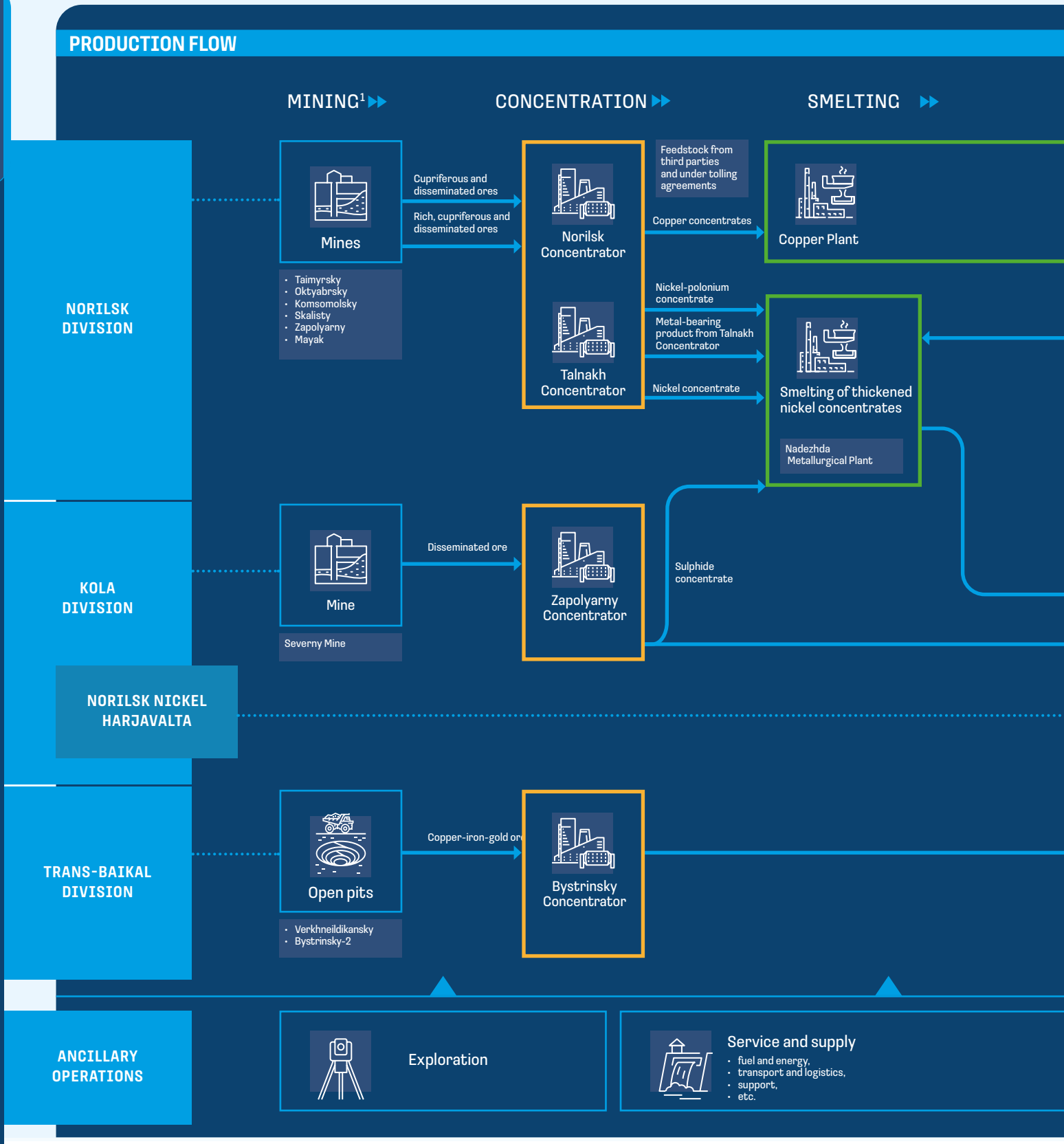
OPERATIONAL PERFORMANCE

PRODUCTION FLOW



1 sulphide copper-nickel and copper-iron-gold ores

REFINING ▸▸ PGM REFINING ▸▸ SALES ▸▸

Copper Plant's metallurgical shop

Precious metal concentrate

Krasnoyarsk Precious Metals Refinery, Urals' Innovative Technologies, Prioksky Plant of Non-Ferrous Metals

Own sales network

Copper sludge

Precious metal concentrate

Metal-bearing reverts from the metallurgical shop

Metallurgical

closed in March 2021

and chemical and metallurgical shops

Chlorine leaching residuals, nickel sludge

Copper matte

Nickel tankhouse

Refining shop

Converter matte

Sulphide concentrate

Third-party feedstock

Nickel refinery in Finland

Copper cake under tolling agreements to the Norilsk Division

Saleable metals and products

- Nickel
- Palladium
- Copper
- Platinum
- Cobalt
- Rhodium
- Iridium
- Ruthenium
- Silver
- Gold
- Selenium
- Tellurium
- Sulphur
- Sodium sulphate
- Sodium chloride

Products

- Iron ore, copper and (gold) gravity concentrates

R&D

Production of saleable metals

Norilsk Nickel Group's saleable metals production [1]

Asset	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total nickel, t	300,340	285,292	274,248	266,406	235,749	217,112	218,770	228,687	235,709	193,006
from the Company's own Russian feed	223,153	219,273	223,224	220,675	196,809	210,131	216,856	225,204	232,532	189,945
from third-party feed	77,187	66,019	51,024	45,731	38,940	6,981	1,914	3,482	3,177	3,061
Total copper, t	363,764	371,063	368,008	369,426	360,217	401,081	473,654	499,119	487,186	406,841
from the Company's own Russian feed	344,226	345,737	345,897	352,766	344,482	397,774	473,515	498,838	486,816	406,815
from third-party feed	19,538	25,326	22,111	16,660	15,735	3,307	139	281	370	26
Total palladium, koz	2,732	2,662	2,752	2,689	2,618	2,780	2,729	2,922	2,826	2,616
from the Company's own Russian feed	2,624	2,529	2,582	2,575	2,526	2,728	2,729	2,919	2,820	2,616
from third-party feed	108	133	170	114	92	52	0	3	6	0
Total platinum, koz	683	650	662	656	644	670	653	702	695	641
from the Company's own Russian feed	658	604	595	610	610	650	653	700	693	641
from third-party feed	25	46	67	46	34	20	0	2	2	0
NORILSK DIVISION AND KOLA MMC										
Nickel, t	233,632	231,798	228,438	222,016	182,095	157,396	158,005	166,265	172,357	145,817
Norilsk Division (from Company feed)	124,000	122,700	122,390	96,916	50,860	0	0	0	0	0
Kola MMC	109,632	109,098	106,048	125,100	131,235	157,396	158,005	166,265	172,357	145,817
from the Company's own Russian feed	99,153	96,573	100,834	123,335	126,937	155,110	157,519	166,265	172,357	145,817
Copper, t	352,466	359,102	354,943	355,707	350,619	387,640	436,201	442,682	422,031	337,120
Norilsk Division (from Company feed)	295,610	296,760	297,552	292,632	280,347	306,859	353,131	355,706	351,413	315,511
Kola MMC	56,856	62,342	57,391	63,075	70,272	80,781	83,070	86,976	70,618	21,609
from the Company's own Russian feed	48,616	48,977	48,345	60,134	63,542	78,587	82,987	86,976	70,618	21,609
Palladium, koz	2,628	2,580	2,660	2,606	2,554	2,738	2,671	2,868	2,809	2,587
Norilsk Division (from Company feed)	1,989	2,006	2,065	1,935	1,703	956	987	1,042	1,180	1,058
Kola MMC	639	574	595	671	851	1,782	1,684	1,826	1,630	1,529
from the Company's own Russian feed	635	523	517	640	815	1,737	1,684	1,826	1,630	1,529
Platinum, koz	660	627	627	622	622	660	642	690	691	634
Norilsk Division (from Company feed)	529	504	500	488	449	259	260	251	302	271

1 Total amounts may vary from the sum of numbers due to arithmetical rounding. The total operating results of Nkomati are not included in the total performance of the Group.

Asset	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Kola MMC	131	123	127	134	173	401	381	439	390	363
from the Company's own Russian feed	129	100	95	122	159	385	381	439	390	363
NORILSK NICKEL HARJAVALTA (FINLAND)										
Nickel, t	45,518	44,252	42,603	43,479	53,654	59,716	60,765	62,422	63,352	47,189
from the Company's own Russian feed	0	0	0	424	19,012	55,021	59,337	58,939	60,175	44,128
Copper, t	1,006	6,549	10,629	13,048	9,598	13,441	18,036	12,948	2,491	1,923
from the Company's own Russian feed	0	0	0	0	593	12,328	17,980	12,667	2,121	1,897
Palladium, koz	21	39	74	78	64	42	58	54	17	30
from the Company's own Russian feed	0	0	0	0	8	35	58	51	11	29
Platinum, koz	9	16	31	33	22	10	11	12	4	7
from the Company's own Russian feed	0	0	0	0	2	6	11	9	2	7
TRANS-BAIKAL DIVISION[2]										
Copper (in concentrate), t	—	—	—	—	—	—	19,417	43,489	62,664	67,798
Gold (in concentrate), koz	—	—	—	—	—	—	89	177	241	258
Iron ore concentrate, kt	—	—	—	—	—	—	346	1,311	2,046	2,582
NORILSK NICKEL NKOMATI (SOUTH AFRICA)[3]										
Nickel, t	9,624	11,920	11,359	11,350	8,486	8,006	6,597	6,485	5,839	795
Copper, t	4,594	5,034	4,938	5,301	4,007	4,504	3,055	3,419	2,877	465
Palladium, koz	32	46	48	53	40	46	33	33	30	5
Platinum, koz	12	20	19	20	15	20	13	14	13	2
NORILSK NICKEL TATI (BOTSWANA)[4]										
Nickel, t	12,215	6,416	3,207	911	—	—	—	—	—	—
Copper, t	10,292	5,412	2,436	671	——	—	—	—	—	—
Palladium, koz	83	43	18	5	—	—	—	—	—	—
Platinum, koz	14	7	4	1	—	—	—	—	—	—
LAKE JOHNSTON (AUSTRALIA)										
Nickel, t	8,975	2,826	—	—	—	—	—	—	—	—

1 The Group owns 50.01% in Bystrinsky GOK. The operating results show metals contained in concentrate for sale assuming a 100% ownership by the Group while total operating results include Bystrinsky GOK's full performance. Bystrinsky GOK was commissioned in 2019.

2 The Company owns 50% in Nkomati. The operating results show metals contained in concentrate for sale assuming a 50% ownership and are not consolidated in the Group's total operating results. In 2019, the Group and African Rainbow Minerals, its partner in the project, decided to close the project, which was eventually put on care and maintenance in Q2 2021 due to termination of operations.

3 The sale of the asset was closed on 2 April 2015.

Group ore output (mln t)

Asset	2019	2020	2021
Assets in Russia (copper-nickel sulphide ores)	**26.3**	**26.5**	**24.62**
Norilsk Division	18.4	18.8	17.5
Kola Division	7.9	7.7	7.2
Assets in Russia (gold-iron-copper ores)	**10.5**	**16.0**	**16.6**
Trans-Baikal Division	10.5	16.0	16.6

Average metal content in mined ore

Asset	2019	2020	2021
NICKEL (%)			
Norilsk Division	1.32	1.30	1.20
Kola Division	0.55	0.53	0.57
COPPER (%)			
Norilsk Division	2.24	2.27	2.09
Kola Division	0.24	0.24	0.25
Trans-Baikal Division	0.60	0.60	0.50
PGMS (g/t)[1]			
Norilsk Division	6.89	6.89	6.69
Kola Division	0.10	0.10	0.29

Metals recovery in concentration (%)

Asset	2019	2020	2021
NICKEL			
Norilsk Division	83.1	84.8	84.3
Kola Division (Kola MMC)	67.9	62.9	67.7
COPPER			
Norilsk Division	95.2	95.1	95.5
Kola Division (Kola MMC)	73.2	71.8	76.8
Trans-Baikal Division	87.7	87.4	86.9
PGMS			
Norilsk Division	85.2	86.4	85.6

1 The PGMs include palladium, platinum, rhodium, ruthenium, and iridium.
2 Metals recovery into bulk concentrate.

Metals recovery in smelting (%)

Asset	2019	2020	2021
NICKEL			
Norilsk Division[1]	94.6	94.1	94.4
Kola Division (Kola MMC)[2]	97.0	96.3	98.3
Kola Division (NN Harjavalta)[2]	97.9	98.2	98.1
COPPER			
Norilsk Division[1]	94.1	94.6	95.1
Kola Division (Kola MMC)[2]	96.5	95.4	99.5
Kola Division (NN Harjavalta)[2]	99.8	99.8	99.8
PGMS			
Norilsk Division[1]	95.8	96.4	96.5
Kola Division (Kola MMC)[2]	91.6	92.9	92.9
Kola Division (NN Harjavalta)[2]	99.8	99.9	99.9

Seleable metals production

Product	2019	2020	2021
GROUP TOTAL			
Nickel, kt	228.7	235.7	193.0
from own feed	225.2	232.5	189.9
Copper, kt	499.1	487.2	406.8
from own feed	498.8	486.8	406.8
Palladium, koz	2,922	2,826	2,616
from own feed	2,919	2,820	2,616
Platinum, koz	702	695	641
from own feed	700	693	641
ASSETS IN RUSSIA			
Nickel, kt	166.3	172.4	145.8
Copper, kt	486.2	484.7	404.9
Palladium, koz	2,868	2,809	2,587
Platinum, koz	690	691	634
NORILSK NICKEL HARJAVALTA (Finland)			
Nickel, kt	62.4	63.4	47.2
Copper, kt	12.9	2.5	1.9
Palladium, koz	54	17	30
Platinum, koz	12	4	7

1 Feedstock to finished products.
2 In refining, converter matte to finished products.

Norilsk Division

The Norilsk Division is the Group's flagship asset boasting a full metals production cycle from ore mining to the shipment of finished products to customers. The Norilsk Division includes the Company's two major production assets – the Polar Division and Medvezhy Ruchey (100% stake), as well as a number of transport and support assets. The Norilsk Division's assets are located on the Russian Taimyr Peninsula – in the Norilsk Industrial District in the north of the Krasnoyarsk Region in the Arctic Circle, and linked to other regions by the Yenisei River, the Northern Sea Route, and by air.

The Norilsk Division operates the largest deposits in the Company's portfolio: Talnakhskoye and Oktyabrskoye, as well as the Norilsk-1 deposit, with a combined annual output of over 17 mln t of copper-nickel sulphide ore.

In 2021, the Norilsk Division accounted for 78% of copper and 41% of PGMs in the Group's total finished products.

MINING PRODUCTION

The Norilsk Division mines copper-nickel sulphide ores of three grades: high-grade ores with a higher content of base and precious metals; cuprous ores with a higher copper content as compared to nickel; and disseminated ores with a lower content of all metals.

The Polar Division of the Norilsk Division develops the Talnakhskoye and Oktyabrskoye deposits through underground mining at the Taimyrsky, Oktyabrsky, Komsomolsky, Skalisty, and Mayak Mines. The mines deploy slicing and room-and-pillar methods with the cut-and-fill system. Stopes are refilled with backfill mixtures, with their composition adjusted in each case depending on technological requirements for mine backfill durability.

The Norilsk-1 deposit is developed by the Zapolyarny Mine (Medvezhy Ruchey – South Cluster project), through open-pit and underground mining. Underground mining is carried out through sublevel (level) caving using front ore passes and self-propelled vehicles.In 2021, total ore production by the Norilsk Division was 17.5 mln t, down 1.4 mln t y-o-y (–7%). High-grade and disseminated ore production decreased by 19% and 3%, respectively, while production of cuprous ores increased by 1%. The year-on-year decrease in production was caused by the temporary suspension of operations at the Oktyabrsky and Taimyrsky Mines due to flooding by groundwater. Both mines have currently resumed their operations in full.

Ore output (mln t)

Deposit/mine, ore type	2019	2020	2021
Total ore	18.42	18.82	17.46
high-grade	7.35	7.48	6.07
cuprous	5.75	5.49	5.55
disseminated	5.32	5.85	5.84
Oktyabrskoye deposit	9.45	9.58	7.39
Oktyabrsky Mine (underground)	5.37	5.34	4.79
high-grade	0.88	0.80	0.58
cuprous	3.38	3.41	3.41
disseminated	1.11	1.13	0.80
Taimyrsky Mine (underground)	4.08	4.24	2.60
high-grade	4.08	4.24	2.60
Talnakhskoye and Oktyabrskoye deposits	7.34	7.55	7.98
Komsomolsky Mine (underground)	4.00	4.25	4.26
high-grade	0.10	0.14	0.35
cuprous	2.28	1.81	1.85
disseminated	1.62	2.30	2.06
Skalisty Mine (underground)	2.34	2.54	2.79
high-grade	2.25	2.27	2.50
cuprous	0.09	0.27	0.29
Mayak Mine (underground)	1.00	0.76	0.93
high-grade	0.04	0.03	0.04
disseminated	0.97	0.73	0.89
Norilsk-1 deposit	1.63	1.69	2.09
Zapolyarny Mine (open-pit/underground)			
disseminated			

SINCE 2020, THE COMPANY HAS BEEN IMPLEMENTING THE TECHNOLOGY BREAKTHROUGH 2.0

Project portfolio aimed at shifting to safe, green and efficient digital operation driven by innovation, big data analytics and unmanned mining technology. Nornickel was the first Russian company to put unmanned autonomous haul trucks into commercial operation at the Skalisty Mine in 2021.

CONCENTRATORS

Talnakh Concentrator

Processes high-grade, cuprous and disseminated ores from the Oktyabrskoye and Talnakhskoye deposits to produce nickel-pyrrhotite and copper concentrates, and metal-bearing products. The key processing stages include crushing, milling, flotation, and thickening.

Norilsk Concentrator

Processes all disseminated ores from the Norilsk-1 deposit, cuprous and disseminated ores from the Oktyabrskoye and Talnakhskoye deposits, and low-grade ores from Copper Plant to produce nickel and copper concentrates.
The key processing stages include crushing, milling, flotation, gravity concentration, and thickening.

The resulting thickened concentrates from Talnakh Concentrator and Norilsk Concentrator are transported via slurry pipelines to the metals operations of the Norilsk Division for further processing. In 2021, the Company's concentration facilities processed a total of 16.5 mln t across all types of ore feedstocks.

In 2021, Talnakh Concentrator decreased its ore processing by 7% to 10.1 mln t due to a temporary decline in production caused by the flooding of the Taimyrsky and Oktyabrsky Mines. Recovery of nickel from ore into bulk flotation concentrate, including the output of metal-bearing pyrrhotite product, remained almost flat year-on-year at 87.4% (down 0.5%).

In 2021, the Norilsk Concentrator reduced its ore processing to 6.4 mln t, down 1.2 mln t y-o-y, as a result of a temporary suspension of processing operations due to an accident. Recovery of nickel from ore into bulk concentrate was 70.0%, down 0.6% y-o-y, due to the concentrator temporarily shifting to processing (crushing) ores from the Talnakhskoye deposit during and after the accident response.

TALNAKH CONCENTRATOR HAS SUCCESSFULLY TESTED THE DIGITAL TWIN OF A FLOTATION OPERATOR

automating
80%
of processes

Its automation algorithms generate recommendations for the ore flotation process in real time to increase metal recovery into concentrate. The project also uses machine vision to monitor ore sizes on several conveyors before it is fed into a semi-autogenous grinding mill, which is essential for optimal grinding control.

Ore processing and nickel recovery

HItem	2019	2020	2021
Ore processing, mln t			
Talnakh Concentrator	10.7	10.9	10.1
Norilsk Concentrator	7.5	7.6	6.4
Nickel recovery, %			
Talnakh Concentrator	85.9	87.9	87.4
Norilsk Concentrator	71.3	70.6	70.0

In 2021, total ore production by the Norilsk Division was
17.46 mln t.

In 2021, the Norilsk Division accounted
for 78% of copper
in the Group's total finished products.

SMELTING

Production chain

The produced concentrates, including steam cured sulphide concentrate, secondary materials, and metal-bearing feed from Kola MMC, are fed into flash smelting furnaces at Nadezhda Metallurgical Plant. Steam cured sulphide concentrate is leached at the hydrometallurgical shop of Nadezhda Metallurgical Plant from products with low metal content, such as Talnakh Concentrator's metal-bearing products, products from Nadezhda Metallurgical Plant's tailings facility, and concentrates from tailings ponds. The matte produced in flash smelting furnaces is then converted into high-grade converter matte.

Copper Plant processes all of the copper concentrate from the Company's concentrators and also a copper cake with Norilsk Nickel Harjavalta to obtain copper cathodes, elemental sulphur, and sulphuric acid for the operational needs of the Norilsk Division.

Copper Plant's metallurgical shop recycles sludge from the copper tankhouses of Copper Plant and Kola MMC to produce precious metal concentrates, commercial selenium, and tellurium.

The precious metals produced by the Norilsk Division are refined at Krastsvetmet and Urals' Innovative Technologies under tolling agreements.

The decrease in copper and PGM output in 2021 was caused by the temporary suspension of operations at Norilsk Concentrator due to an accident, and at two mines due to flooding.

DOWNSTREAM FACILITIES

Nadezhda Metallurgical Plant

Copper Plant

Copper Plant's metallurgical shop

Production volumes

Products	2019	2020	2021
Copper, t	355,706	351,413	315,511
Palladium, koz	1,042	1,180	1,058
Platinum, koz	251	302	271

Products

- Copper cathodes
- Nickel converter matte sent for processing to Kola MMC
- Precious metal concentrates
- Commercial sulphur, selenium
- Tellurium ingots

Kola Division

The Kola Division includes Kola MMC, Nornickel's wholly owned subsidiary. The Kola Division is another key production asset of the Company in Russia, which is located on the Kola Peninsula in the Murmansk Region.

In 2021, Kola MMC accounted for 76%, 5% and 58% of the Group's total nickel, copper, and PGM finished products, respectively.

MINING PRODUCTION

Kola MMC mines disseminated copper-nickel sulphide ores at four deposits: Zhdanovskoye, Zapolyarnoye, Kotselvaara, and Semiletka.

Kola MMC uses various ore mining methods. The Zhdanovskoye and Zapolyarnoye deposits use three mining methods: gravity caving with front ore passes, sublevel caving with room-and-pillar ore removal, and room-and-pillar mining. The Kotselvaara and Semiletka deposits primarily use stoping from sublevel drifts and sublevel caving. Room-and-pillar short-hole and long-hole stoping is also used on a limited scale.

In 2021, Kola MMC produced 7.2 mln t of ore (down 6% y-o-y). The decrease in ore production was due to the fact that the concentrator stopped processing off-balance (sub-economic) ores from the open-pit section to enhance the technical and economic performance in producing sulphide concentrate.

Ore output (mln t)

Deposit/mine	2019	2020	2021
Total ore	7.91	7.65	7.16
Zhdanovskoye deposit:	7.25	7.08	6.55
• Severny Mine (underground section)	6.49	6.43	6.48
• Severny Mine (open-pit section)	0.77	0.65	0.07
Zapolyarnoye deposit:	0.06	0.05	0.03
• Severny section (underground)	0.06	0.05	0.03
Kotselvaara and Semiletka deposits:	0.60	0.52	0.58
• Kaula-Kotselvaara mine (underground)	0.60	0.52	0.58

CONCENTRATION

The concentrator produces nickel sulphide concentrate, which is then sold via third parties or partially shipped to the Norilsk Division for further processing. In 2021, the concentrator processed 7.1 mln t of ore.

Ore processing, (mln t)

Item	2019	2020	2021
Ore processing, mln t	7.60	7.96	7.11

THE CONCENTRATION PLANT SUCCESSFULLY TESTED EXPRESS METHODS TO ASSESS ORE DRESSABILITY BY MEASURING THE ORE'S MAGNETIC PROPERTIES WITH A FERROMETER AND DETERMINING DISSEMINATION, WHICH GOING FORWARD WILL BOOST THE RECOVERY RATES FOR NON-FERROUS METALS.

SMELTING

In 2021, Kola MMC used only Nornickel's own Russian feedstock in metals production. The decrease in saleable nickel and PGM production was primarily caused by lower supplies of raw materials from the Norilsk Division due to the temporary suspension of operations at the Oktyabrsky and Taimyrsky Mines, and at Norilsk Concentrator. The decrease in saleable copper output was due to the closure of the copper shop in March 2021.

The precious metals produced by the Kola Division are refined at Krastsvetmet and Prioksky Plant of Non-Ferrous Metals under tolling agreements.

Production volumes

Products	2019	2020	2021
Nickel, t	166,265	172,357	145,817
from own Russian feed	166,265	172,357	145,817
Copper, t	86,976	70,618	21,609
from own Russian feed	86,976	70,618	21,609
Palladium, koz	1,826	1,630	1,529
from own Russian feed	1,826	1,630	1,529
Platinum, koz	439	390	363
from own Russian feed	439	390	363

Products:

- Nickel cathodes
- Nickel carbonyl
- Copper cathodes
- Copper concentrate
- Sulphide concentrate from the concentrator
- Electrolytic cobalt
- Cobalt concentrate
- Precious metal concentrates
- Sulphuric acid
- Crushed matte and converter matte for Haijavalta

NORNICKEL SUCCESSFULLY TESTED THE CHEMICAL AND METALLURGICAL SHOP EQUIPMENT TO PERFORM EXPRESS ANALYSIS OF REUSED WATER FOR RHODIUM CONTENT. THE COMPANY ALSO DEPLOYED ULTRA M PRO BY DISTRAN, A DEVICE TO DETECT GAS LEAKS, WHICH REDUCES MECHANICAL ENERGY LOSSES IN PROCESS PIPELINES AND UTILITIES.

Norilsk Nickel Harjavalta (Finland)

Norilsk Nickel Haijavalta located in Haijavalta, Finland, is Nornickel's wholly owned subsidiary, acquired by the Group in 2007. The Haijavalta is apart of the Kola Duvision and processes Nornickel's Russian feedstock and nickel-bearing raw materials sourced from third-party suppliers.

Founded in 1959, it is Finland's only nickel refinery and one of the largest nickel producers in Europe. Harjavalta's capacity is 66 ktpa of nickel products.

The facility uses sulphuric acid leaching with metal recovery rates above 98%, which is a best practice in the global mining and metals industry.

In 2021, Norilsk Nickel Haijavalta accounted for 24%, 1% and 1% of the Group's total nickel, copper and PGM finished products, respectively.

SMELTING

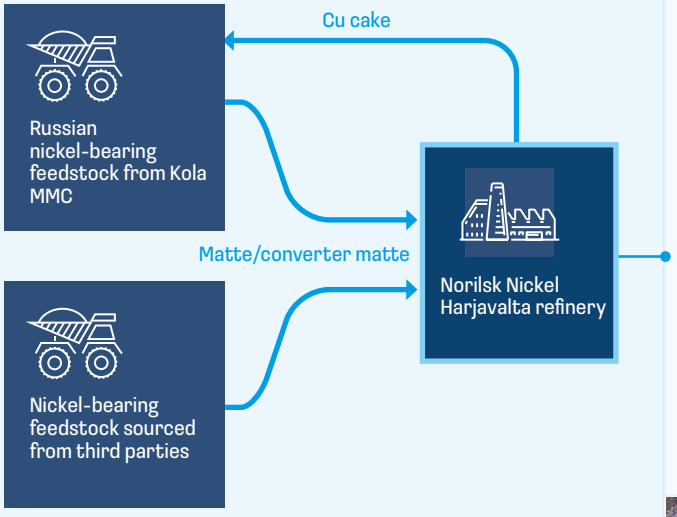
During 2021, Norilsk Nickel Harjavalta mainly processed nickel feed from Kola MMC's refining operations. Third-party feedstocksand nickel salts from other suppliers, were supplied regularly in small amounts throughout 2021. Metal recovery remained high.

In 2021, Norilsk Nickel Harjavalta reduced its nickel production by 26% due to lower supplies of nickel concentrate from Kola MMC. The production of copper in copper cake totalled 1.9 kt, down 23% y-o-y, while the output of saleable palladium and platinum in copper cake increased by 43% y-o-y. The increase was due to increased supplies of crushed converter matte to match operational needs.

Production volumes

Products	2019	2020	2021
Nickel, t	62,422	63,352	47,189
from the Company's own Russian feed	58,939	60,175	44,128
Copper (in copper cake), t	12,948	2,491	1,923
from the Company's own Russian feed	12,667	2,121	1,897
Palladium (in copper cake), koz	54	17	30
from the Company's own Russian feed	51	11	29
Platinum (in copper cake), koz	12	4	7
from the Company's own Russian feed	9	2	7

Facility's process chart



Products:

- Ni:
  - cathodes
  - briquettes
  - salts
  - powders
  - solutions
- Co
  - sulphate
  - solutions
- Cu
  - PGM-bearing copper cake

Trans-Baikal Division

The Trans-Baikal Division includes Bystrinsky GOK, the construction of which was started by Nornickel in 2013 (put into commercial operation in 2019). In 2021, Bystrinsky GOK reached its design capacity. In 2021, the Trans-Baikal Division produced 17% of the Group's total copper output.

17%

In 2021, the Trans-Baikal Division produced 17% of the Group's total copper output

MINING PRODUCTION

Bystrinsky GOK mines gold-iron-copper ores of the Bystrinskoye deposit.

Ore output (mln t)

Mining asset	2019	2020	2021
Total ore	10.49	16.04	16.55
Bystrinskoye deposit:	10.49	16.04	16.55
Verkhne-Ildikansky open-pit mine	8.60	11.57	13.34
Bystrinsky-2 open-pit mine	1.89	4.47	3.21

CONCENTRATION

The facility processes ores of the Bystrinskoye deposit into copper, iron ore and gold concentrates. Its key processing stages include crushing, milling, flotation, thickening, filtration, and end product packaging. The concentrator has two processing lines. In 2021, it processed 10.47 mln t of ore (2019: 9.76 mln t). The increase was due to scheduled ramp-up to design capacity.

Copper and iron ore concentrates are sold via third parties, while gold concentrates are further processed at the Norilsk Division.

Products:

- Copper concentrate
- Gold concentrate
- Iron ore concentrate

Production volumes

Products	2019	2020	2021
Ore processing, mln t	7.50	9.76	10.47
Copper (in copper concentrate), t	43,489	62,663	67,798
copper content in the concentrate, %	25.50	24.65	22.87
Gold (in copper and gold concentrates), koz	177	241	258
gold content in the concentrate, g/t	4,034	3,050	2,627
Iron ore concentrate, kt	1,311	2,047	2,582
iron content in the concentrate, %	64.60	64.22	63.72

A PROJECT TO OPTIMISE FLOTATION PROCESSES USING THE DIGITAL TWIN OF A FLOTATION OPERATOR (TALNAKH CONCENTRATOR) WAS PILOTED AT BYSTRINSKY GOK.

The pilot was rated as successful, and in 2022 we plan to conduct repeat testing of the system using video analytics of the foam layer in flotation cells and measuring metrics such as froth floatation speed, bubble size and foam color in real time.