Nornickel's roadmap to comply with the TCFD recommendations

In 2023, Nornickel completed the implementation of the roadmap to comply with the TCFD recommendations adopted in 2021, which included more than 50 measures aimed at improving the system for managing climate change-related risks and opportunities. Alongside that, the Company started developing the Climate Change Action Plan through 2025 in furtherance of the TCFD roadmap it had previously completed.

> We place heavy emphasis on climate risk management. Among other things, we are developing energy saving technologies and implementing a geotechnical monitoring system for permafrost soils. This helps us identify potentially hazardous defects and deviations in a timely manner, thus reducing the likelihood of accidents. In our decision-making, we take into account the territorial singularities of the Arctic in order to adapt our operations to the specific conditions in this region.
>
> **Alexey Devochkin,**
> Polar Division's Deputy Director for Industrial Ecology and Sustainable Development (length of service with the Company – 29 years)

CLIMATE CHANGE RISKS AND OPPORTUNITIES

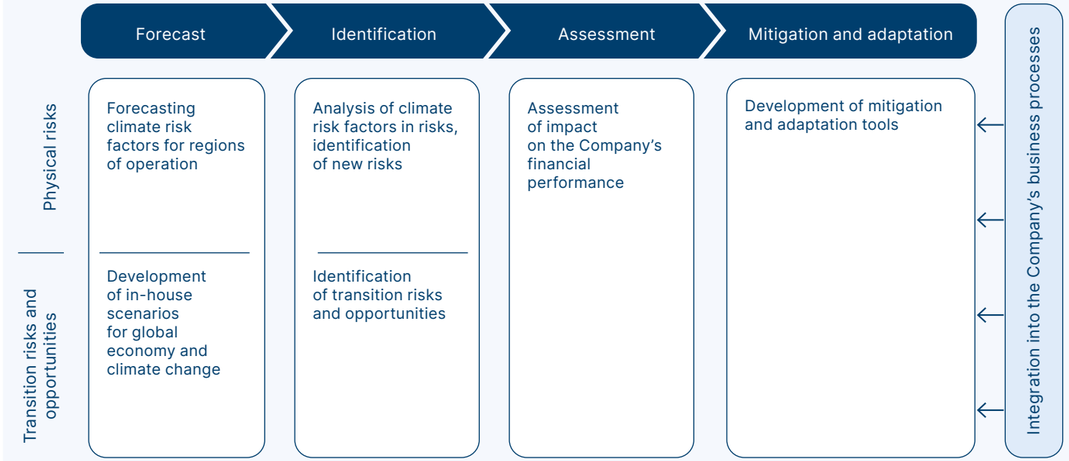
GRI 201-2

Guided by the TCFD Recommendations, COSO standards and the Environmental and Climate Change Strategy, Nornickel is building procedures for managing climate change risks and opportunities. The Company uses the TCFD classification to identify two types of risks and opportunities:

- physical risks, with impacts arising from abnormal weather events (acute risks) or chronic weather changes (chronic risks);
- transition risks and opportunities associated with the changing market, regulatory, technological and political environment during the transition to a low-carbon economy.

In 2023, the Company continued to enhance its approaches to assessing physical risks and transition risks and opportunities. The Risk Management Committee of the Management Board reviewed the concept for assessing climate change risks.

To those, the Company is implementing the following procedures:



Physical risks

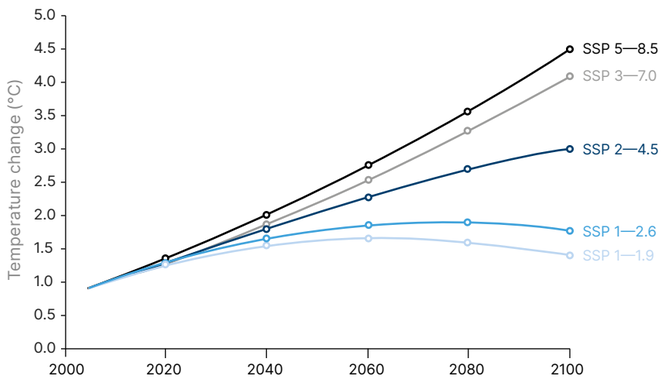
In 2022–2023, the Company made significant progress in identifying and assessing physical risks. The first step made was a joint project with the Institute of Atmospheric Physics of the Russian Academy of Sciences (IAP RAS) focusing on the analysis of historical climate change data starting from the 1960s. The analysis confirmed a trend in the change of several climate factors.

For example, in Norilsk, the temperature has been increasing by 0.6 °C every decade, suggesting that temperatures in the Arctic are rising faster than the global average.

Retrospective analysis was followed by scenario modelling of changes in climate risk factors through 2050. To do that, the Company selected three global climate scenarios developed by the IPCC – SSP1-2.6, SSP2-4.5 and SSP5-8.5[1], as well as CMIP 6[2]. The global scenarios were localised for all regions of the Company's operation, including Finland. The assessment of climate risk factors was completed for Norilsk, Energy, Kola and Trans-Baikal Divisions, as well as Norilsk Nickel Harjavalta OY.

Characteristics of IPCC scenarios

Scenario	SSP1-2.6	SSP2-4.5	SSP5-8.5
Temperature rise by 2100	by 1.8 °C	by 2.7 °C	by 4.4 °C
Greenhouse gas emissions	Greenhouse gas emissions are expected to decline and reach zero by 2055;	The current rate of increase in greenhouse gas emissions will be maintained, with carbon neutrality achieved by 2100;	The current level of GHG emissions will double by 2050



[1] The following probability of risk occurrence was determined for the selected scenarios: SSP1-2.6 – 25%, SSP2-4.5 – 70%, SSP5-8.5 – 5%.
[2] Coupled Model Intercomparison Project.

Modelling of changes in climate factors up to 2050 performed by IAP RAS for the territories where the Company's assets are located, in scenario 55P2-4.5

Climate factors	Expected changes in climate factors by 2050 vs 2022: Norilsk and Energy Divisions	Kola Division	Norilsk Nickel Harjavalta OY	Trans-Baikal Division
Changes in seasonal thaw depth, m This factor is mainly applicable to infrastructure risk assessment outside urban areas. The phrase "degradation of permafrost soil" is used in the assessment	0.8	Irrelevant	Irrelevant	Irrelevant
Number of days with heavy precipitation per year Precipitation occurring with a probability of 5%	1.4	0.6	2	-0.3
Number of days with a high risk of severe thunderstorm per year Due to changes in temperature and humidity	6	2	2	5
Annual precipitation, mm Mainly due to changes in the trajectory of Atlantic cyclones and an increase in the moisture content of the atmosphere	58	4	41	23
Average air temperature, °C	1.5	1.1	0.6	1
Change in sea level, mm	58	49	37	Irrelevant

The forecasting identified the following key climate risk factors for Nornickel: degradation of permafrost soil[1], increased frequency of heavy precipitation, and higher annual precipitation. Most of the changes are expected to occur after 2040. Low water levels in rivers (a problem the Company faced in 2013) also pose a risk[1].

[1] For the description, assessment of impact on the development strategy and targets, and mitigation measures, please see the Internal Control and Risk Management section.

Impact of permafrost soil degradation on the Company's assets

Power infrastructure facilities

- Hydropower plants
- Fuel storage tanks (heat and power plants / oil depots)
- Gas / gas condensate field
- Water intake facility in Norilsk
- Power lines
- Pipelines (gas, water, tailings)

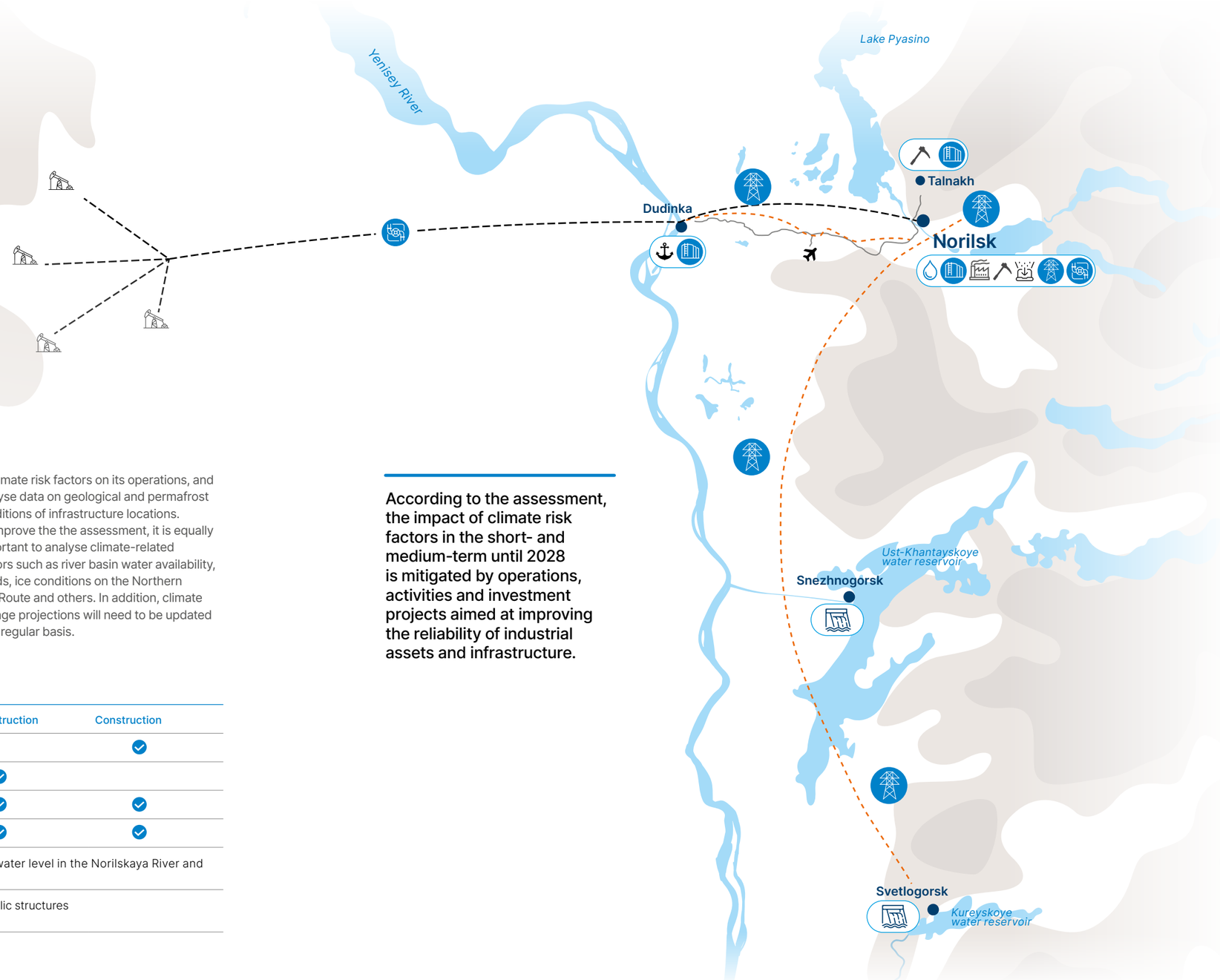
Logistics

- Dudinka Sea Port
- Alykel (airport)

Production facilities

- Plants
- Mines
- Tailing dumps

Facilities most susceptible to permafrost soil degradation



The analysis found that most of the industrial buildings and structures in the Norilsk Industrial District are built on stable (rock) foundations; linear infrastructure such as pipelines and power lines is more susceptible to the impact of permafrost soil degradation.

In order to mitigate the risks associated with the condition of permafrost soil in the Norilsk Industrial District, the Company monitors the technical condition of assets on an ongoing basis through expert examinations, surveys, and monitoring of the condition of permafrost soils and basement foundations.

To estimate the long-term impact of climate risk factors on the Company's operations through 2050, we will need to improve climate modelling, collect additional statistics of the Company to assess the impact of climate risk factors on its operations, and analyse data on geological and permafrost conditions of infrastructure locations. To improve the the assessment, it is equally important to analyse climate-related factors such as river basin water availability, floods, ice conditions on the Northern Sea Route and others. In addition, climate change projections will need to be updated on a regular basis.

Factor	Mitigation effort			
Degradation of permafrost soil	Monitoring	Repair	Reconstruction	Construction
• Power line	✓	✓		✓
• Gas pipelines	✓	✓	✓	
• Pipelines	✓	✓	✓	✓
• Fuel storage tanks	✓	✓	✓	✓
Higher frequency of heavy precipitation	Monitor the technical condition of facilities and control water level in the Norilskaya River and water reservoirs			
Higher annual precipitation	Maintain the technical condition of, and modernise, hydraulic structures			

According to the assessment, the impact of climate risk factors in the short- and medium-term until 2028 is mitigated by operations, activities and investment projects aimed at improving the reliability of industrial assets and infrastructure.

Permafrost monitoring

To mitigate the risk of natural and man-inflicted accidents, in 2021 the Company's Polar Division put in place an innovative system to monitor the technical condition of buildings and structures located in permafrost areas. The Buildings and Structures Monitoring Centre performs visual inspections and instrumental monitoring of deformations in the bases and foundations of buildings and structures, groundwater levels, soil temperatures, and thermal stabilisers.

In addition to visual inspections and instrumental measurements, as part of Polar Division's information and diagnostics system, Nornickel implemented a data collection, transmission, storage, processing and analysis framework enabling experts to oversee in the real-time mode (through a 24/7 control unit) the safe operation of buildings and structures not only in Polar Division, but also at the facilities of Norilsk and Energy Divisions, to process and analyse historical facility data, and to digitalise visual inspections of buildings and structures. Furthermore, the Company pioneered a two-level system of criterion values for the diagnostic indicators of structure and building conditions.

The most critical buildings and structures are now furnished with automated sensors, which transmit relevant signals to the system on a daily basis.

The information and diagnostics system helps issue recommendations, verifying their implementation, and produce reports on the monitored metrics.

>450 thermistor strings	For tracking the temperature of permafrost soil under buildings and structures
43 air temperature and humidity measuring devices	For ensuring operational control of relevant indicators in crawl spaces, including for rapid response to accidents affecting heat and water supply systems
1,200 inclinometers	For assessing displacements of certain elements of buildings and engineering structures
1 automated weather station	For determining air temperature, humidity, and wind speed and direction
30 accelerometers	For determining the static and dynamic characteristics of buildings or structures
138 strain gauges	For monitoring relative deformation / mechanical stress in construction structures

17 production sites of the Company are connected to Polar Division's information and diagnostics system

>600 employees work in Polar Division's information and diagnostics system

>950 facilities are connected to Polar Division's information and diagnostics system, including **218 facilities** equipped with a continuous automated monitoring system (data for the remaining facilities is entered manually)

In the first year since the system's launch, the Company decommissioned 49 facilities intended for various purposes (industrial, social, and other) to minimise the risk of accidents.

For improving permafrost degradation assessments, Nornickel joined forces with the Polar State University to develop a new scientific and methodological approach championing background monitoring at the facilities of Polar Division. To put this approach into practice, in 2023 we drilled 20 wells ranging in depth from 10 to 20 m, and another two wells with a depth of 200 m. There are plans to continue enhancing systems of background monitoring to identify geocryological hazards in 2024. This project won the top prize in the Science for Sustainable Development category at the 21st V.I. Vernadsky National Environmental Awards.

As a way to develop the monitoring system for buildings and structures, Nornickel approved a corporate geotechnical monitoring standard in August 2023. This standard incorporates not only the existing laws and regulations of the Russian Federation, but also in-house solutions and expertise, which enabled the Company to build a transparent and effective business process for supervising the technical condition of buildings and structures in a short period of time.

The standard regulates the planning and implementation of geotechnical monitoring initiatives, assigns roles to participants, and formalises requirements for connecting new facilities to the information and diagnostics system, a core framework ensuring the safe and reliable operation of the Company's assets.

Transition risks and opportunities

To identify and assess relevant transition risks and opportunities, in 2022 Nornickel partnered with the Institute of Economic Forecasting of the Russian Academy of Sciences in developing three proprietary long-term scenarios for the global economy and climate change through 2050.

The Rapid Transition, Sustainable Palladium, and Global Growth scenarios rely on an analysis of over 190 public scenarios made available by the leading agencies and organisations (International Energy Agency, World Energy Council, International Renewable Energy Agency, OPEC, Bloomberg, NGFS, Shell, BP, DNV, etc.).

The estimated changes in global temperature under these scenarios are consistent with the three IPCC scenarios (SSP1-2.6, SSP2-4.5 and SSP5-8.5) that have been adopted by the Company to assess the physical climate change risks.

Key characteristics of the scenarios developed to assess transition risks and opportunities through 2050

	Rapid Transition SSP1-2.6	Sustainable Palladium SSP2-4.5	Global Growth SSP5-8.5
Probability	25%	70%	5%
Strategic focus	Low-carbon development paradigm with the global community's efforts focused on the reduction of GHG emissions	Maintaining current socioeconomic trends. Traditional industries remain centre stage along with the green economy	Abandoning efforts to curb climate change with further economic growth fuelled by hydrocarbons
Inflation	High	Moderate	Low
Resource/energy intensity	Low	Moderate reduction	High
Climate regulation	Strict	Moderate	Insignificant
CO_2 prices	Major increase	Moderate increase	At 2021 levels
Temperature change by 2050[1]	+1.7°C	+2.0°C	+2.5°C
Alignment with the Paris Agreement goal	+	-	-

The scenario assumptions differ from each other in qualitative terms, and these differences are directly related to the Company's product portfolio. Sustainable Palladium is considered to be the baseline scenario, which provides for traditional industries to remain centre stage along with the green economy. For example, ICE vehicles will retain a large market share, contributing to robust demand for palladium in the long run.

The Company will apply the other two scenarios in stress-testing of risks associated with climate change. In addition, a scenario parameter monitoring tool was developed to record actual deviations from the baseline scenario. A scenario analysis of the consolidated financial and economic model through 2050 showed revenue growth in all scenarios by 2050 against the average value for 2017–2021 (for more details, please see the Climate Change Report).

The Company identified potential transition risks and opportunities based on the scenarios for global economy and climate change, analysis of proposed carbon regulations, market trends and stakeholder expectations.

[1] Growth in temperature vs pre-industrial levels.

Identified transition risks and opportunities

Technology

Risks:
- Failure to achieve the decarbonisation targets:
  - due to a mismatch between the real and expected impact of low-carbon technologies or the inability to scale low-carbon technologies
  - due to the lack of access to advanced international low-carbon technologies.

Opportunities:
- Use of low-carbon technologies due to their development and lower cost in the long term.

Regulatory/financial

Risks:
- Compliance with carbon regulations in the Company's export markets.
- Compliance with national carbon regulations.

Opportunities:
- Use of ESG financing tools.
- Sale of carbon credits resulting from climate projects.

Reputational

Risks:
- Negative stakeholder perception towards the Company's climate action.
- More protests by non-profit organisations and local communities, including indigenous northern peoples.

Opportunities:
- Higher stakeholder loyalty thanks to the Company's climate action.

Market

Risks:
- Inability to raise additional debt financing on favourable terms.
- Limited sales opportunities due to insufficient carbon intensity reduction efforts compared to peers.
- Restrained demand for mined platinum group metals due to declining sales of internal combustion engine vehicles.
- Restrained demand for mined nickel due to a decline in overall vehicle production as a result of increase in ride sharing and autonomous vehicles and the development and mass production of new nickel-free batteries.
- Restrained demand for mined metals due to increased recycling.

Opportunities:
- Stronger demand for mined nickel and copper due to transport system electrification, growing hybrid vehicle market, and the development of renewables
- Stronger demand for mined platinum group metals due to the use of platinum and palladium in the hydrogen economy and palladium in vehicles hybridisation
- Benefiting from the low carbon footprint of products

To mitigate the risks caused by the need to comply with carbon regulations, the Company frequently monitors laws and regulations in both Russia and export markets.

The CBAM[1], a cross-border carbon tariff introduced in the European Union in 2023, does not pose any risk to the Company in the short term as non-ferrous and platinum group metals are not currently included in the list of products subject to the tariff. The Company continues monitoring the evolution of carbon regulations and forecasting the amount of potential associated costs.

In the long term, Nornickel relies on its competitive advantage – one of the lowest product carbon footprints in the industry.

The Company is also exploring opportunities related to the trading of carbon credits that may be generated as a result of climate projects both in the Russian and foreign carbon markets.

[1] Carbon Border Adjustment Mechanism.

Sustainability assessment of Nornickel's product portfolio under three scenarios for the global economy and climate change

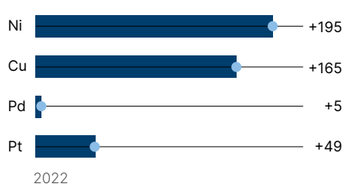
One of the key drivers of Nornickel's long-term strategy is the growing demand for the Company's metals to develop a low-carbon economy. The very fact of supplying green metals to the market means that the Company is actively contributing to the global transition to cleaner modes of transport and renewable energy.

Sustainable Palladium, the baseline scenario with a probability of 70%, envisages growing consumption of nickel, copper and platinum and expects palladium demand to remain at its current level.

For more details on the metal demand forecasts and assumptions underlying the Rapid Transition and Global Growth scenarios, please see Nornickel's Climate Change Report.

Changes in metal demand by 2050 under the Sustainable Palladium scenario,

%

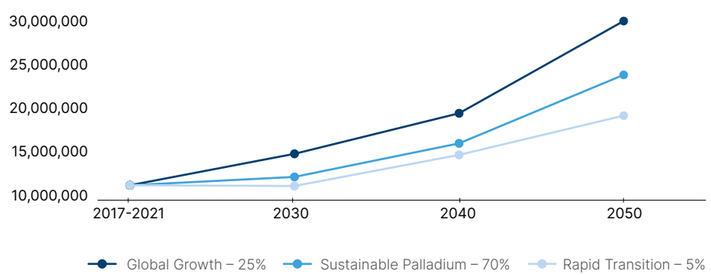


Key climate change factors affecting demand for the Company's key products

Factor	Ni	Pd/Pt	Cu
Growth of market share of battery electric vehicles (BEVs)	↑	↓	↑
Growing hybrid vehicle market	↑	↑	↑
Growing fuel cell market and hydrogen economy	→	↑	→
Growth of renewables / low carbon fuel in power generation	↑	↑	↑
Storage and grid expansion to support growth in EVs	↑	→	↑
Net effect	↑	→	↑

Scenario analysis of the consolidated financial and economic model through 2050

Revenue from Nornickel's basket of metals



Based on the global economic development and climate change scenarios, Nornickel conducted a scenario analysis of the consolidated financial and economic model through 2050. The analysis shows revenue growth in all scenarios by 2050 against the average value for 2017–2021. The key revenue growth drivers in the Global Growth scenario are the highest GDP and population growth rate, which will fuel the strongest demand for palladium, nickel, and copper in 2050 vs the other two scenarios. Although the Rapid Transition scenario is based on the most aggressive decarbonisation rates, which is impossible without green metals – nickel and copper, – the scenario projects the global economy to slow down, with the lowest GDP and population growth rates. On top of that, the total car fleet, along with the fleet of passenger EVs, hydrogen cars, and plug-in hybrids in the Rapid Transition scenario will be lower than that in the Sustainable Palladium scenario as a result of the general trend towards demotorisation and ride-sharing development.

Product portfolio diversification

In 2023, the Company adopted the Innovation Strategy, which includes plans for developing new products as a way to mitigate market risks and leverage energy transition opportunities.

To mitigate the risk of restrained demand for platinum group metals due to declining sales of ICE vehicles in the Rapid Transition scenario, the Company is exploring the outlook of producing palladium catalysts for the growing hydrogen energy market. Today the hydrogen energy market uses platinum- and iridium-based catalysts. Nornickel is considering catalyst efficiency improvements achieved through partial replacement of these metals with palladium, which, thanks to its extremely high chemical resistance, may be more effective in catalysts than other platinum group metals.

Nornickel joined forces with the scientific community to create the first prototype of a palladium-based catalyst – nanosized material for membrane electrode assemblies used in the electrolysis of hydrogen.

Nornickel is exploring the prospects of using palladium in the production of the anode and cathode of a hydrogen-air fuel cell and a proton exchange membrane electrolyser. The Company's Kola Division serves as a production site to manufacture limited batches of chemical compounds with platinum group metals. The latter can be used as the source material (precursor) to produce palladium-based catalysts.

The Company sees the development potential not only for catalysts, but also for other hydrogen energy segments such as membrane technologies for making, storing and transporting high-purity hydrogen.

To meet the growing demand of the rapidly developing battery sector for materials, the Company expands its portfolio of cobalt and nickel products, including by amplifying the production of sulphates and other nickel and cobalt compounds. Nornickel is also developing technologies for the manufacture of lithium compounds, precursors and cathodes for the battery sector.

In addition, Nornickel together with a partner are set to develop Russia's most promising lithium deposit located in the Murmansk Region. The Kolmozerskoye deposit project envisages a 45 ktpa output of lithium carbonate and hydroxide.

The partners plan to set up a large-scale integrated production site spanning everything from mining and processing to high-tech production, helping to create over 1,000 new jobs and substitute the imports of lithium feedstock and battery components.

> The hydrogen energy market is still in the making, but it is increasingly evident that sooner or later hydrogen will find its niche in the technology sector by offering a viable alternative to traditional energy sources. We have every chance of emerging as one of the key players in this industry, which is desperately looking for innovative products such as the ones we are currently working on.
>
> **Vitaly Busko,**
> Vice President for Innovations at MMC Norilsk Nickel