Introduction

GREAT NORILSK EXPEDITION

In July 2020, Nornickel initiated the Great Norilsk Expedition. A group of scientists from 14 research institutes of the Siberian Branch of the Russian Academy of Sciences was to study in detail the environment of the Taimyr Peninsula and develop proposals and recommendations that would help implement the best nature conservation solutions for industrial companies operating in the Arctic region.

Nornickel is a leading industrial company in the Russian Arctic. The Company's tactical and strategic plans are linked to the region's development, but further activities require an in-depth study of the Arctic and reliable up-to-date scientific knowledge. This statement was made by Vladimir Potanin, Nornickel's President. Any development of northern territories requires an understanding of natural and anthropogenic changes in the natural environment and their impacts on geological and biological processes.

Nornickel and the Siberian Branch of the Russian Academy of Sciences organised the Great Norilsk Expedition to gather this research. The expedition included specialists in various disciplines from botany to petrochemicals from the leading scientific institutions of Novosibirsk, Yakutsk, Krasnoyarsk, Tomsk, Norilsk and Barnaul.

The expedition's priority was an objective and high-quality study producing reliable results.

The scientists were to determine the outline of the Norilsk CHPP-3 spill and the timeline of anthropogenic pollution of the Taimyr Peninsula, and identify changes in biocoenoses and permafrost. An extremely large scope of work to be done in the harsh arctic climate required that special care be given to designing the expedition schedule and route. Feedback from the participants suggests that this was a job well done. The studies requiring special conditions, such as absence of snow or ice cover, were scheduled for the most suitable periods. Zoologists, botanists and hydrobiologists were the first to start work, with geochronologists being the last in the field.

The best possible conditions were provided for the expedition participants. All expedition members working in the field were reliably provided with transport, fuel and proper equipment. About two thousand samples of water, soils, bottom sediments, and living organisms have been taken and supplemented with permafrost measurements. This was followed up by laboratory analysis of the samples.

A report with the expedition data was released towards the end of 2020. The scientists confirmed the unsatisfactory condition of terrestrial ecosystems near Norilsk, noting that it improves gradually further away from the city.

Hydrobiologists concluded that the microflora of Taimyr water bodies polluted with petroleum products had

adapted to the new conditions, enabling the self-purification of the water bodies by the microorganisms. The self-purification ability of the water bodies is also confirmed by studies of bottom sediments, bacteria and animals, as the presence of certain species in the samples proves that the rivers and lakes are not heavily polluted now.

The scientists have collected an herbarium of plants, mosses and lichens to get a better understanding of species present in the arctic flora. Minor reduction of biodiversity observed in some areas was not linked by the specialists to anthropogenic pollution. Elsewhere, vegetation was more diverse than expected. Abundance of mosses, which are sensitive to the environment quality, is another proof of low pollution.

The region's fauna was also not affected by anthropogenic influence. Its diversity was low, as expected, but no changes that could be caused by petroleum product pollution were identified in caught mammals.

The specialists also examined soil conditions to evaluate the current condition of permafrost. The study identified the most probable cause of the tank failure at CHPP-3: subsidence of its pile foundation due to underground thawing. An analysis of the complete body of collected data ruled out the hypothesis that large volumes of petroleum products had reached the Artic Ocean.

Upon completion of a review of the expedition data, Nornickel and the Siberian Branch of the Russian Academy of Sciences designed a long-term programme to eliminate the consequences of the petroleum product spill.

The Company intends to continue collaboration with institutions engaged in fundamental research. The results of this research will lay a foundation for a new approach to operations in the Arctic. One of its key features will be conformity to sustainability principles and active deployment of green technologies, which is especially important given the fragility of northern ecosystems.

The results of the Great Norilsk Expedition will be used to develop rules for business activities in the Arctic. Andrei Bougrov, Senior Vice President of Nornickel, said these rules might be formalised as relevant governmental regulations.