

Production flow



Mining



Concentration



Smelting



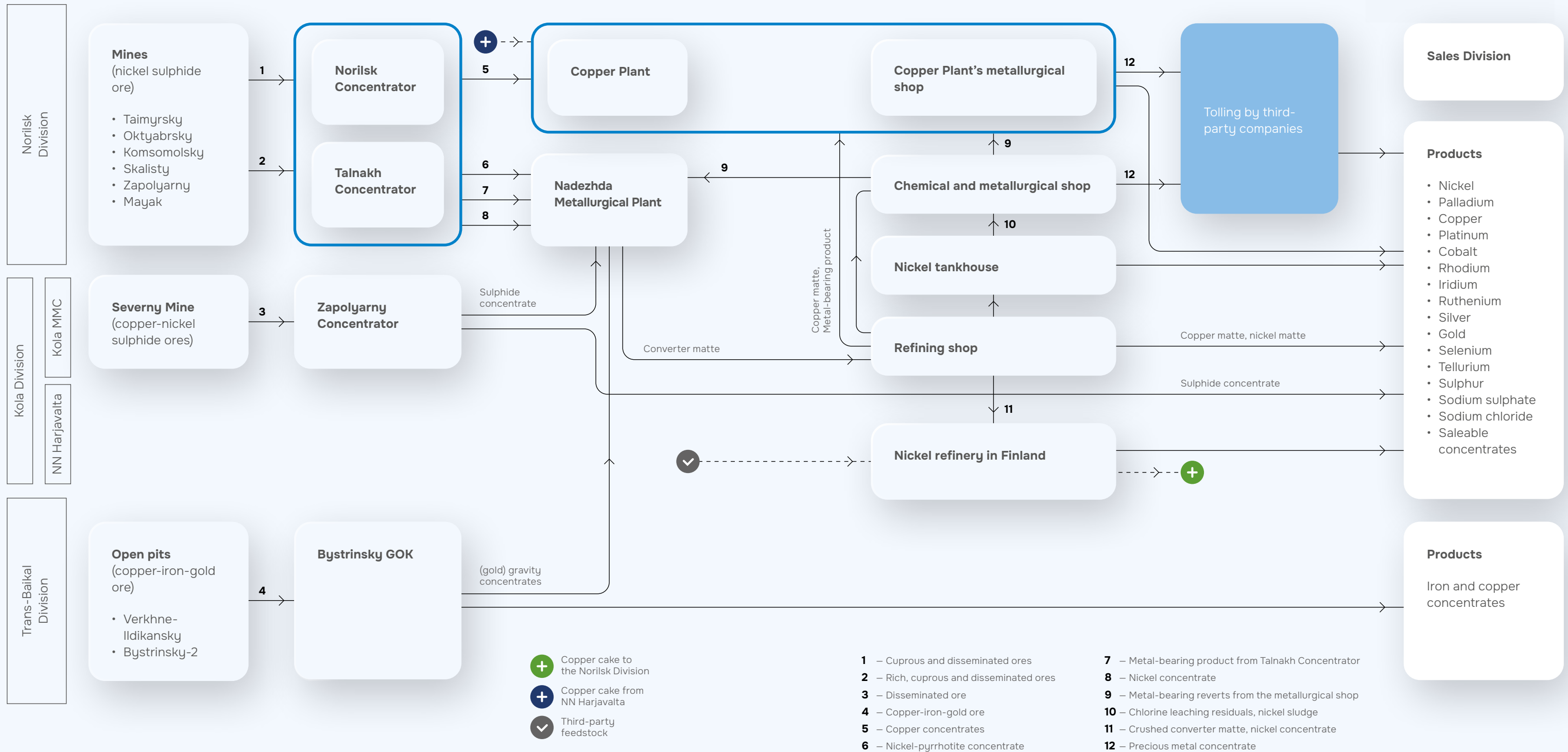
Refining



PGM refining



Sales



Mining

Average metal content in mined ore



For more details on ore production, metal content, and metal recovery percentage in our concentration and metallurgical operations, please see the [Data Book section on the Company website](#).

The Norilsk and Kola Divisions mine copper-nickel sulphide ores of three grades: high-grade ores with a higher content of non-ferrous 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 Trans-Baikal Division mines gold-iron-copper ores of the Bystrinskoye deposit.

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, with stopes refilled with backfill mixtures.

The Norilsk-1 deposit is developed by the Zapolyarny Mine of the Norilsk Division through open-pit and underground mining. Underground mining is carried out through sublevel caving using front ore passes and self-propelled vehicles.

In 2023, total ore production by the Norilsk Division was 19.2 mln t, up 0.74 mln t y-o-y (up 4%). High-grade ore output decreased by 9% (-0.6 mln t), while production

of cuprous ores decreased by 11.0% (-0.6 mln t). The decline in ore output was caused by self-propelled diesel machinery breakdowns, lack of spare parts, and undersupply of new mining equipment. Disseminated ore production increased by 34% (+1.9 mln t). The year-on-year increase in the production of disseminated ores was driven by higher ore production at the Zapolyarny Mine, which only produces disseminated ores, as was anticipated in the mining option.

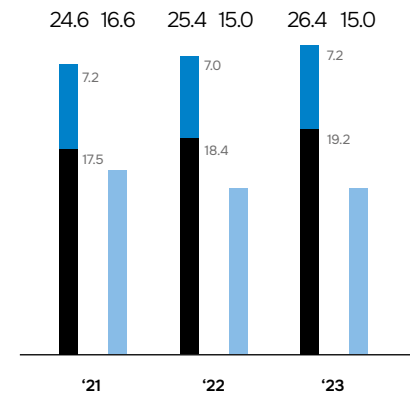
The **Kola Division** mines disseminated ores at Kola MMC, which operates four deposits: Zhdanovskoye, Zapolyarnoye, Kotselvaara, and Semiletka. Kola MMC uses various ore mining methods. The Zhdanovskoye and Zapolyarnoye deposits use three mining methods: gravity caving with front ore passes, sublevel 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 2023, Kola MMC produced 7.2 mln t of ore (up 3% y-o-y). The increase in ore production (+0.2 mln t) was driven by the concentrator tapping into off-balance (sub-economic) ore reserves with partial replacement of the output from the Kaula-Kotselvaara mine due to preparations for mothballing in 2024.

The **Trans-Baikal Division** mines gold-iron-copper ores of the Bystrinskoye deposit through open-pit mining at the Verkhne-Ildikansky and Bystrinsky-2 mines.

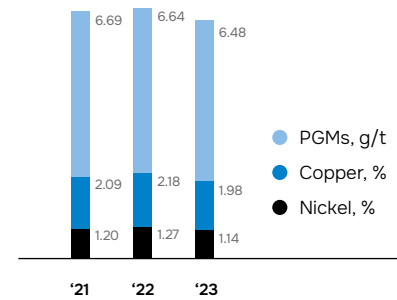
In 2023, total ore production by the Trans-Baikal Division was 15.0 mln t, virtually flat year-on-year.

Group ore output, MLN T



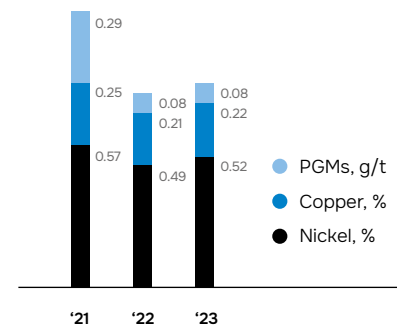
- Kola Division (copper-nickel sulphide ores)
- Norilsk Division (copper-nickel sulphide ores)
- Trans-Baikal Division (gold-iron-copper ores)

Norilsk Division



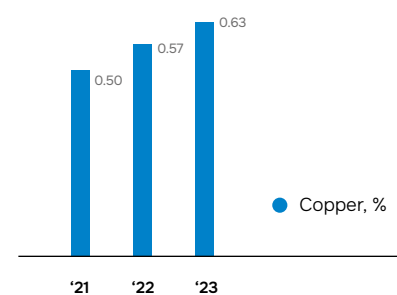
- PGMs, g/t
- Copper, %
- Nickel, %

Kola Division



- PGMs, g/t
- Copper, %
- Nickel, %

Trans-Baikal Division



Concentration

Concentrators

- Talnakh Concentrator, Norilsk Division
- Norilsk Concentrator, Norilsk Division
- Zapolyarny Concentrator, Kola Division
- Bystrinsky GOK, Trans-Baikal Division

Talnakh Concentrator

processes high-grade, cuprous, and disseminated ores from the Oktyabrskoye and Talnakhskoye deposits to produce nickel-pyrrhotite and copper concentrates as well as metal-bearing products. Its key processing stages include crushing, milling, flotation, and thickening. In 2023, ore processing volumes at Talnakh Concentrator stayed flat at 10.7 mln t.

Norilsk Concentrator processes all disseminated ores from the Norilsk-1 deposit, cuprous and disseminated ores from the Oktyabrskoye and Talnakhskoye deposits, and some metal-bearing products from Talnakh Concentrator to produce nickel and copper concentrates. Its key processing stages include crushing, milling, flotation, gravity

concentration, and thickening. In 2023, Norilsk Concentrator increased its ore processing to 8.4 mln t, up 0.7 mln t y-o-y.

The resulting thickened concentrates from Talnakh and Norilsk Concentrators are transported via slurry pipelines to the metals operations of the Norilsk Division for further processing.

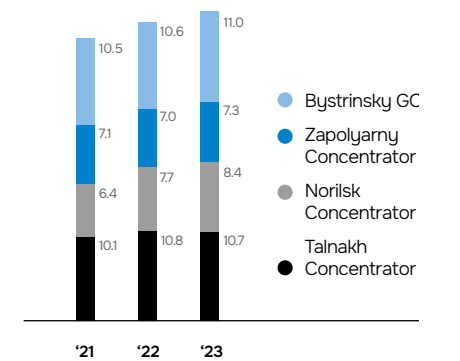
Zapolyarny Concentrator processes disseminated ores from Kola MMC deposits. The concentrator produces nickel sulphide concentrate, which is then sold via third parties or partially shipped to the Norilsk Division for further processing. In 2023, the concentrator processed 7.3 mln t of ore, up 0.3 mln t y-o-y due to an increase in open-pit ore production.

Bystrinsky GOK processes ores from 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. Copper and iron ore concentrates are sold via third parties, while gold concentrates are further processed at the Norilsk Division. In 2023, Bystrinsky GOK processed 11.0 mln t of ore, up 0.4 mln t y-o-y.

Metals recovery in concentration, %

Division	2021	2022	2023
NICKEL			
Norilsk Division	84.3	85.3	84.7
Kola Division (Kola MMC)	67.7	67.4	66.5
COPPER			
Norilsk Division	95.5	96.3	96.2
Kola Division (Kola MMC)	76.8	73.7	73.1
Trans-Baikal Division	86.9	88.1	88.8
PGMS			
Norilsk Division	85.6	85.8	85.3

Concentrators' throughput, MLN T



- Bystrinsky GC
- Zapolyarny Concentrator
- Norilsk Concentrator
- Talnakh Concentrator

10.7 MLN T

Ore processing at Talnakh Concentrator in 2023

0.7 MLN T

Growth in ore processing volumes at Norilsk Concentrator in 2023

0.3 MLN T

Growth in ore processing volumes at Zapolyarny Concentrator in 2023

0.4 MLN T

Increase in ore processing volumes at Bystrinsky GOK from 2022

Smelting and refining

Downstream facilities

- Nadezhda Metallurgical Plant, Norilsk Division
- Copper Plant, Norilsk Division
- Metallurgical shop of Copper Plant, Norilsk Division
- Chemical and metallurgical shop, Kola Division
- Refining shop, Kola Division
- Nickel tankhouse, Kola Division
- Refinery, Kola Division, Harjavalta

Production chain

Norilsk Division

The produced nickel concentrates, including pressure oxidised sulphide concentrate¹, secondary materials, and metal-bearing feed from Kola MMC, are fed into flash smelting furnaces at **Nadezhda Metallurgical Plant**. The matte produced in flash smelting furnaces is then converted into high-grade converter matte, which is shipped to the Kola MMC.

Copper Plant processes all of the copper concentrate from the Norilsk Division's concentrators, metal-bearing feed from Kola MMC, and copper cake from 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 to produce precious metal concentrates and commercial selenium.

Kola Division (Kola MMC)

Kola MMC's refining facilities in Monchegorsk refine converter matte from the Norilsk Division¹. Supplied to the converter matte separation section, converter matte is crushed, milled, and separated into copper and nickel concentrates by flotation, while part of the converter matte after crushing is immediately sent for processing to Norilsk Nickel Harjavalta. The resulting copper concentrate is sent to the Norilsk Division's Copper Plant. The nickel concentrate flow is then separated, with some of it after magnetic separation and recovery of precious metals sent to Norilsk Nickel Harjavalta for further processing. The remaining nickel concentrate is processed at the roasting and electric furnace sections to produce tube furnace nickel powder, anodes, and granulated nickel alloy. Anodes are processed using the conventional electrorefining technology at Tankhouse 1 to produce cathodes. Tube furnace nickel powder is processed at Tankhouse 2 using a new technology involving leaching plus electrowinning to produce cathodes. The granulated nickel alloy is processed at the nickel carbonyl section to produce pellets and powder.

The production of nickel cathodes at Tankhouse 1 and Tankhouse 2 results in semi-finished products with a high content of precious metals. These semi-finished products are processed at the chemical and metallurgical shop to produce precious metal concentrates. The production of nickel cathodes at Tankhouse 1 and Tankhouse 2 also generates primary cobalt cake, which is used by the cobalt section to produce saleable cobalt concentrate and cobalt cathodes.

Kola Division (NN Harjavalta)

Norilsk Nickel Harjavalta uses sulphuric acid leaching with high metal recovery rates – above 98%. The refinery processes nickel feedstock (matte and crushed converter matte with precious metals recovered from it) supplied by Kola MMC and feedstocks purchased from third parties (nickel salts). Once leached, copper cake is sent to the Norilsk Division or sold to third parties, while purified nickel solutions are sent for further processing to produce nickel cathodes, nickel briquettes, powder, salts, as well as salts and solutions of cobalt.

Precious metals produced by Nornickel are refined under tolling agreements by third-party companies.

Metals recovery in smelting, %

Division	2021	2022	2023
NICKEL			
Norilsk Division ³	94.4	95.1	94.9
Kola Division (Kola MMC) ⁴	98.3	98.4	98.5
Kola Division (NN Harjavalta) ⁴	98.1	97.8	98.3

¹ Hydrometallurgical product.

² The production and processing of own converter matte have been discontinued following the shutdown of the smelting shop in December 2020.

³ Feedstock to finished products.

⁴ In refining, converter matte to finished products.

Division	2021	2022	2023
COPPER			
Norilsk Division ³	95.1	95.4	95.6
Kola Division (Kola MMC) ⁴	99.5	99.6	99.2
Kola Division (NN Harjavalta) ⁴	99.8	99.8	99.8
PGMS			
Norilsk Division ³	96.5	96.6	96.7
Kola Division (Kola MMC) ⁴	92.9	97.8	98.1
Kola Division (NN Harjavalta) ⁴	99.9	99.9	99.9

Products

Production volumes by Bystrinsky GOK

Products	2021	2022	2023
Ore processing (mln t)	10.47	10.60	11.02
Copper (in copper concentrate, t)	67,798	67,240	68,958
Copper content in the concentrate (%)	22.87	22.97	22.96
Iron ore concentrate (kt)	2,582	2,545	2,892
Iron content in the concentrate (%)	63.72	64.68	65.09

Finished product output by the Group

Saleable metals	2021	2022	2023
Nickel (kt)	193.0	219.0	208.6
including from own feed	189.9	218.7	208.2
Copper (kt)	406.8	433.0	425.4
Palladium (koz)	2,616	2,790	2,692
Platinum (koz)	641	651	664

The Group's saleable products

Norilsk Division:

- Copper cathodes
- Commercial sulphur
- Selenium
- Precious metals

Kola Division:

- Nickel cathodes and carbonyl
- Nickel sulphide concentrate
- Nickel matte
- Copper matte

- Cobalt cathodes, cobalt concentrate
- Precious metals
- Sulphuric acid

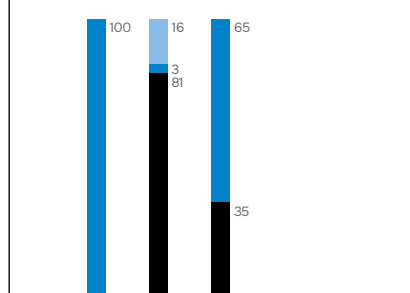
Norilsk Nickel Harjavalta:

- Nickel salts, briquettes, cathodes, powders, and solutions
- Copper cake
- Cobalt sulphate, cobalt solutions

Trans-Baikal Division:

- Iron ore concentrate
- Copper concentrate

Finished products by division in 2023, %



Nickel Copper PGMs

- Trans-Baikal Division
- Kola Division
- Norilsk Division