, 13.5% higher than 1Q21 and 6.3 % lower than 2Q20. Both qoq increase and yoy decrease were a result of the ramp up of maintenance activities after a broader review of maintenance routines in 1Q21, which restricted mine movement due to lower equipment availability.

Copper production in Sossego totalled 16.6 kt, 4.4% higher than 1Q21 and 14.9% lower than 2Q20. Production volumes improved compared to 1Q21 as a result of delays in maintenance activities and SAG mill issues in 1Q21. In comparison to 2Q20, production was 14.9% lower due to a necessary 15-day scheduled maintenance performed during 2Q21. This maintenance has enabled the postponement of a major scheduled SAG mill maintenance to 2022. Consequently, Vale expects performance improvements in 2H21.

In 2Q21, copper production in Canada reached 18.2 kt, 31.6% lower than 1Q21 and 23.2% lower than 2Q20. Production was impacted mainly by Sudbury strike and delays in mining in

Voisey's Bay due to pit flooding, primarily related to extraordinary weather conditions, which affected copper concentrate production. The pit conditions have recovered well.

Sales volumes⁹ of copper were 74.2 kt in 2Q21, 4.2% higher than 1Q21, mainly due to higher production in Brazilian operations which was offset by lower concentrate production in North Atlantic operations. Sales volumes were higher than production in 2Q21 due to delays in copper concentrates shipments from Brazilian operations from March to April and sale of available inventories from Canadian operations.

⁹ Sales volumes are lower compared to production volumes due to payable copper vs. contained copper; part of the copper contained in the concentrates is lost in the smelting and refining process, hence payable quantities of copper are approximately 3.5% lower than contained volumes.

Base Metals by-products

Finished production by source

000' metric tons	2Q21	1Q21	2Q20	1H21	1H20	% change		
						2Q21/1Q21	2Q21/2Q20	1H21/1H20
COBALT	754	711	562	1,465	1,228	6.1%	34.2%	19.3%
Sudbury	116	96	156	212	297	20.8%	-25.6%	-28.6%
Thompson	13	14	13	27	35	-7.1%	0.0%	-22.9%
Voisey's Bay	463	476	433	939	740	-2.7%	6.9%	26.9%
Others	161	124	64	285	156	29.8%	151.6%	82.7%
PLATINUM (000' oz troy)	30	30	35	60	83	0.0%	-14.3%	-27.7%
PALLADIUM (000' oz troy)	36	39	51	75	110	-7.7%	-29.4%	-31.8%
GOLD AS BY-PRODUCT (000' oz troy)¹	96	86	114	182	233	11.6%	-15.8%	-21.9%
TOTAL BY-PRODUCTS (000' metric tons Cu eq.)^{2 3}	42	43	69	85	144	-3.3%	-38.7%	-40.9%

¹ Includes gold from Copper and Nickel operations.

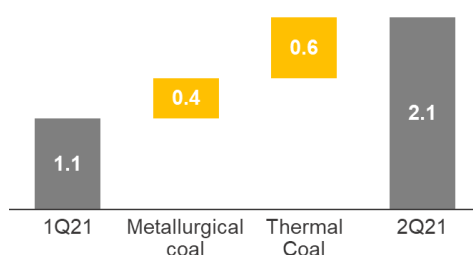
² Includes iridium, rhodium, ruthenium and silver.

³ Copper equivalent tonnes calculated using average market metals prices for each quarter. Market reference prices: for copper, cobalt, gold and silver: LME spot; for Platinum and Palladium: NYMEX spot; for other PGMs: Johnson Matthey.

Coal

000' metric tons	2Q21	1Q21	2Q20	1H21	1H20	% change		
						2Q21/1Q21	2Q21/2Q20	1H21/1H20
COAL PRODUCTION	2,091	1,090	1,283	3,181	3,246	91.8%	63.0%	-2.0%
Metallurgical Coal	980	558	698	1,538	1,680	75.8%	40.5%	-8.5%
Thermal Coal	1,111	532	585	1,643	1,565	108.7%	89.8%	5.0%
COAL SALES	1,544	1,015	1,385	2,559	2,951	52.1%	11.5%	-13.3%
Metallurgical Coal	713	474	516	1,187	1,221	50.4%	38.4%	-2.8%
Thermal Coal	831	541	869	1,373	1,730	53.6%	-4.4%	-20.6%

Production Variation (1Q21 x 2Q21) Mt



Production and sales overview

Coal production totalled 2.1 Mt in 2Q21, posting solid growth both on a quarter-on-quarter and year-over-year basis due to the improved productivity after the major plant revamp concluded last quarter. The revamp removed important bottlenecks in the processing plants by increasing equipment availability and productivity.

The production is ramping-up in line with the plan to reach the annual production rate of 15Mtpy during the second semester of 2021. The feed rate of both plants is already stabilized, and the improved operational conditions support the goal to enhance productivity and reach higher production rates.

During the revamp period, inventory levels were kept to a minimum to support the lower production volumes. The higher production in 2Q21 enabled Vale to rebuild its operational inventories to sustainable levels, limiting coal sales in the quarter.